KLCM/ENV. / 499 /2022 Dated: 30.05.2022

To,

The Joint Director(s)
Ministry of Environment, Forest & Climate Change,
Eastern Regional Office,
Bhubaneswar

Sub.: Submission of Six-monthly compliance report to the conditions stipulated in the grant order of Environmental Clearance (EC) pertaining to Kalarangiatta Chromite Mines of M/s FACOR LTD.

Ref.: MoEF EC Letter No.: J-11015/183/2007-IA II(M) dtd.13.05.2009

Dear Sir,
With reference to the captioned subject & cited reference, we are herewith submitting six monthly compliance reports pertaining to Kalarangiatta Chromite Mines of M/s FACOR Ltd for the period from October'2021 to March'2022 for your kind perusal.
The Monthly & quarterly Environmental monitoring data for the period October'2021 to Mar'2022 comprising AAQ, Water, Noise & Soil are enclosed herewith as Annexures.

This is for your Kind information & necessary action.

Thanking You

Yours faithfully,
for Ferro Alloys Corporation LTD

MINES MANAGER

Encl.: A/a

Name of the Project : **Kalarangiatta Chromite Mines, M/s. FACOR Ltd.**

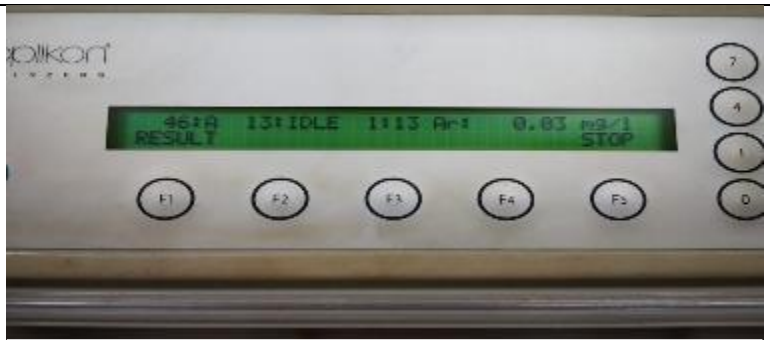
Project Code : **Mining (Non-Coal)**

Clearance Letter No. with date : **J-11015/183/2007-IA-II (M) dated.13-05-2009**

Period of Compliance Report : **Oct' 2021 to Mar' 2022**

Specific Condition

Sl. No.	Condition	Compliance Status
1.	All the conditions stipulated by the State Pollution control Board, Odisha in their consent to establish shall be effectively implemented.	All stipulated conditions are being effectively implemented.
2.	The environmental clearance is granted for opencast mining only. For the underground mining, the project proponent shall obtain separate clearance after getting the mine plan approval from the Indian Bureau of Mines.	Now opencast mining operation is going on. Before starting underground mining the project proponent will obtain separate clearance after getting mining plan approval from the Indian Bureau of Mines.  **Open Pit Mine**
3.	The environmental clearance is subject to approval of the State Land purposes Dept. Govt. of Odisha for diversion of agricultural land for non-agricultural use.	Till date Agricultural land has not been used for non-agricultural use. Diversion of Agricultural land for non-agricultural use will be done after getting approval from the State Land use Dept., Govt. of Odisha.
4.	The Project proponent shall ensure that no natural watercourse and/or water resources are obstructed due to any mining operations. Adequate measures shall be taken for protection of Damsala Nallah and other seasonal channels, if any emanating from the mine lease, during the course of mining operation.	There is no natural water course or water resource obstructed due to the mining operation. Adequate measures have been taken before discharging the mines pumped out water to Damsala Nallah. Water is being treated in ETP with Ferrous sulfate depending upon the concentration of Cr^{+6} to neutralize its effect before discharging out of the mine lease area.

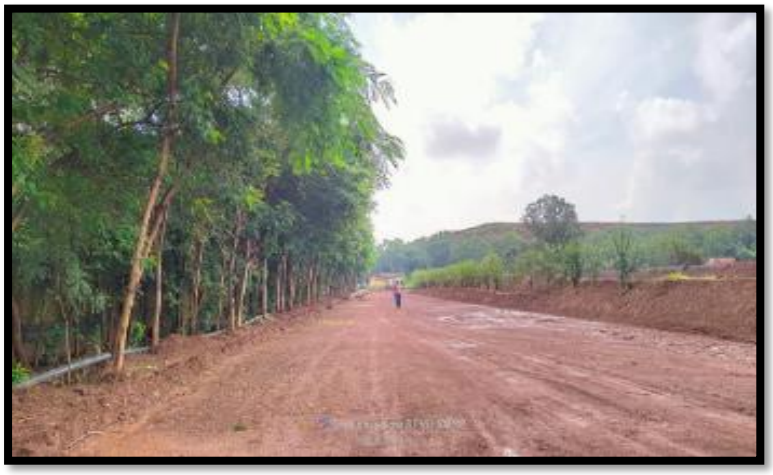
		 **ETP Outlet Cr^{+6} conc. data**
5.	The topsoil shall temporarily be stored at earmarked site(s) only and it should not be kept unutilized for long. The topsoil shall be used for land reclamation and plantation.	All the generated topsoil has been utilized for land reclamation and plantation purpose & there is no stock presently.
6.	The overburden (OB) generated during the mining operation shall be stacked at earmarked dump site (s) only and it should not be kept active for a long period of time and their phase-wise stabilization shall be carried out. There shall be one external over burden dump having maximum projected height of 30m. Proper terracing of the OB dump maintained to 27º.	The OB generated during the mining operation is being stacked at earmarked dump site. Height of the OB dump is only 19 meters. The OB dump is not kept active for long period. Overall slope of the OB dump is being maintained below 30°. Bottom inactive slope of the dump have been vegetated with native species to prevent erosion & surface run-off. Monitoring and management of rehabilitated areas of the dump have been continuing until the vegetation becomes self-sustaining.  **Plantation on OB Dump Slope**

	The OB dump shall be scientifically vegetated with suitable native species to prevent erosion and surface run off. In critical areas, use of geo textiles shall be undertaken for stabilization of the dump. Monitoring and management of rehabilitated areas shall continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the Ministry of Environment & Forests and its Regional Office located at Bhubaneswar on six monthly basis	Several precautions have been taken in the dump for its slope stabilization which are given below 1. Dumping is being carried out in peripheral dumping method by using dozers. In this method the materials are compacted by running of vehicles as well as the dozer. 2. The top surface is also maintained to avoid ponding of water which affect the stability of the dump. 3. The overburden is stacked in bench form to ensure stability. 4. The bench height is maintained at 10 – 15mtrs. 5. Various types of plants such as Acacia, Chakunda, Teak, Chhatian etc. have been planted in the inactive portions of the overburden dump. 6. The overburden dump has been stabilized by tree plantation in the dead benches after carrying out suitable terracing of size 2 M × 1 M each. 7. Grass patching has been developed on the dump slopes to ensure prevention of erosion of soil from the dump slopes due to rainwater. 8. Proper drainage system has already been maintained to prevent rain cuts on the dump. 9. Proper garland drain is being maintained all around the dump to collect the surface runoff during rain. 10. Over the bench surface of the overburden dump yard longitudinal and transverse drains have been made to enable the water to flow to the settling pit through proper drainage system. This not only prevents erosion of overburden dump material but also ensure stability of overburden dump by preventing development of hydro static pressure inside the overburden dump and proper channelization of rainwater for plantation purposes. As a result, the generation of rain cut is very negligible. 11. We have already planted 15195 nos. of Saplings to stabilize this overburden dump including safety zone also.  **Plantation on OB Dump**

