JK LAKSHMI CEMENT Ltd.

JKLC/DU/ENV/MoEF/07 26.11.2019

Addl. Principal Chief Conservator of Forest
Ministry of Environment and Forest, Climate Change
Regional Office (WCZ), Ground Floor
East Wing, New Secretariat Building,
Civil Line, Nagpur-440001

Sub: Submission of Half yearly compliance report of M/s JK Lakshmi Cement Limited (Durg)
(Ref: MoEFCC clearance letter no. J-11011/1170/2007-IA II(I) Dated 13th May 2009 and validity extension of EC on 04.09.2015 & EC Amendment on 27 Feb 2010, 23 July 2015, 07 June 2017, 20 July 2018, and 14 November 2018)

Dear Sir,
As per the Environment Clearance given by MoEFCC vide its letter no. J-11011/1170/2007-IA II (I) Dated 13.05.2009, we are hereby submitting half yearly compliance report for our Integrated Cement Plant (Clinker 1.98 MTPA, Cement 5 MTPA), Lime Stone Mines (Limestone production capacity 4.8 MTPA from 267.695 ha & 252.105 ha) and Captive Thermal Power Plant (40 MW) and Waste Heat Recovery Based Power Plant – 08 MW, located at village-Malpuri Khurd, Khasadih, Semaria, Ghikuria and Nandini Kundini, Tehsil- Dhamda, District Durg, C.G., for the period of **April 18 – Sept. 2019.**

It may be noted that we are forwarding, half yearly compliance report with annexures by mail on the mail address: moefregionalofficenagpur@gmail.com for your ready reference.

Thanking you
Yours Faithfully

For **JK LAKSHMI CEMENT LTD.**

D.K. Mehta
Sr. Vice President (Works)

Encl.: As above

CC: 1. Regional Officer – Chhattisgarh Environment Conservation Board, 5/32 Bungalow Bhilai, Dist. - Durg. (CG)
2. Zonal Officer – Central Pollution Control Board 3rd Floor, Sahakar Bhawan North TT Nagar Bhopal- 462003

COMPLIANCES OF CONDITION AS STIPULATED IN ENVIRONMENTAL CLEARANCE AND THEIR SUBSEQUENT AMENDMENTS, FOR INTEGRATED CEMENT PLANT AND LIMESTONE MINE

MOEF (I.A. Division) granted EC vide F. No. J-11011/1170/2007-IA II (I) for Integrated Cement Plant (Clinker, 3.0 MTPA, Cement 10.0 MTPA), Limestone mine (4.8 MTPA, 267.695 ha and 281.339 ha) and Captive Power Plant (40 MW) dated 13th May 2009,

Subsequently MOEF & CC has given extension of validity of Environmental clearance vide F. No. J-11011/1170/2007-IA II (I), which was obtained for completion of balance works of phase-I dated 4th September, 2015.

- **EC Amendment was made by MOEF vide F. No. J-11011/1170/2007-IA II (I) regarding change of plant location dated 27th February, 2010.**
- **EC Amendment was made by MOEF & CC vide F. No. J-11011/1170/2007-IA II (I) regarding change of mode of limestone transport dated 23rd July, 2015.**
- **EC Amendment was made by MOEF & CC vide F. No. J-11011/1170/2007-IA II (I) regarding opening of second pit in the ML area of project dated 07th June, 2017. However, there were no conditions specified in this amendment.**
- **EC Amendment was made by MOEF & CC vide F. No. J-11011/1170/2007-IA II (I) regarding reduction of mining lease area from 281.339 ha to 252.105 ha and interception of ground water table during mining operation dated 20th July, 2018.**
- **EC Amendment was made by MOEF & CC vide F. No. J-11011/1170/2007-IA II (I) regarding change in configuration of Clinker production of 1.5 MTPA to 1.98 MTPA through Up-gradation and Optimization in Phase-I under the provisions of EIA Notification, 2006. Dated 14th November 2018**