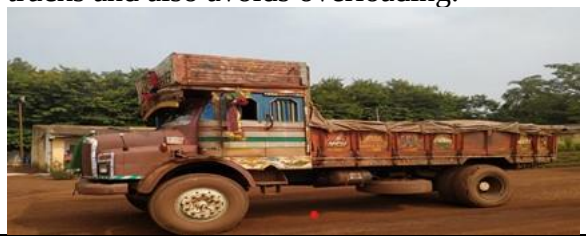
		12. Garland drain & retaining wall has been constructed all around the dump.  **Retaining Wall & Garland Drain**
7.	Catch drains and siltation ponds of appropriate size shall be constructed for the working pit, soil, OB and mineral dumps to arrest flow of silt and sediment directly into the Damsala Nallah and other water bodies. The water so collected should be utilized for watering the mine area, roads, green belt development etc.	1901 meters of garland drains has been constructed around the working pit, OB & mineral dumps with siltation ponds at different intervals to arrest flow of silt & sediments.  **Garland Drain**

	The drains should be regularly de-silted particularly after the monsoonand maintained properly. Garland drains, settling tanks and check dams of appropriate size, gradient and length shall be constructed both around the mine pit and overburden dump to prevent run off of water and flow of sediments directly into the Damsala Nallah and other water bodies and sump capacity should be designed keeping 50% safety margin over and above peak sudden rainfall (based on 50 years of data) and maximum discharge in the area adjoining the mine site. Sump capacity should also provide adequate retention period to allow proper settling of silt material. Storm water return system should be provided. Storm water should not be allowed to go to the effluent treatment plant during high rainfall/super cyclone period. A separate storm water sump for this purpose should be created.	Whenever required, the silts & sediments are being cleaned. Mines pumped-out water is being used for dust suppression and plantation purposes after proper treatment.  **Settling Pond**
8.	Dimension of retaining wall at the toe of the overburden dump and the OB benches within the mine to check run-off and siltation should be based on the rainfall data.	About 810 meters of retaining wall of width 1.5m and height 1.2m has been constructed at toe of the overburden dump to check run-off and siltation.  **Retaining Wall**

9.	Effluents containing Cr^{+6} shall be treated to meet the prescribed standards before reuse/discharge. Effluent treatment plant should be provided for treatment of mine water discharge and wastewater generated from the workshop and mineral separation plant. Run off from the OB dump and other surface run off should be analyzed for Cr^{+6} and in case its concentration is found higher than the permissible limit the water should be treated before reuse/discharge.	An Effluent Treatment Plant has been in operation for treatment of mines discharge water. The concentration of Cr^{+6} in treated discharged water is <0.005mg/l. The analysis report of mines final discharge water after treatment in ETP for the period from Oct' 2021 to Mar'2022 is enclosed in **Annexure-1**.  **ETP** Small scale mining operation is being carried out. Also, the machineries & vehicles belong to the Contractor. The repairing of these vehicles is being done at outside workshop only. There is no workshop and mineral separation plant. Surface runoff water samples were collected in a settling pit during rainy season and then pumped to the ETP for treatment before final discharge. Mine discharge water through pumping station is pumped to Flash Mixing Tank with ferrous sulfate ($FeSO_4$) for reduction of Cr^{6+} to Cr^{3+}. The effluent is then distributed to Clariflocculators & the supernatant is passed into the Sand Filters. Now, the filtered water shall be collected in Treated Water Tank and could be disposed of meeting standards stipulated by OSPCB or reused in plantation or haul roads dust suppression.  **Water Sprinkling on Haul Road**
10.	Separate impervious concrete pits for disposal of sludge shall be provided for the safe disposal of sludge generated from the mining operations.	Separate impervious pit has been provided for disposal of sludge generated from treatment of water generated during the mining operation

11.	The project proponent shall ensure that the treated effluents conforming to the prescribed standards shall only be discharged.	The mines pumped out water directly collected in the intake tank of ETP through pipeline and then treated by adding $FeSO_4$ & NaOH dosing. The final treated water is being discharged to outside ML area, conforming to the prescribed standards. For analysis reports refer **Annexure-1.**
12.	Plantation shall be raised in an area of 12.715 ha. Including 7.5m wide green belt in the safety zone around the mining lease, overburden dump, roads etc. by planting the native species in consultation with the local DFO/Agriculture Dept. The density of the trees should be around 2500 plants per hect.	During the year 2021-22, 2446 nos. of saplings have been planted in the Safety Zone area around the Mining lease and inactive bottom slope of the dump. And a 6.290 hectares has been planted till Mar'2022. Native species has been planted in consultation with local Forest Dept. by maintaining the density 2500plants per Hectare.  **Plantation in Safety Zone**
13.	The void left unfilled in an area of 5.21 hectares shall be converted into the water body. The higher benches of the excavated void/mine pit shall be terraced and plantation done to stabilize the slopes. The slopes of higher benches shall be made gentler for easy accessibility by the local people to use the water body. Peripheral fencing shall be carried out all along the excavated area.	The same will be implemented at the end of mining Operation.
14.	Effective safeguard measures, such as regular water sprinkling shall be carried out in critical areas prone to air pollution and having high levels of SPM & RSPM such as around crushing and screening plant, loading and unloading point and all transfer points. Extensive water sprinkling shall be carried out on haul roads. It should be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central Pollution Control Board in this regard.	All the parameters of ambient air quality are well within the prescribed limit. Although, regular water sprinkling is being carried out on haul roads, loading & unloading points to control the dust generation at source. There is no crushing and screening plant.  **Water Sprinkling on Haul Road**

15.	Regular monitoring of water quality upstream and downstream of the Damsala nallah shall be carried out and record of monitored data should be maintained and submitted to the Ministry of Environment & Forests, its Regional Office, Bhubaneswar, the Central Ground water Authority, the Regional Director, Central Ground water Board, the State Pollution control Board and the Central Pollution Control Board.	Monitoring of water quality upstream & downstream of the Damsala nallah is being carried out and record of monitoring data are being Maintained. The test reports is enclosed as **Annexure No.-2**.
16.	The project authority shall implement suitable conservation measures to augment ground water resources in the area in consultation with the Regional Director, Central Ground Water Board.	There are no. of rain water harvesting structures have been made in Mining premises i.e. Check Dam, Garland drain, Settling pond/tank & rooftop rain water harvesting to augment the ground water resources.  **Check Dam**
17.	Regular monitoring of ground water level and quality shall be carried out by establishing a network of existing wells and constructing new piezometers in and around the mining lease during the mining operation. The periodical monitoring {(at least four times in a year- pre-monsoon (April-May), monsoon (August), post-monsoon (November) and winter (January); once in each season)} shall be carried out in consultation with the state ground Water Board/Central Ground Water Authority and the data thus collected may be sent regularly to the MoEF and its Regional Office, Bhubaneswar, the Central Ground Water Authority and the Regional Director, CGWB. If at any stage, it is observed that the ground water table is getting depleted due to the mining activity; necessary corrective measures shall be crried out.	Monitoring of ground water level & quality is being carried out in and around the mining lease by one accredited third party. Further, as per the directive of CGWA, two nos. of piezometer holes are fitted with DWLR with telemetry system to monitor the ground water level through online. **DWLR with Telemetry system**  Monitoring report carried out by third party for water level & quality is enclosed as **Annexure No - 3 & Annexure No – 4.**