A. Specific Conditions		
Sr. No.	**CONDITIONS**	**COMPLIANCE STATUS**
i.	Continuous monitoring system to monitor gaseous emission shall be provided and limit of SPM shall be controlled within 50 mg/Nm3 by installing adequate air pollution control system.	**Being Complied** • **We have installed Continuous Emission monitoring System (CEMS) for monitoring of SOx & NOx parameters which are placed at RABH stack and CPP stack and Opacity meters have been installed at all major stacks for monitoring SPM. Continuous monitoring systems have been installed at all Stacks and are connected to CECB, Raipur and CPCB, New Delhi.** • **The emission of SPM is maintained within 30 mg/Nm^3 (As per its CTO), as We have installed state of art Air Pollution Controlling Equipments at all stages with adequate capacities.** **Details of the same are in Annexure- i**
ii.	High efficiency electrostatic precipitators (ESPs) to clinker cooler and AFBC boiler (CPP);	**Being Complied** • **High efficiency Electrostatic precipitator's are**

	bag house to raw mill / kiln system, coal /pet coke mill system and cement mill, bag filters to crushing plant, raw mill hopper, blending silo / kiln feed, clinker storage, cement mill hopper, cement silo, transfer points, packing plant etc shall be provided to reduce pollution and gaseous emissions to <50 mg/Nm3. AFBC boilers shall be installed to control SO2 and NOx emissions. At no time, particulate emissions from the cement plant shall exceed 50 mg/Nm^3. All the pollution control equipments in raw mill / kiln, kiln feeding system, clinker cooler, coal mill, cement mill and cement silo shall be interlocked so that the event of the pollution control equipment not working, the respective unit (s) is shut down automatically. Continuous stack monitoring facilities for all the stacks and adequate air pollution control systems shall be providing and data submitted to the Ministry's 'egional Office Bhopal half yearly, CPCB and CECB quarterly.	**installed at Clinker Cooler and AFBC boiler(CPP). Reverse Air Bag House is installed at Raw Mill/Kiln system.** • **The mills including Coal mill, Slag Mill, Cement Mill-1 and -2 are fully equipped with the efficient bag houses.** • **Efficient dust extraction systems (Bag filters) are installed at all transfer points covering work of transfer points, conveyors, Crushing plants, Material handling units, materials storage area, storage silos to maintain emissions below 30 mg/Nm^3 (As per its CTO).** • **Details of the same are in Annexure- ii** • **Interlocked systems have been already provided at all major Air pollution controlling equipments for auto shut down in case of failure of any pollution control equipments.** • **Continuous Stack emission monitoring data are being uploaded on the CPCB & CECB server.** • **Half yearly compliance report are being submitted to MOEFCC regional office Nagpur dated 1st June 2019 and Quarterly Report submitted to CPCB dated 24th Oct 2019 and CECB dated 30th Oct 2019**
iii.	Ambient air quality monitoring stations shall be set up in the down wind direction as well where maximum ground level concentration of SPM, SO2 and NOx are anticipated as per statutory requirement in consultation with Chhattisgarh Environment Conservation Board (CECB). Ambient air emission shall not exceed the standards stipulated under EPA or by the State authorities. Monitoring of ambient air quality shall be carried out regularly in consultation with CECB and data submitted to the Ministry's 'egional Office at Bhopal half –yearly, CPCB and CECB quarterly.	**Being Complied** • **To continuously monitor Ambient Air Quality, 06 continuous ambient air monitoring systems have been installed, which includes 04 at plant and 02 at mines premises.** • **Details of the same are in Annexure- iii** • **We have also installed four steel fabricated Environmental Monitoring stations at plant and mines site for regular Ambient air Quality monitoring.** • **Data of ambient air quality monitoring are being displayed at both Plant and Mines main gate and the data is being submitted to the ministry's Regional office at Nagpur half yearly, and to CPCB and CECB quarterly.**
IV.	The fugitive emissions during loading and unloading should be suitably controlled by	**Being Complied**

	installing adequate dust collection and extraction system and at all the transfer points. Fugitive emissions shall also be controlled by providing silos and closed roof sheds for raw materials and product. Water sprinkling arrangement shall be made in the raw material stock yard and cement bag loading areas to prevent fugitive emissions. Bag filters shall be provided to coal and limestone handling system. Dust suppression system and water spraying shall be provided in the mine area to control fugitive emissions due to drilling and handling and transportation of general public.	• **Efficient dust collection and extraction systems (Bag filters) have been installed at all loading, unloading and at all transfer points.** • **All the conveyer belts carrying the material are fully covered.** • **All the raw materials including lime Stone, Coal, Slag & Gypsum etc. are being stored in the closed sheds.** • **Silos are provided for storage of Clinker, Raw meal, and Cement.** • **Efficient Bag Filters are provided at Coal and Lime stone handling systems.** • **Dust Suppression and water sprinkling, systems have been provided at mines area.** • **Wet drilling method is being imparted to control the dust emission during drilling. Details of the same are in Annexure- IV**
v.	Data on ambient air quality, stack emission and fugitive emissions shall be uploaded on the company website and also regularly submitted on-line to the Ministry's ʻegional Office at Bhopal, Chhattisgarh Environment Conservation Board (CECB) and Central pollution Control Board (CPCB) as well as hard copy once in six months. Data on SPM, SO2 and NOx shall also be displayed prominently outside the premises at the appropriate place for the information of general public	**Being Complied** • **Data of ambient air quality monitoring are being displayed on display boards which are installed at Plant main gate and Mines main gate area, for the information of general public.** • **Continuous online ambient air quality monitoring and Continuous stack emission monitoring data are being uploaded to both Chhattisgarh Environment Conservation Board (CECB) and Central pollution Control Board (CPCB) server has been provided. The details are also being provided in hard copy once in six months. Details of the same are in Annexure- V** • **Links for the same are http://adagecpcb.glensserver.com/ http://cecb.glensserver.com/ www.envsaindia.com/cpcb/login.php**
Vi.	Secondary fugitive emissions from all the sources shall be controlled within the permissible limits set by the Ministry and regularly monitored. Guidelines /Code of Practice issued by the CPCB shall be followed.	**Being Complied** • **All necessary measures have been taken to control the Secondary fugitive emissions. We have a Truck mounted sweeping/vacuum cleaning machine along with mechanical road sweeping machine. We have also developed**

		Greenbelt along the length of road to arrest fugitive dust emissions. These fugitive emissions are kept within the permissible limits as set by the ministry and are regularly monitored . **Details of the same are in Annexure- VI**
vii.	Asphalting /Concreting of roads and water spray all around the critical areas prone to air pollution and having high levels of SPM and RPM shall be ensured	**Being Complied** • **The plant and mines area have concrete road for road transportation, we also have 2 road sweeping and cleaning machines to arrest any kind of emissions and 2 water tankers have been engaged for dust suppression purposes at Mine haul roads.** **Details of the same are in Annexure- VII**
viii.	No new pit shall be opened till old pit is exhausted	**Being Complied** • **To open new pit, EC amendment have been obtained from the MOEF & CC vide letter no J-11011/1770/2007-IA II (I) Dated 07.06.2017 to facilitate use of low grade limestone(Mineral Conservation) for blending with high grade limestone to optimize life of mine.**
ix.	Efforts shall be made to reduce impact of the transport of the raw materials and end products on the surrounding environment including agricultural land. All the raw material materials including fly ash shall be transported in closed containers only and should not be overloaded. Vehicular emissions shall be regularly monitored.	**Being Complied** • **The construction of pipe conveyer belt is not completed due to land acquisition of approx 300 m piece of land from Bhilai Steel plant (SAIL) , Remaining portion of pipe conveyor is already completed necessary material have been procured from Bridgestone, Japan. However EC amendment was obtained by us to change the mode of Lime stone transportation from mine to plant have been done by MOEF vide letter no. J-11011/1170/2007 IA –II (I) dated 23.07.2015.** • **However major raw materials are being transported through tarpaulin covered trucks (containers) and bulkers whose weighment is done.** • **Only valid pollution under control vehicles are allowed inside the plant.** • **Details of the same are in Annexure- VIII**
x.	Total water requirement from Shivnath River and bore wells shall not exceed 4500 m^3/day. The water stored in the artificial reservoir made in the mines pit shall be used maximum to reduce ground water consumption. Air cooled condensers shall be provided to CPP to reduce water consumption. The process effluent from CPP treated in neutralization pit shall be recycled back in the process after	**Being Complied** • **Their total water requirement from Shivnath river and bore wells does not exceed 4500 m^3/day.** • **The Power Plant installation and commissioning happened in the first week of May 2019. Air Cooled condensers have been**