18.	The project proponent shall obtain necessary prior permission of the competent authorities for drawl of requisite quantity of water (surface water and ground water) for the project and effectively implement all the conditions stipulated therein.	NOC has been obtained from Central Ground Water Authority, Ministry of Water Resources, New Delhi vide NOC No. : CGWA/NOC/MIN/REN/1/2021/6526 for ground water withdrawal. The stipulated conditions are being effectively implemented.
19	Suitable rainwater harvesting measure on long term basis shall be planned and implemented in consultation with the Regional Director, CGWB.	Rainwater is being collected in pits and pond for suitable rainwater harvesting measures. Also roof top rainwater harvesting measure is implemented within the lease area.  **Roof Top Rain-Water Harvesting**
20.	Vehicular emissions shall be kept under control and regularly monitored. Measures shall be taken for maintenance of vehicles used in mining operations and in transportation of mineral. The mineral transportation shall be carried out through the covered trucks only and vehicles carrying the mineral shall not be overloaded.	Vehicular emission of all machinery used in mining operations are being monitored regularly and kept under control by rigorous maintenance of all engines & changing of lubricants as per the recommendation of the manufacturer. The HEMMs, with valid PUC certificate are allowed for operation inside the mines. Transportation of mineral has been done through covered trucks and also avoids overloading. 
21	Blasting operation shall be carried out only during the daytime. Controlled blasting shall be practiced. The Fitigative measures for control of ground vibrations and to arrest fly rocks and boulders should be implemented.	At present, blasting operation has not been carried out. Excavation has been carried out by machines only.
22	Drills shall either be operated with dust extractors or equipped with water injection system.	Drilling has not been done so far. In future, if drilling is required, then wet drilling practice will be adopted.
23	Mineral handling area shall be provided with adequate number of high efficiency dust extraction system. Loading and unloading areas	Water spraying arrangement is being carried out on mineral handling area, loading & unloading areas to suppress dust generation. The test report of fugitive dust emissions is enclosed as **Annexure-5.**

	including all the transfer points should also have efficient dust control arrangements. These should be properly maintained and operated.	
24	Sewage treatment plant shall be installed for the colony, ETP shall also be provided for the workshop and waste water generated during the mining operation.	One 20 KLD STP has been installed to treat the domestic wastewater & to reuse it for gardening purpose.  STP Near Office (20 KLD Capacity) All the mining machineries have been engaged by contractor for mining operation and the maintenance work of their machines have been carried out at outside workshop. Therefore, question of workshop effluent does not arise. An ETP has been established for treatment of mines pumped out water and surface runoff water before discharge to outside leasehold area. Further, installation of STP is under process  **ETP**
25.	Consent to operate shall be obtained from the State Pollution Control Board, Odisha before starting production from the mine.	Consent to Operate has been obtained from SPCB, Odisha before starting production from the mine. Mining operation has been going on with valid consent to operate obtained from SPCB vide their letter No. 3856/IND-I-CON-6318, Dtd.27.03.2020, valid upto dt 31.03.2021
26.	The project authorities should undertake sample survey to generate data on pre-project community health status within a radius of 1 km from proposed mine.	Sample survey for community health status within 1 Km radius from Project area has already been done.

27.	Pre-placement medical examination and periodical medical examination of the workers engaged in the project shall be carried out and records maintained. For the purpose, schedule of health examination of the workers should be drawn and followed accordingly.	Pre-placement medical examination has already been carried out of the workers engaged in the project and the records are being maintained and periodical medical examination is being carried out once in five years.
28.	Provision shall be made for the housing of construction labor within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.	Housing for construction labor is not required, since the laborers are coming from nearby villages.
29	The critical parameters such as SPM, RSPM, NOx, In the ambient air within the impact zone, peak particle velocity at 300 m distance or within the nearest habitation, whichever is closure shall be monitored periodically (at least once a month). Further, quality of discharged water shall also be monitored (TDS, DO, pH, suspended particulate matter and Cr^{+6}). The monitored data shall be uploaded on the website as well as displayed on a display board at a suitable location in public domain.	Parameters such as PM_{10}, $PM_{2.5}$, NOx &SO_2 in the Ambient Air and Quality of discharge water are being monitored. The monitored data is being uploaded in the Company Website and display on a display board installed at the Mines main gate. Blasting operation has not been carried out. Hence peak particle velocity has not been monitored.
30	The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered fauna namely elephant etc. spotted in the study area. Action plan for conservation of flora and fauna shall be prepared and implemented in consultation with the State Forest and Wildlife Dept. All the safeguard measures brought out in the Wildlife Conservation Plan so prepared specific to this project site shall be effectively implemented. Necessary allocation of funds for implementation of the conservation plan shall be made and the funds so allocated shall be included in the project cost. A copy of action plan shall be submitted to the MoEF and its Regional Office, Bhubaneswar.	Wildlife management plan has been prepared by accredited consultant "M/s Chandanam". It is under obtaining the approval. After getting the approval , all the stipulated conditions will be implemented strictly. Further, Biodiversity study has been carried out by a domain expert. The company has a proper system of budgeting for implementing environment management activities and CSR activities. All the Environmental protective measures expenses are being maintained in a separate dedicated Cost center/ account & the implemented expenses are being monitored Action taken report is also submitted.

31	A final Mine Closure Plan along with details of Corpus Fund shall be submitted to the MoEF 5 years in advance of final mine closure for approval.	The same will be submitted in due time to MOEF for approval

GENERAL CONDITIONS

Sl. No.	Condition	Compliance Status
1	No change in mining technology and scope of working should be made without prior approval of the MoEF.	The Mining technology & scope of working will not change without approval of Ministry of Environment & Forest.
2	No change in the calendar plan including excavation, quantum of mineral chromite ore and the waste shall be made.	The calendar plans including excavation, quantum of mineral chromite ore and waste overburden have not been changed. The calendar plan including excavation, quantum of mineral chromite ore and overburden generated during the period April 2021 to March, 2022 is given in **Annexure -6**
3	At least four ambient air quality monitoring stations should be established in the core zone as well as in the buffer zone for RSPM, SPM, SO2, & NOx monitoring. Location of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets and frequency of monitoring should be undertaken in consultation with the State Pollution Control Board.	Ambient Air quality monitoring stations has already been established in consultation with SPCB.  Near Office Building  Near ETP  NearElectrical substation  Near Weigh bridge
4	Data on ambient air quality (RSPM, SPM, SO2 & NOx) should be regularly submitted to the MoEF including its Regional. Office located at Bhubaneswar and the state Pollution Control Board / Central Pollution Control Board once in six months.	Data on Ambient Air Quality Monitoring with respect to PM_{10}, $PM_{2.5}$, SO_2, & NOx are being carried out. The monitoring reports for the period from Oct'2021 to Mar'2022 are enclosed as **Annexure-7**

5	Fugitive dust emissions from all the sources should be controlled regularly. Water spraying arrangement on haul roads, loading and unloading and at transfer points should be provided and properly maintained.	Control of fugitive dust emission is being carried out by water spraying on haul roads, loading & unloading points and ore handling yard regularly.  **Water Sprinkling on Haul Road**
6	Measures should be taken for control of noise levels below 85 dB (A) in the work environment. Workers engaged in operations of HEMM etc. should be provided with ear plugs/muffs.	Control measures such as maintenance of all machines including checking of silencers regularly and changing of engine oil as per recommendation of the manufacturer has been carried out regularly. The workers engaged at noise generating areas are provided with earplugs/muffs. The present noise level at work environment is below 85 dB (A). Sound pressure level at work environment is enclosed as **Annexure No.-8**
7	Industrial wastewater (Workshop & Waste water from the mine) should be properly collected, treated so as to conform to the standards prescribed under GSR 422(E) Dtd. 19th May, 1993 and 31st December, 1993 or as amended from time to time. Oil and grease trap should be installed before discharge of workshop effluents.	The Mines wastewater is being collected directly in intake tank of the ETP for treatment of Cr^{+6} and finally discharged to outside ML area. The analysis of this water shows that all parameters are well within the prescribed limit. The analysis report of mines final discharge water after treatment in ETP is given in **Annexure -1**. Almost all mining machineries and transporting vehicles are being engaged on contract basis for transportation of OB and chrome ore. The repairing of these vehicles is being done at outside workshop by the contractor. Therefore, question of workshop effluent does not arise.
8	Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequate training and information on safety and health aspects. Occupational health surveillance of the workers should be undertaken periodically to observe any contractions due to exposure to dust and take corrective measures, if needed.	In addition to water spraying for dust suppression, workers engaged in dusty areas such as dumper drivers, HEMM Operators, are being provided with nose masks as precautionary measure. Training & information on safety, health hazards are being given to all categories of deserved workers. Occupational health surveillance program of all categories of workers and employees have been conducted periodically.