	treatment and used for cooling and dust suppression. Mining shall not intercept ground water table. No effluent shall be discharged from the cement plant, captive power plant and limestone mines and 'Zero' discharge should be strictly followed. Domestic waste water shall be treated in sewage treatment plant (STP) and used for green belt development.	**provided to CPP to reduce water consumption. We are maintaining "Zero discharge" which is being and will be strictly followed.** • **Details of the same are in Annexure- IX** • **Permission for Interception of ground water table during mining operation has already been obtained by EC amendment from the MOEF & CC vide letter no J-11011/1770/2007-IA II (I), Dated 20th July 2018 and this condition got amended to "Mining shall intercept the ground water table"** • **Root zone technology based Sewage Treatment plant with a capacity of 70 m3/day is under operation and treated water is being utilized for Dust suppression and green belt development.**
XI.	Permission for the drawl of 4500 m^3/day water from Shivnath river and ground water from CGWA/SCWP / concern department shall be obtained and copy of the permission shall be submitted to the Ministry's ʻegional office at Bhopal.	**Complied** • **Permission from WRD, CG for use of Shivnath river water has been obtained vide F 4-165/S-2/31/Industrial water uses/2010, Raipur September 2012.** • **Permission from CGWA has been already been obtained vide CGWA letter no 21-4(34)/NCCR/CGWA/2012-2036 Dated 26th Sept 2016.**
XII.	Detailed hydrological study shall be carried out and implementation of recommendations of the detailed hydrological study shall be ensured.	**Being Complied** • **Detailed hydrological study has been carried out and statuses of compliances / recommendations are being regularly submitted to the CGWA dated 4th July 2019. Based on recommendations, We have built a total of 53 rain water harvesting structures, 2 conservation ponds within plant premises and 6 rain water harvesting structures in nearby villages, to recharge 1659782 m^3/Year**
XIII.	All the bag filter dust, raw meal dust, coal dust, clinker dust and cement dust from Pollution control devices shall be recycled and reused in the process and used for cement manufacturing. STP sludge shall be used as manure. Waste oil shall be sold to authorize	**Being Complied** • **All the bag filter dust, raw meal dust, coal dust, clinker dust and cement dust from Pollution control devices are being recycled and reused in the process for cement**

	recyclers/re-processors only.	**manufacturing. Their entire process is a closed system and We do not generate any kind of process waste.** • **Their STP is based on Root zone Technology and sludge acts as manure to plants.** • **Waste oil is being sold to authorized recyclers only**
XIV.	An effort shall be made to use of high calorific hazardous waste in the cement kiln and necessary provision shall be made accordingly.	**Complied.**
XV.	Effort shall be made to use low grade lime, more fly ash and solid waste in the cement manufacturing.	**Being Complied** • **To facilitate use of low grade limestone(mineral conservation) for blending with high grade limestone to optimize life of mine, We have obtained amendment in their EC no. J-11011/1170/2007-IA.II(I) dated 13.05.2009**
XVI.	Action plan for mining, management of over burden (removal, storage, disposal etc.,) reclamation of the mined out area and mines closure shall be submitted to the Ministry and its Regional office at Bhopal.	**Complied** **vide letter No. JKLC/Durg/Env/1109 dated 12.12.2011.**
XVII.	All the fly ash should be utilized as per Fly Ash Notification, 1999 subsequently amended in 2003. Effort shall be made use fly ash generated from the captive power plant maximum in manufacturing Pozollona Portland Cement (PPC)	**Being Complied** • **The Captive power plant installation and commissioning happened in the first week of May 2019. All the fly ash to be generated from CPP (20 MW) is being used within the plant for manufacturing of cement.**
XVIII.	As proposed , green belt shall be developed in at least 78 ha (38%) out of total 210 ha area in the cement plant area and all the mined out area except used for reservoir to reduce impact of fugitive emissions as per Central Pollution Control Board (CPCB) guidelines in consultation with DFO	**Being Complied** • **The company has employed about 60 workers who are engaged in plantation work in and around the plant boundary as well in the mines area.** • **Four water tankers have been engaged for watering of these plants.** • **So far the company has planted about 163599 saplings which includes 92913 plants in mines area and 70686 plants in Factory area.** • **We have developed in-house nurseries where about 21000 saplings have been developed for further green belt development in the plant and mines area.** **Details of the same are in Annexure- X**