9	A separate environmental management cell with suitable qualified personnel should be set-up under the control of a Senior Executive, who will report directly to the Head of the Organization.	A separate Environment Management Cell with qualified personnel and well equipped Environment Engineering Laboratory are functioning under the control of a Senior Executive. Besides, we are carrying out all Environmental monitoring & analysis through a MoEF & NABL accredited laboratory M/S **VisionTek Consultancy Services** Pvt. Ltd., Bhubaneswar.
10	The funds earmarked for environmental protection measures should be kept in separate account and should not be diverted for other purpose. Year wise expenditure should be reported to the MoEF and its Regional Office located at Bhubaneswar.	Separate funds provision is made to carryout environmental protection measures. Details of expenses for Environmental protection measures during the year 2021-22 are given in **Annexure No.-9**
11	The project authorities should inform to the Regional Office located at Bhubaneswar regarding date of financial closures and final approval of the project by the concerned authorities and the date of start of land development work.	The date of final approval of the Project is 04.10.2010 by DMS and 23-01-2012 by SPCB.
12	The Regional Office of this Ministry located at Bhubaneswar shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the Officer (s) of the Regional Office by furnishing the requisite data/information/monitoring reports.	As & when required and during the inspection, full co-operation is being extended by the project authorities.
13	The project proponent shall submit six monthly reports on the status of the implementation of the stipulated environmental safeguards to the MoEF, its Regional Office, Bhubaneswar, CPCB, and SPCB, The project proponent shall upload the status of compliance of the environment clearance conditions on their website and update the same periodically and simultaneously send the same by e-mail to the Regional Office, MoEF, Bhubaneswar.	All the stipulated conditions have been implemented. The Six-monthly report on Status of compliance of the Environmental Clearance conditions have been submitted to the concerned authorities and the same is being uploaded in our website www.facorgroup.in

Annexure No.-1

Visiontek Consultancy Services Pvt. Ltd.

(Committed For Better Environment)

Certified for : ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 (OH&S), ISO/IEC 17025:2017

Accredited by : NABET-A Grade, MOEF & CC/CPCB & SPCB-A Grade

- Infrastructure Enginering
- Water Resource Management
- Environmental & Social Study
- Surface & Sub-Surface Investigation
- Quality Control & Project Management
- Renewable Energy
- Agricultural Development
- Information Technology
- Public Health Engineering
- Mine Planning & Design
- Mineral/Sub-Soil Exploration
- Waste Management Services

Laboratory Services
Environment Lab
Food Lab
Material Lab
Soil Lab
Mineral Lab
&
Microbiology Lab

Ref : Envlab/20/R-5023 **Date : 31.03.2022**

EFFLUENT WATER DISCHARGE ANALYSIS REPORT- MARCH 2022

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **EW1:** ETP Mines Final Discharge Water
4. Method of Sampling : **APHA 1060 B**
5. **Date of Sampling : 21.03.2022**
6. Date of Analysis : **22.03.2022 to 28.03.2022**
7. Sample Collected by : VCSPL Representative in presence of Client's Representative

Sl. No.	Parameters	Testing Methods	Unit	Standards (In land Surface water)	Analysis Results EW-1
1	Colour	**Visual Comparison Method** APHA 2120 B; 23rd Edition, 2017	Hazen	**Colourless**	10
2	Odour	**Threshold Odour Method** APHA 2150 B; 23rd Edition, 2017	--	**Odourless**	pungent smell
3	pH at 25°C	**pH Meter** APHA 4500 H^+B; 23rd Edition, 2017	--	**5.5-9.0**	8.21
4	Total Suspended Solids	**Gravimetric Method** APHA 2540 D; 23rd Edition, 2017	mg/l	**100**	40
5	Copper as Cu	**By AAS Method** APHA 3111 B; 23rd Edition, 2017	mg/l	**3**	<0.01
6	Fluoride as F	**Distillation followed by Spectophotometric Method** APHA 4500 F^- C,D; 23rd Edition, 2017	mg/l	**2**	0.32
7	Total Residual Chlorine	**Iodometric Method** APHA 23RD Ed.2017 : 4500Cl, B	mg/l	**1**	0.21
8	Iron as Fe	**By AAS Method** APHA 3111 B; 23rd Edition, 2017	mg/l	**3**	0.46
9	Manganese as Mn	**By AAS Method** APHA 3111 B; 23rd Edition, 2017	mg/l	**2**	<0.025
10	Nitrate as NO_3	**By UV-Screen Method** APHA 4500 NO_3^- B; 23rd Edition, 2017	mg/l	**10**	7.28
11	Phenolic Compounds as C_6H_5OH	**Distillation Followed by Spectophotometric Method** APHA 5530-B, D; 23rd Edition, 2017	mg/l	**1**	<0.05
12	Selenium as Se	**By AAS Method** APHA 3500 Se C; 23rd Edition, 2017	mg/l	**0.05**	<0.001
13	Cadmium as Cd	**By AAS Method** APHA 3111 B; 23rd Edition, 2017	mg/l	**2.0**	<0.01
14	Cyanide as CN	**Distillation Followed by Spectophotometric Method** APHA 4500 –CN-C,E; 23rd Edition, 2017	mg/l	**0.2**	<0.01
15	Lead as Pb	**By AAS Method** APHA 3111 B; 23rd Edition, 2017	mg/l	**0.1**	<0.02
16	Mercury as Hg	**By AAS Method** APHA 3112 B; 23rd Edition, 2017	mg/l	**0.01**	<0.004
17	Nickel as Ni	**By AAS Method** APHA 3111 B; 23rd Edition, 2017	mg/l	**3**	<0.1
18	Arsenic as As	**By AAS Method** APHA 3114 B; 23rd Edition, 2017	mg/l	**0.2**	<0.004
19	Total Chromium as Cr	**By AAS Method** APHA 3111 B; 23rd Edition, 2017	mg/l	**2**	0.28
20	Zinc as Zn	**By AAS Method** APHA 3111 B; 23rd Edition, 2017	mg/l	**5**	0.032
21	Hexavalent Chromium as Cr^{+6}	**By AAS Method** APHA 3500 Cr B; 23rd Edition, 2017	mg/l	**0.1**	<0.01
22	Vanadium as V	**By AAS Method** APHA 3500 V; 23rd Edition, 2017	mg/l	**0.2**	<0.001

Ref : Envlab/20/R-5023 **Date : 31.03.2022**

23	Temperature	**By Thermometer** APHA 2550 B; 23rd Edition, 2017	°C	**Shall not exceed 5°C above the receiving water temperature**	34
24	Dissolved Oxygen	**Modified Winkler Method** APHA 4500 O. C; 23rd Edition, 2017	mg/l	--	6.1
25	Biochemical Oxygen Demand as BOD	**Oxygen Depletion Method** IS 3025 (Part 44):2003	mg/l	**30**	5.9
26	Chemical Oxygen Demand as COD	**Open Reflux Method** APHA 5220 B; 23rd Edition, 2017	mg/l	**250**	18
27	Oil & Grease	**Gravimetric Method (Solvent Extraction)** APHA 5520 B; 23rd Edition, 2017	mg/l	**10**	4.2
28	Ammonical Nitrogen as N	**By TKN Method** APHA 4500-NH_3 C; 23rd Edition, 2017	mg/l	**50**	2.6
29	Total Kjeldahl Nitrogen as N	**By TKN Method** APHA 4500-N_{org} C; 23rd Edition, 2017	mg/l	**100**	6.9
30	Sulphide as S	**By Methylene Blue Method** APHA 4500-S D; 23rd Edition, 2017	mg/l	**2**	<0.05
31	Free Ammonia as NH_3	**By Calculation**	mg/l	**10**	4.8
32	Particulate Size of Suspended Solids	**Gravimetric Method** APHA 2540 D; 23rd Edition, 2017	µ	**Shall pass 850 micron IS Sieve**	<850
33	Bio-assay Test	**Evaluating Acute Toxicity** IS 6582 (P-2) 2008	%	**90% survival of fish after 96 hours in 100% effluent**	98% Survival of Fish after 96 Hrs in 100% Effluent

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Annexure No.-2

Visiontek Consultancy Services Pvt. Ltd.