XIX.	Wet drilling blasting method and provision for the control air emissions during blasting using dust collectors etc. shall be used.	**Being Complied** **Wet drilling method is being used to control the dust emission from mines. Details of the same are in Annexure- XI**
XX.	Bench height, width and slope for individual bench shall be properly assessed and implemented. Adequate measures shall be adopted to stabilize the slope before abandonment. The fencing around the reservoir shall be provided to prevent accidents.	**Being Complied**
XXI.	The company shall obtain necessary clearances/ approval from the concerned Departments i.e. 'No Objection Certificate' form the Chhattisgarh Environment Conversation Board (CECB) , Indian Bureau of Mines, State Government, MoEF etc. for the linking mining component before undertaking any construction activity at the project site.	**Being Complied**
XXII.	All the safety norms stipulated by the Director General, Mines and Safety (DGMS) shall be implemented.	**Being Complied** • **All necessary safety norms stipulated by the DGMS are being followed. We provide all the required Personal Protective Equipments (PPEs) are being provided to the employees and workers.**
XXIII	Rehabilitation and resettlement plan for the project affected population including tribals as per the policy of the State Govt. of Chhattisgarh in consultation with the State Govt. shall be implemented. Compensation paid in any case shall not be less than norms prescribed under the National Resettlement and rehabilitation Policy '2007	• **R & R is not applicable to us.**
XXIV	All the recommendation mentioned in the Corporate Responsibility for Environment Protection (CREP) guidelines shall be followed implemented	**Being Complied** **Details of the same are in Annexure- XII**
XXV.	The company shall provide housing for construction labor within site with all necessary infrastructure and facilities such as fuel for cooking , mobile toilet, 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	**Being Complied** • **The company had provided temporary housing for labor within site during project phase.** • **Sewage Treatment plant based on Root zone technology with installed capacity of 70 m^3/day is provided for the treatment of sewage generated from worker's colony and**

		the treated water is being utilized for Dust suppression and Green Belt development. • **Medical Health care with qualified personnel has been provided.**
B.	**GENERAL CONDITIONS:**	
i.	The project authorizes must strictly adhere to the stipulations made by the Chhattisgarh Environment Conservation Board (CECB) and the State Government.	**Being Complied**
ii.	No further expansion or modifications in the plant should be carried out without prior approval of the Ministry of Environment and Forests.	• **We have obtained EC amendment in vide F. No. J-11011/1170/2007-IA.II(I), for change in configuration of clinker production of 1.5 MTPA to 1.98 MTPA through upgradation and optimization in Phase-I under 7.ii of EIA notification, 2006.**
iii.	The company shall provide adequate dust collection and extraction system to control fugitive dust emissions at various transfer points, raw mill handling (unloading, conveying, transportation, stacking), vehicular movement, bagging and packing areas etc. Asphalting /concreting of roads and water spray all around the coal stockpiles shall be carried out to control fugitive emissions.	**Being Complied** • **Adequate dust collection and extraction systems have been provided at various transfer points, raw mill handling unloading, conveying, transportation, stacking, bagging and packing areas to control fugitive dust emissions.** • **All internal roads / area are built of concrete to control fugitive emissions during road transportation.** • **Water sprinkling is being done all around the coal stockpiles to control fugitive dust emissions.** • **We have also provided Road Vacuum sweeper machine, to control fugitive dust emissions.**
iV.	Industrial waste water shall be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19th May 1993, and 31st December, 1993 or as amended from time to time. The treated wastewater shall be utilized for plantation purpose.	**Being Complied** • **The occupied does not generate waste water as the process is based on dry process.**
v.	The overall noise levels in and around the plant area shall be kept well within the standards 85 dB(A) by providing noise control measures including acoustic hoods, silencers , enclosures etc. on all the sources of noise generation. The ambient noise levels should confirm to the standards prescribed under EPA Rules ,1989 viz 75 dBA (day time)and 70 dBA (nighttime)	**Being Complied** • **We are taking all the precautionary measures to control the noise pollution and ensure that the noise will be well within specified standards 85 dB(A).** • **Regular noise level monitoring is being conducted at plant site and mines area.**