(Committed For Better Environment)

Certified for : ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 (OH&S), ISO/IEC 17025:2017

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Food Lab
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Soil Lab
Mineral Lab
&
Microbiology Lab

Ref : Envlab/20/R-5024 **Date : 31.03.2022**

SURFACE WATER QUALITY ANALYSIS REPORT- MARCH-2022

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **SW1:** Damsala Nallah Upstream Water (100 mtr Up)
   SW2: Damsala Nallah Downstream Water (100 mtr Up)
   (with impact of other mines discharge)
4. Method of Sampling : **APHA 1060 B**
5. **Date of Sampling** : **21.03.2022**
6. Date of Analysis : **22.03.2022 to 28.03.2022**
7. Sample Collected by : VCSPL Representative in presence of Client's Representative

Sl. No	Parameter	Testing Method	Unit	Standards as per IS-2296:1992 Class –'C'	Analysis Results	
					SW-1	SW-2
1	Colour (max)	**Visual Comparison Method** APHA 23RD Ed.2017 : 2120 B, C	Hazen	300	<5	5
2	pH Value	**pH Meter** APHA 23RD Ed.2017 : 4500H+ B	--	6.0-9.0	7.28	7.24
3	Suspended solids	**Gravimetric Method** APHA 23RD Ed.2017 : 2540 D	mg/l	--	62	84
4	Dissolved Oxygen (minimum)	**Modified Winkler Method** APHA 23RD Ed.2017 : 2540 C	mg/l	4.0	6.8	6.2
5	Turbidity	**Nephelometric Method** APHA 23RD Ed.2017: 2130 B	NTU	--	8.1	10.8
6	Chloride (max)	**Titrimetric Method** APHA 23RD Ed.2017: 4500Cl- B	mg/l	600	8.6	10.2
7	Total Dissolved Solids	**Gravimetric Method** APHA 23RD Ed.2017: 2540 C	mg/l	1500	90	120
8	BOD (3) days at 27°C (max)	IS 3025(P-44) : 1993 RA 2003	mg/l	3.0	<1	<1
9	Arsenic as As	**By AAS Method** APHA 23RD Ed.2017: 3114 B	mg/l	0.2	<0.004	<0.004
10	Lead as Pb(max)	**By AAS Method** APHA 23RD Ed.2017 3111 B	mg/l	0.1	<0.02	<0.02
11	Cadmium as Cd (max)	**By AAS Method** APHA 23RD Ed.2017: 3111 B	mg/l	0.01	<0.01	<0.01
12	Hexa Chromium as Cr^{+6}	**Diphenyl Carbazide Method** APHA 23RD Ed.2017: 3500Cr B	mg/l	0.05	<0.01	<0.01
13	Copper as Cu (max)	**By AAS Method** APHA 23RD Ed.2017: 3111 B	mg/l	1.5	<0.02	<0.02
14	Zinc as Zn(max)	**By AAS Method** APHA 23RD Ed.2017: 3111 B	mg/l	15	<0.03	<0.03
15	Selenium as Se (max)	**By AAS Method** APHA 23RD Ed.2017: 3500 Se C	mg/l	0.05	<0.001	<0.001
16	Cyanide as CN (max)	**Distillation followed by Spectrophotometric Method** APHA 23RD Ed.2017: 4500 CN- C,D	mg/l	0.05	<0.01	<0.01
17	Fluoride as F (max)	**Distillation followed by Spectrophotometric Method** APHA 23RD Ed.2017: 4500F- C	mg/l	1.5	0.14	0.24
18	Sulphates (SO_4) (max)	**Turbidimetric Method** APHA 23RD Ed.2017: 4500 SO_4^{2-} E	mg/l	400	0.92	0.92

Ref : Envlab/20/R-5024 **Date : 31.03.2022**

19	Phenolic Compounds as C_6H_5OH (max)	**Chloroform Extraction By Colorimetric Method** APHA 23RD Ed,2017: 5530 B,D	mg/l	**0.005**	<0.05	BDL
20	Iron as Fe (max)	**By AAS Method** APHA 23RD Ed,2017: 3500Fe, B	mg/l	**0.5**	0.64	0.041
21	Nitrate as NO_3 (max)	**By UV-Screen Method** APHA 23RD Ed,2017: 4500 NO_3^- E	mg/l	**50**	2.8	1.8
22	Anionic Detergents (max)	**Anionic Surfactants as MBAS** APHA 23RD Ed,2017: 5540 C	mg/l	**1.0**	<0.2	<0.2
23	Total Coli form	**By Multiple Tube Fermentation Technique** APHA 23RD Ed,2017: 9221 B	MPN/ 100 ml	**5000**	1280	1800

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Annexure No.-3

Visiontek Consultancy Services Pvt. Ltd.

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Certified for : ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 (OH&S), ISO/IEC 17025:2017

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Soil Lab
Mineral Lab
&
Microbiology Lab

Ref : Envlab/21/R-0061 **Date : 12.01.2022**

GROUND WATER LEVEL REPORT- DECEMBER- 2021

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sample Collected by : VCSPL Representative in presence of Client's Representative

SL.No.	Locations	DOS	Unit	Analysis Result
1	Tube Well Water Near TISCO Main Gate	14.12.2021	mt/bgl	6.2
2	Tube Well Inside the Lease Hold Area	14.12.2021	mt/bgl	7.1
3	Open Well Water of Ransol	14.12.2021	mt/bgl	7.6
4	Tube Well Water of Kalarangiatta	14.12.2021	mt/bgl	7.8
5	Tube Well Water of Bhimtanagar	14.12.2021	mt/bgl	7.2
6	Open Well Village Goramian	14.12.2021	mt/bgl	7.3
7	Tube Well Near OMC Labour Colony	14.12.2021	mt/bgl	7.6
8	Open Well at Village Chingudipal	14.12.2021	mt/bgl	8.4
9	Open Well at Village Kusumundia	14.12.2021	mt/bgl	7.3

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Approved By

ANNEXURE NO.-4

Visiontek Consultancy Services Pvt. Ltd.

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Certified for : ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 (OH&S), ISO/IEC 17025:2017

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Soil Lab
Mineral Lab
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Microbiology Lab

Ref : Envlab/20/R-5021 **Date : 31.03.2022**

GROUND WATER QUALITY ANALYSIS REPORT- MARCH 2022

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **GW1:** Tube Well Near TISCO Main Gate
   GW2: Tube Well inside the Lease hold Area
   GW3: Open Well at Ransol Village
4. Method of Sampling : **APHA 1060 B**
5. Date of Analysis : **22.03.2022 to 28.03.2022**
6. Sample Collected by : VCSPL Representative in presence of Client's Representative

Sl. No.	Parameter	Testing Method	Unit	Standard as per IS -10500:2012 Amended on 2015 & 2018		Analysis Result		
						GW1	GW2	GW3
				Permissible Limit	Permissible Limit	DOS: 21.03.2022	DOS: 21.03.2022	DOS: 21.03.2022
Essential Characteristics								
1	Colour	**Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B, C	Hazen	5	15	<5	<5	<5
2	Odour	**Threshold Odour Test** APHA 23RD Ed,2017 :2150 B	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	**Flavor Threshold Test** APHA 23RD Ed,2017 : 2160 C	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	**Nephelometric Method** APHA 23RD Ed,2017 :2130 B	NTU	1	5	<1	<1	<1
5	pH Value at 25^{0}C	**pH Meter** APHA 23RD Ed,2017 : 4500H$^+$ B	--	6.5-8.5	No Relaxation	6.88	6.69	6.88
6	Total Hardness (as $CaCO_3$)	**EDTA Titrimetric Method** APHA 23RD Ed,2017 : 2340 C	mg/l	200	600	196	190	187
7	Iron (as Fe)	**By AAS Method** APHA 23RD Ed,2017 : 3111, B	mg/l	1.0	No Relaxation	0.28	0.31	0.26
8	Chloride (as Cl)	**Argentometric Method** APHA 23RD Ed,2017 : 4500Cl$^-$ B	mg/l	250	1000	44	36	48
9	Residual, free Chlorine	**Iodometric Method** APHA 23RD Ed,2017 : 4500Cl, B	mg/l	0.2	1	ND	ND	ND
Desirable Characteristics								
10	Dissolved Solids	**Gravimetric Method** APHA 23RD Ed,2017 : 2540 C	mg/l	500	2000	318	288	308
11	Calcium (as Ca)	**EDTA Titrimetric Method** APHA 23RD Ed,2017 : 3500Ca B	mg/l	75	200	56.8	50.8	58.2
12	Magnesium (as Mg)	**Calculation Method** APHA 23RD Ed,2017 : 3500Mg B	mg/l	30	100	22.6	21.6	26.4
13	Copper (as Cu)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	0.05	1.5	<0.02	<0.02	<0.02
14	Manganese (as Mn)	**Persulfate Method** APHA 23RD Ed,2017: 3500Mn B	mg/l	0.1	0.3	<0.025	<0.025	<0.025
15	Sulphate (as SO_4)	**Turbidimetric Method** APHA 23RD Ed,2017: 4500 $SO4^{2-}$ E	mg/l	200	400	28	22	23
16	Nitrate (as NO_3)	**By UV-Screen Method** APHA 23RD Ed,2017: 4500 NO_3^- E	mg/l	45	No Relaxation	7.4	6.8	7.1
17	Fluoride (as F)	**Distillation followed by Spectrophotometric Method** APHA 23RD Ed,2017: 4500F C	mg/l	1.0	1.5	0.26	0.21	0.24
18	Phenolic Compounds (as C_6H_5OH)	**Chloroform Extraction by Colorimetric Method** APHA 23RD Ed,2017: 5530 B,D	mg/l	0.001	0.002	<0.05	<0.05	<0.05
19	Mercury (as Hg)	**AAS Method** APHA 23RD Ed,2017: 3112 B	mg/l	0.001	No Relaxation	<0.004	<0.004	<0.004
20	Cadmium (as Cd)	**AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	0.003	No Relaxation	<0.01	<0.01	<0.01

Ref : Envlab/20/R-5021 **Date : 31.03.2022**

21	Selenium (as Se)	**By AAS Method** APHA 23RD Ed,2017: 3500 Se C	mg/l	**0.01**	**No Relaxation**	<0.001	<0.001	<0.001
22	Arsenic (as As)	**By AAS Method** APHA 23RD Ed,2017: 3114 B	mg/l	**0.01**	**No Relaxation**	<0.004	<0.004	<0.004
23	Cyanide (as CN)	**Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500 CN^- C,D	mg/l	**0.05**	**No Relaxation**	<0.01	<0.01	<0.01
24	Lead (as Pb)	**By AAS Method** APHA 23RD Ed,2017 3111 B	mg/l	**0.01**	**No Relaxation**	<0.02	<0.02	<0.02
25	Zinc (as Zn)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**5**	**15**	<0.03	<0.03	<0.03
26	Anionic Detergents (as MBAS)	**Anionic Surfactants as MBAS** APHA 23RD Ed,2017: 5540 C	mg/l	**0.2**	--	<0.2	<0.2	<0.2
27	Mineral Oil	**Partition-Gravimetric Method** APHA 23RD Ed,2017: 5520 B	mg/l	**0.5**	**No Relaxation**	<0.5	<0.5	<0.5
28	Alkalinity	**Titration Method** APHA 23RD Ed,2017:2320 B	mg/l	**200**	**600**	180	190	196
29	Aluminium as(Al)	**AAS Method** APHA 23RD Ed,2017: 3111 D	mg/l	**0.03**	**0.2**	<0.1	<0.1	<0.1
30	Boron (as B)	**Curcumin Method** APHA 23RD Ed,2017: 4500B, B	mg/l	**0.5**	**2.4**	<0.1	<0.1	<0.1
31	Total Coli form as TC	**MPN Method** APHA 23RD Ed,2017 : 9221 b	MPN/ 100ml	Shall not be detectable in any 100ml sample	--	160	110	112

L – Colourless, ND – Not detected.
BDL (Below detection limit) Values :(Cu<0.02 mg/l , Mn<0.025 mg/l, C_2H_5OH<0.05mg/l, Hg<0.004mg/l, Cd<0.01 mg/l ,Se<0.001 mg/l, As<0.004 mg/l,Pb<0.02 mg/l, Zn<0.65 mg/l, Cr^{+6}<0.01 mg/l, Al<0.1 mg/l , B<0.1 mg/l, NO_3<1 mg/l)

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&
Microbiology Lab

Ref : Envlab/20/R-5022 **Date : 31.03.2022**

GROUND WATER QUALITY ANALYSIS REPORT- MARCH 2022

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **GW4:** Tube Well at Kalarngiatta Village
   GW5: Tube Well at Bhimta Nagar Village
4. Method of Sampling : **APHA 1060 B**
5. Date of Analysis : **22.03.2022 to 28.03.2022**
6. Sample Collected by : VCSPL Representative in presence of Client's Representative

Sl. No.	Parameter	Testing Method	Unit	Standard as per IS -10500:2012 Amended on 2015 & 2018		Analysis Result	
						GW4	GW5
				Permissible Limit	Acceptable Limit	DOS: 21.03.2022	DOS: 21.03.2022
Essential Characteristics							
1	Colour	**Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B, C	Hazen	5	15	<5	<5
2	Odour	**Threshold Odour Test** APHA 23RD Ed,2017 :2150 B	--	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	**Flavor Threshold Test** APHA 23RD Ed,2017 : 2160 C	--	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	**Nephelometric Method** APHA 23RD Ed,2017 :2130 B	NTU	1	5	<1	<1
5	pH Value at 25^0C	**pH Meter** APHA 23RD Ed,2017 : 4500H^+ B	--	6.5-8.5	No Relaxation	7.08	7.18
6	Total Hardness (as $CaCO_3$)	**EDTA Titrimetric Method** APHA 23RD Ed,2017 : 2340 C	mg/l	200	600	194	186
7	Iron (as Fe)	**By AAS Method** APHA 23RD Ed,2017 : 3111, B	mg/l	1.0	No Relaxation	0.52	0.48
8	Chloride (as Cl)	**Argentometric Method** APHA 23RD Ed,2017 : 4500Cl^- B	mg/l	250	1000	36	34
9	Residual, free Chlorine	**Iodometric Method** APHA 23RD Ed,2017 : 4500Cl, B	mg/l	0.2	1	0.24	0.21
Desirable Characteristics							
10	Dissolved Solids	**Gravimetric Method** APHA 23RD Ed,2017 : 2540 C	mg/l	500	2000	328	320
11	Calcium (as Ca)	**EDTA Titrimetric Method** APHA 23RD Ed,2017 : 3500Ca B	mg/l	75	200	62	56
12	Magnesium (as Mg)	**Calculation Method** APHA 23RD Ed,2017 : 3500Mg B	mg/l	30	100	26.4	22.8
13	Copper (as Cu)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	0.05	1.5	<0.02	<0.02
14	Manganese (as Mn)	**Persulfate Method** APHA 23RD Ed,2017: 3500Mn B	mg/l	0.1	0.3	<0.025	<0.025
15	Sulphate (as SO_4)	**Turbidimetric Method** APHA 23RD Ed,2017: 4500 $SO4^{2-}$ E	mg/l	200	400	28.6	26.4
16	Nitrate (as NO_3)	**By UV-Screen Method** APHA 23RD Ed,2017: 4500 NO_3^- E	mg/l	45	No Relaxation	7.8	7.1
17	Fluoride (as F)	**Distillation followed by Spectrophotometric Method** APHA 23RD Ed,2017: 4500F^- C	mg/l	1.0	1.5	0.23	0.21
18	Phenolic Compounds (as C_6H_5OH)	**Chloroform Extraction by Colorimric Method** APHA 23RD Ed,2017: 5530 B,D	mg/l	0.001	0.002	<0.05	<0.05
19	Mercury (as Hg)	**AAS Method** APHA 23RD Ed,2017: 3112 B	mg/l	0.001	No Relaxation	<0.004	<0.004
20	Cadmium (as Cd)	**AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	0.003	No Relaxation	<0.01	<0.01
21	Selenium (as Se)	**By AAS Method** APHA 23RD Ed,2017: 3500 Se C	mg/l	0.01	No Relaxation	<0.001	<0.001