Vi.	The company shall harvest the rain water from the roof tops and storm water drains to recharge the ground water. The company must also collect rain water in the mined out pits and use the same water for the various activities of the project to conserve fresh water.	**Being Complied** • **To harvest rain water, company has constructed 53 rain water harvesting systems with a rain water harvesting potential of 1583038 m^3/year @ rainfall of 960 mm. Details of the same are in Annexure XIII**
vii.	All the recommendations of the CREP guidelines shall be strictly followed.	**Being Complied**
viii.	The project proponent shall also comply with all the environment protection measures and safeguards recommended in the EIA/EMP reports	**Being Complied**
ix.	The company must undertake socio-economic development activities in the surrounding villages like community development programs, educational programs , drinking water supply and health care etc.	**Being Complied** • **Company is doing its CSR activity for the socio-economic development of nearby 07 Villages. Details of the same are in Annexure- XIV**
x.	As proposed, Rs.125.00 Crores and Rs.8.00 Crores earmarked towards total capital cost and recurring cost/annum for environmental pollution control measures Rs.1.00 Crores for socio-economic development program shall be used to implement the condition stipulated by the Ministry of Environment and Forests as well as the State Government and an implement schedule for implementing all the conditions stipulated herein shall be submitted to the Regional Office of this Ministry at Bhopal. The fund provided shall not be diverted for any other purpose.	**Complied** • **We have incurred an expenditure of Rs. 127 Crores for the installation of Air pollution control equipments which is under operation with the capacity of 1.98 MTPA clinker, 05 MTPA cement production & 10 MW Waste heat recovery based Power Plant and 3.5 MTPA Limestone mine from ML-1 and ML-2.** • **For the socio economic development We have adopted 07 nearby villages and implementing the CSR programs in these villages.** • **The detailed CSR action plan (40 years) have been submitted to MoEF & CC vide letter number b-1011/3/2008-M&MP Dated 15.02.2010**
XI.	The Regional Officer of this Ministry at Bhopal /CPCB /CECB will monitor the stipulated conditions. A six monthly compliance report and the monitoring data along with statistical interpretation shall be submitted to them regularly.	• **Half Yearly Environment Compliance report being regularly submitted to Regional Offices of CPCB dated 7th June 2019, MoEF & CC (Nagpur) dated 1st June 2019 and CECB (Bhilai) dated 6th June 2019.**
XII.	The Project Proponent shall inform public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the CECB /Committee and may also be seen at Website of the Ministry of Environment and Forest at http;/envfor.nic.in .This shall be advertised within seven days from the date of issue of the clearance letter at least in two local newspapers that are widely circulated in the region of which one shall be in the vernacular	**Being Complied** • **To inform public about the accordance of environment Clearance, an advertisement was published in local newspapers and a copy of the same was forwarded to than Regional office of MoEF & CC at Bhopal.** • **Copy of Environment clearance has also been uploaded on the company website.**

	language of the locality concerned and a copy of the same should be forwarded to the Regional office at Bhopal.	
XIII.	Project authorities shall inform the Regional Office as well as the Ministry, the date of the financial closure and final approval of the project by the concerned authorities and date of commencing the land development work.	**Being Complied** • **We have complied vide our letter no JKLC/Durg/Env/1206 dated 15.06.2011 and company is following the year starts from April & ends in March (April-March) for the financial matters.**

COMPLIANCES OF CONDITION STIPULATED IN ENVIRONMENTAL CLEARANCE AMENDMENT OBTAINED FROM MOEF (I.A. Division) vide F. No. J-11011/1170/2007-IA II (I) regarding change of plant location dated 27th February, 2010.

(Ref: EC Amendment Dated 27th February 2010)

S. No.	CONDITION	COMPLIANCE STATUS
i.	Al least 5 % of the total cost of the project (viz.Rs.1100.00 Crores) shall be earmarked towards the corporate social responsibility and item –wise details along with time bound action plan shall be prepared and submitted to the Ministry's 'egional Office at Bhopal .The corporate social responsibility (CSR) facilities shall be extended to all the persons residing in 15 Km instead of 10 Km radius to cover all the villagers of old location also. Implementation of such program shall be ensured accordingly in a time bound manner.	**Being Complied** • **We are doing CSR activity for the socio-economic development of nearby 07 Villages. Comprehensive details of CSR and item wise details have already been prepared and submitted to the MOEF & CC New Delhi vide our letter no B-11011/3/2008-M-MP dated 15.02.2010.** **Details of the same are in Annexure- XIV**
ii.	The National Ambient Air Quality Emission Standards issued by the Ministry vide GSR No.826 (E) dated 16th November, 2009 shall be followed.	**Being Complied** **Being followed by taking all measures to keep their surrounding ambient air quality as per NAAQs standards.**
iii.	A copy of clearance letter shall be sent by the proponent to concerned Panchayat /Zila Parishad/Municipal Corporation, Urban Local Body and local NGO, if any form whom suggestions/representations, if any received while processing the proposal .The clearance letter shall also be put on the web site of the company by the proponent.	**Being Complied**
iV.	The project proponent shall upload the status of compliance of the stipulated environment clearance conditions, including results of monitoring data on the website and shall update the same periodically .It shall simultaneously be sent to the Regional Office of the MOEF at Bhopal, the respective Zonal Office of CPCB and the CPCB. The criteria pollutants levels namely : SPM, RSPM,SO2,NOX(ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the project shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.	**Being Complied** • **The environment Compliance report including monitoring data is being uploaded on the company website.** • **Copy of the compliance report is being submitted to the Regional office of MoEF & CC, Nagpur dated 1st June 2019, CPCB Zonal office Bhopal 7th June 2019 and Regional office CECB Raipur dated 6th June 2019.** • **Environmental monitoring data is being displayed on the online display board installed at Plant and Mines Main Gate in public domain and also summary of data uploaded on the Company website as an annexure to EC compliance.**
v.	The project proponent of compliance in the	**Being Complied**