Ref : Envlab/20/R-5022 **Date : 31.03.2022**

22	Arsenic (as As)	**By AAS Method** APHA 23RD Ed.2017: 3114 B	mg/l	**0.01**	**No Relaxation**	<0.004	<0.004
23	Cyanide (as CN)	**Distillation followed by Spectophotometric Method** APHA 23RD Ed.2017: 4500 CN^- C,D	mg/l	**0.05**	**No Relaxation**	<0.01	<0.01
24	Lead (as Pb)	**By AAS Method** APHA 23RD Ed.2017 3111 B	mg/l	**0.01**	**No Relaxation**	<0.02	<0.02
25	Zinc (as Zn)	**By AAS Method** APHA 23RD Ed.2017: 3111 B	mg/l	**5**	**15**	<0.03	<0.03
26	Anionic Detergents (as MBAS)	**Anionic Surfactants as MBAS** APHA 23RD Ed.2017: 5540 C	mg/l	**0.2**	--	<0.2	<0.2
27	Mineral Oil	**Partition-Gravimetric Method** APHA 23RD Ed.2017: 5520 B	mg/l	**0.5**	**No Relaxation**	<0.5	<0.5
28	Alkalinity	**Titration Method** APHA 23RD Ed.2017:2320 B	mg/l	**200**	**600**	188	172
29	Aluminium as(Al)	**AAS Method** APHA 23RD Ed.2017: 3111 D	mg/l	**0.03**	**0.2**	<0.1	<0.1
30	Boron (as B)	**Curcumin Method** APHA 23RD Ed.2017: 4500B, B	mg/l	**0.5**	**2.4**	<0.1	<0.1
31	Total Coliform as TC	**MPN Method** APHA 23RD Ed.2017 : 9221 b	MPN/ 100ml	Shall not be detectable in any 100ml sample	--	140	120

CL – Colorless, ND – Not detected.

BDL (Below detection limit) Values :(Cu<0.02 mg/l , Mn<0.025 mg/l, C_2H_5OH<0.05mg/l, Hg<0.004mg/l, Cd<0.01 mg/l ,Se<0.001 mg/l, As<0.004 mg/l,Pb<0.02 mg/l, Zn<0.65 mg/l, Cr^{+6}<0.01 mg/l, Al<0.1 mg/l , B<0.1 mg/l, NO_3<1 mg/l)

Reviewed By *Approved By*

Visiontek Consultancy Services Pvt. Ltd.

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Mineral Lab
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Microbiology Lab

Ref : Envlab/20/R-5029 **Date : 31.03.2022**

FUGITIVE EMISSION ANALYSIS REPORT- MARCH 2022

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **F1-** Near Mines Ore Plot Area
   F2- Near Office
4. Method of Sampling : IS 5182(P-5) 1975 RA 2014
5. Date of Sampling : 16.03.2022
6. Date of Analysis : 17.03.2022 to 19.03.2022
7. Sample Collected by : VCSPL Representative in presence of Client's Representative

SL. No.	Test Parameters	Test Method	Unit	Analysis Result	
				F1	F2
1	Suspended Particulate Matter as SPM	IS 5182 (P-4)1999 RA 2014 Gravimetric Method	$\mu g/m^3$	242.0	318.0

Reviewed By

Approved By

Annexure No.-6

EXCAVATION PLAN FY 2021-22
KALARANGIATTA CHROMITE MINES

Particulars	Approved quantity Per Annum	Achieved FY 2021-22
Over burden (Lac Cub Mt)	1.895 Lac Cub Mt	1.620 Lac Cub Mt
ROM Production	50000 Tonne	49985.420 Tonne

Annexure No.-7

Visiontek Consultancy Services Pvt. Ltd.

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Certified for : ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 (OH&S), ISO/IEC 17025:2017

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Mineral Lab
&
Microbiology Lab

Ref : Envlab/20/R-5018 **Date : 31.03.2022**

AMBIENT AIR QUALITY (CORE ZONE) MONITORING REPORT- MARCH 2022

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Monitor, VOC Sampler
4. Sample Collected by : VCSPL Representative in presence of Client's Representative

Monitoring Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_x (µg/m³)	CO (mg/m³)	O_3 (µg/m³)	NH_3 (µg/m³)	C_6H_6 (µg/m³)	Bap (ng/m³)	Pb (µg/m³)	Ni (ng/m³)	As (ng/m³)
	AAQMS-1: Near Office Building											
02.03.2022	63.8	38.3	6.9	12.4	0.39	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.03.2022	64.6	38.8	6.4	12.8	0.41	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.03.2022	65.8	39.5	6.2	13.4	0.43	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.03.2022	66.6	40.0	7.4	13.1	0.44	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.03.2022	67.8	40.7	7.8	12.6	0.46	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.03.2022	68.2	40.9	6.6	12.8	0.48	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.03.2022	69.6	41.8	6.2	13.1	0.44	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.03.2022	66.8	40.1	6.1	13.2	0.42	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Monthly Average	**66.7**	**40.0**	**6.7**	**12.9**	**0.43**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
NAAQ Standard	100	60	80	80	4	100	400	5	01	01	20	06
Monitoring Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_x (µg/m³)	CO (mg/m³)	O_3 (µg/m³)	NH_3 (µg/m³)	C_6H_6 (µg/m³)	Bap (ng/m³)	Pb (µg/m³)	Ni (ng/m³)	As (ng/m³)
	AAQMS-2: Near ETP											
02.03.2022	68.6	41.2	7.4	13.8	0.41	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.03.2022	70.6	42.4	7.7	14.6	0.44	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.03.2022	71.4	42.8	8.4	15.4	0.48	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.03.2022	72.8	43.7	8.2	15.8	0.42	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.03.2022	73.6	44.2	7.9	16.6	0.36	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.03.2022	72.8	43.7	7.2	15.2	0.42	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.03.2022	72.6	43.6	8.4	14.8	0.39	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.03.2022	71.4	42.8	8.2	15.4	0.41	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Monthly Average	**71.7**	**43.0**	**7.9**	**15.2**	**0.42**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
NAAQ Standard	100	60	80	80	4	100	400	5	01	01	20	06
Testing Method	Gravimetric	Gravimetric	Improved West and Geake method	Modified Jacob & Hochheiser (Na-Arsenite)	NDIR Spectroscopy	Chemical Method	Indo Phenol Blue Method	Absorption & Desorption followed by GC	Solvent Extraction Followed by GC	AAS Method	AAS Method	AAS Method