	stipulated environment conditions including results of monitoring data (both in hard copies as well as by e-mail) to the Regional Office of MOEF, the respective Zonal Office of CPCB and SPCB. The Regional Office of this Ministry at Bhopal /CPCB/CECB shall monitor the Stipulated conditions.	• **Half yearly Monitoring report and results of monitoring data (both in hard copies as well as by e-mail) are being submitted to the Regional Office of MOEF, the respective Zonal Office of CPCB and SPCB. for the period of October 18 to March 19 was submitted on 30th April 2019.** • **We have annexed Half yearly Monitoring Report as Annexure XVIII**
Vi.	The Environmental statement for each financial year ending 31st March in Form –V as it mandated to be submitted by the project proponent to the concerned State Pollution Control Board As prescribed under the Environmental (Protection) Rule 1986, as amended subsequently, shall also be put on the web site of the company along with the status of compliance of environmental condition and shall also be sent to the respective Regional Offices of the MOEF by e-mail.	**Being Complied** • **Environment statement for last year was submitted on 26.09.2019**
vii.	The Project Proponent shall inform the public that the project has been accordance environmental clearance by the Ministry and copies of the clearance letter are available with the CECB and may also be seen at Website of the Ministry of Environment and Forest at http:/envfor.nic.in. This shall be advertised be advertised within seven days from the date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned and a copy of the same should be forwarded to the Regional office at Bhopal.	**Being Complied**

COMPLIANCES OF CONDITION STIPULATED IN ENVIRONMENTAL CLEARANCE AMENDMENT OBTAINED FROM MOEF & CC (I.A. DIVISION) VIDE F. NO. J-11011/1170/2007-IA II (I) REGARDING CHANGE OF MODE OF LIMESTONE TRANSPORT DATED 23RD JULY, 2015.

(Ref: EC Amendment Dated 27th February 2010)

Additional Specific Condition

S No.	CONDITION	COMPLIANCE STATUS
i.	Trucks engaged for limestone transportation shall be optimally loaded and covered with tarpaulin with no spillage en route. The trucks shall be properly maintained and emission shall be below notified limits. Facilities for parking of trucks carrying limestone shall be created within the plant site.	**Being Complied** • **Limestone is being transported in duly-covered vehicles with tarpaulin to avoid fugitive dust emission during transportation. Facilities for parking of trucks carrying limestone has also been created within the plant site.**
ii.	Vehicular pollution due to transportation of raw material and finished product shall be controlled. Proper arrangement shall also be made to control just emission during loading, and unloading of the raw material and finished product.	**Being Complied** • **All transfer points, Junction loading and unloading points are equipped with efficient dust extraction system to maintain the particulate matter below 30mg/nm^3.** • **Dust suppression system (water Sprinkler) is provided at Limes stone unloading point.** • **We have raised Green belt along the length of limestone transportation route to control vehicular emissions.** • **Dust suppression system being installed at all loading unloading points of lime stone stacker area.** • **02 Water tankers have been engaged for water sprinkling on road to control the fugitive dust emission during transportation of lime stone from mining pit.**
iii.	All approach roads shall be black topped and the eternal roads shall be connected. The roads shall be regularly cleaned with mechanical sweepers.	**Being Complied** • **All internal roads are pucca - Concrete and the roads are being clean regularly cleaned with mechanical sweepers.**

COMPLIANCES OF CONDITION STIPULATED IN ENVIRONMENTAL CLEARANCE AMENDMENT OBTAINED FROM MOEF & CC (IMPACT ASSESSMENT DIVISION) VIDE F. NO. J-11011/1170/2007-IA II (I) REGARDING REDUCTION OF MINING LEASE AREA FROM 281.339 HA TO 252.105 HA AND INTERCEPTION OF GROUND WATER TABLE DURING MINING OPERATION DATED 20TH JULY, 2018.