BDL (Below Detection Limit) PM10 <20 µg/m³, PM 2.5<10 µg/m³, SO_2<4 µg/m³, NO_2<6 µg/m³, O_3<4 µg/m³, NH_3<20 µg/m³, C6H6<4 µg/m³, Bap <0.5 ng/m³, As < 1 ng/m³, Ni < 2.5 ng/m³, Pb <0.02 µg/m³

VISIONTEK CONSULTANCY SERVICES PVT. LTD. *Reviewed*

VISIONTEK CONSULTANCY SERVICES PVT. LTD. *Approved By*

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- Mine Planning & Design
- Mineral/Sub-Soil Exploration
- Waste Management Services

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Soil Lab
Mineral Lab
&
Microbiology Lab

Ref : Envlab/20/R-5019 **Date : 31.03.2022**

AMBIENT AIR QUALITY (CORE ZONE) MONITORING REPORT- MARCH 2022

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Monitor, VOC Sampler
4. Sample Collected by : VCSPL Representative in presence of Client's Representative

Monitoring Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_x (µg/m³)	CO (mg/m³)	O_3 (µg/m³)	NH_3 (µg/m³)	C_6H_6 (µg/m³)	Bap (ng/m³)	Pb (µg/m³)	Ni (ng/m³)	As (ng/m³)
	AAQMS-3: Near Electrical Substation											
02.03.2022	73.6	44.2	8.4	14.8	0.48	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.03.2022	74.8	44.9	8.6	15.6	0.56	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.03.2022	75.2	45.1	8.8	15.9	0.55	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.03.2022	74.6	44.8	8.5	16.2	0.54	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.03.2022	72.8	43.7	8.2	16.6	0.52	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.03.2022	70.8	42.5	8.3	17.4	0.51	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.03.2022	71.6	43.0	8.2	16.8	0.49	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.03.2022	71.8	43.1	8.1	15.9	0.46	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Monthly Average	**73.2**	**43.9**	**8.4**	**16.2**	**0.51**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
NAAQ Standard	100	60	80	80	4	100	400	5	01	01	20	06
Monitoring Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_x (µg/m³)	CO (mg/m³)	O_3 (µg/m³)	NH_3 (µg/m³)	C_6H_6 (µg/m³)	Bap (ng/m³)	Pb (µg/m³)	Ni (ng/m³)	As (ng/m³)
	AAQMS-4: Near Weigh Bridge											
02.03.2022	68.6	41.2	9.4	13.8	0.49	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.03.2022	70.6	42.4	9.6	13.4	0.54	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.03.2022	71.8	43.1	9.8	14.6	0.55	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.03.2022	72.6	43.6	9.2	14.2	0.58	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.03.2022	73.4	44.0	9.1	15.4	0.56	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.03.2022	72.2	43.3	9.4	15.2	0.53	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.03.2022	70.8	42.5	9.5	14.8	0.51	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.03.2022	66.9	40.1	9.2	14.2	0.46	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Monthly Average	**70.9**	**42.5**	**9.4**	**14.5**	**0.53**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
NAAQ Standard	100	60	80	80	4	100	400	5	01	01	20	06
Testing Method	Gravimetric	Gravimetric	Improved West and Geake method	Modified Jacob & Hochheiser (Na-Arsenite)	NDIR Spectroscopy	Chemical Method	Indo Phenol Blue Method	Absorption & Desorption followed by GC	Solvent Extraction Followed by GC	AAS Method	AAS Method	AAS Method

BDL (Below Detection Limit) PM10 <20 µg/m³, PM 2.5<10 µg/m³, SO_2<4 µg/m³, NO_2<6 µg/m³, O_3<4 µg/m³, NH_3<20 µg/m³, C6H6<4 µg/m³, Bap <0.5 ng/m³, As < 1 ng/m³, Ni < 2.5 ng/m³, Pb <0.02 µg/m³

Annexure No.-7

Visiontek Consultancy Services Pvt. Ltd.

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Certified for : ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 (OH&S), ISO/IEC 17025:2017

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- Water Resource Management
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- Quality Control & Project Management
- Renewable Energy
- Agricultural Development
- Information Technology
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- Mine Planning & Design
- Mineral/Sub-Soil Exploration
- Waste Management Services

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Environment Lab
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Soil Lab
Mineral Lab
&
Microbiology Lab

Ref : Envlab/21/R-5020 **Date : 31.03.2022**

AMBIENT AIR QUALITY (BUFFER ZONE) MONITORING REPORT- MARCH 2022

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Monitor, VOC Sampler
4. Sample Collected by : VCSPL Representative in presence of Client's Representative

Monitoring Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_x (µg/m³)	CO (mg/m³)	O_3 (µg/m³)	NH_3 (µg/m³)	C_6H_6 (µg/m³)	Bap (ng/m³)	Pb (µg/m³)	Ni (ng/m³)	As (ng/m³)
	AAQMS-1: Near Village Bhimtanagar											
01.03.2022	46.8	27.4	6.9	10.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
AAQMS-2: Near Village Ransol												
08.03.2022	46.8	28.4	7.2	11.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
AAQMS-3: Near Kaliapani Township												
08.03.2022	48.4	29.6	6.6	11.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
AAQMS-4: Near Village Godisahi												
15.03.2022	49.6	29.6	6.6	11.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
AAQMS-5: Near Village Baragaji												
22.03.2022	56.4	30.8	6.4	11.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

VISIONTEK CONSULTANCY SERVICES PVT. LTD. *Reviewed By*

VISIONTEK CONSULTANCY SERVICES PVT. LTD. *Approved By*

Annexure No.-8

Visiontek Consultancy Services Pvt. Ltd.

(Committed For Better Environment)

Certified for : ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 (OH&S), ISO/IEC 17025:2017

Accredited by : NABET-A Grade, MOEF & CC/CPCB & SPCB-A Grade

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Soil Lab
Mineral Lab
&
Microbiology Lab

Ref : Envlab/20/R-5027 **Date : 31.03.2022**

NOISE QUALITY ANALYSIS REPORT- MARCH 2022

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. **Date of Sampling :16.03.2022**
4. Sample Collected by : VCSPL Representative in presence of Client's Representative

Location ID	Location		Result in dB (A)	
		Ambient	Day Time (6.00 am to 10.00pm)	Night Time (10.00pm to 6.00 am)
N1	Near Middle of the Quarry		65.9	61.8
N2	Near Office Building		63.2	54.2

AMBIENT NOISE LEVEL STANDARD

Category Area/Zone	Limit in dB (A)	
	Day Time (6.00 am to 10.00pm)	Night Time (10.00pm to 6.00 am)
Industrial Area	75	70
Residential Area	55	45
Commercial Area	65	55
Silence Zone	50	40

Annexure No.-9

ENVIRONMENTAL PROTECTION EXPENSES FOR THE YEAR 2021-22 KALARANGIATTA CHROMITE MINE,M/s FACOR LTD		
Sl. No.	**I T E M**	**Expenses for the year 2021-22 (in Rupees ₹)**
1	**AFFORESTATION**	
a)	Seedlings 2446	146,760
b)	Fertilizer/Insecticide/Cow -dung	48,920
c)	Digging of Pits/Planting (Laborcost)	85,610
d)	Post Plantation care(Watering, Weeding, basin making etc.)	305,750
e)	Supervising	360,000
	Sub-Total	**947,040**
2	**WATER MANAGEMENT & TREATMENT**	
a)	ETP Operation & Maintenance (including costs of chemical & Manpower)	1,516,048
b)	Power Consumption	380,173
c)	Sludge disposal	60,000
d)	Water sample analysis	41,016
	Sub-Total	**1,997,237**
3	**DUST SUPRESSION & AIR MONITORING**	
a)	Water spraying at dust generating points by water tanker 835 no. trip	359,050
b)	Air monitoring charges	1,179,200
c)	Fusitive dust analysis	13,600
d)	Noise level measurement	1,200
	Sub-Total	1,553,050
	Grand Total	**4,497,327**