(Ref: EC Amendment Dated 20th JULY 2018)

S No.	CONDITION	COMPLIANCE STATUS
i.	This environmental clearance will not be operational till such time the project proponent complies with all the statutory requirements and judgment of hon'ble Supreme Court dated the 2nd Aug 2017 in write petition (Civil) No. 114 of 2014 in the matter of common cause versus union of India and Ors , if any applicable to this project.	**Being Complied.**
ii.	The department of mines and geology govt. of Chhattisgarh shall ensure that mining operation shall not commence till the entire compensation levied, if any for illegal mining paid by the project proponent through their respective department of mining geology in strict compliance of judgment of Honble supreme court dated 2nd Aug 2017 in writ petition (Civil) No. 114 of 2014 in the matter of common cause versus union of India and Ors.	**Being Complied**
iii.	The regular monitoring of ground water table to be carried out by establishing a network of existing wells and constructing new piezometers. The reports shall be submitted at interval of six month to the regional office of the ministry and CG Pollution control board.	**Being Complied** • **For Regular Ground water levels monitoring 04 Peizometers have been installed at plant site and 04 at Mines area. The reports are being submitted to the regional office of the ministry dated 1st June 2019 and CECB every six months dated 6th June 2019 Details of the same are in Annexure- XV**
IV.	The water balance / water auditing shall be carried out and measures for reducing the consumption of waters shall be taken up and reported to the regional office of the ministry and CG Pollution control board.	**Being Complied** • **Water meters have been installed on all Bore wells for monitoring of ground water withdrawal. Regular monitoring of water consumption on monthly basis is being carried out. Details of the same are in Annexure- XVI**
v.	The regular monitoring of water quality upstream and downstream of water bodies shall be carried out and record of monitoring data should be maintain and submitted to the at interval of six months to the regional office of the ministry and CG Pollution control board .	**Being Complied** • **Regular monitoring of water quality upstream and downstream of water bodies is**

		being carried out and record of monitoring data is being maintained and submitted to the regional office of the ministry and CECB In half yearly report. • **The ground water quality is being monitored during pre monsoon and post monsoon and record of monitoring data is being maintained and submitted to the regional office of the ministry and CECB in Half yearly reports.**
Vi.	The plantation / greenbelt at the periphery of the water body, particularly on eastern and western boundaries, shall be maintained in the mined out area in order to reduce the loss of surface water.	**Being Complied** • **A 3-tier avenue plantation along the roads and along the lease boundary has been done. Local species have been given importance.** • **Company carried out plantation programs in schools and villages. Saplings are distributed to schools and villages.**

COMPLIANCES OF CONDITION STIPULATED IN ENVIRONMENTAL CLEARANCE AMENDMENT WAS MADE BY MOEF & CC (IMPACT ASSESSMENT DIVISION) VIDE F. NO. J-11011/1170/2007-IA II (I) REGARDING CHANGE IN CONFIGURATION OF CLINKER PRODUCTION OF 1.5 MTPA TO 1.98 MTPA THROUGH UP-GRADATION AND OPTIMIZATION IN PHASE-I UNDER THE PROVISIONS OF EIA NOTIFICATION, 2006. DATED 14TH NOVEMBER 2018

(Ref : EC amendment dated 14 th November , 2018)

Sr No.	CONDITION	COMPLIANCE STATUS
i.	An amount of Rs. 15.5 lakhs shall be spent towards corporate environmental responsibility as per office memorandum of the ministry dated 30th May 2018 by the end of 2019.	**Being Complied** **Details of the same are in Annexure- XVII**
ii.	The air pollution control devices should be upgraded to meet the requirement of additional pollution load and shall meet the standards.	**Being Complied** • **State of Art Air Pollution Control Equipments have already been installed which have been upgraded by activation of standby chambers/Fields to meet additional pollution load thereby meeting the standards as prescribed.** • **To control NOx emissions we have installed Selective Non Catalytic Reduction (SNCR) at Integrated Cement plant.** • **To control SOx emissions we have also installed Flue Gas Desulfurization at Captive Power plant.**
iii.	The proposed configuration of the plant shall be commissioned within the valid period of environment Clearance.	**Being Complied**

CEMS and Opacity Meter installed at All major Stacks in Plant

RABH CEMS and Opacity Meter installed at CPP stack and Server Room

CPP CEMS and Opacity Meter installed at CPP stack and Server Room

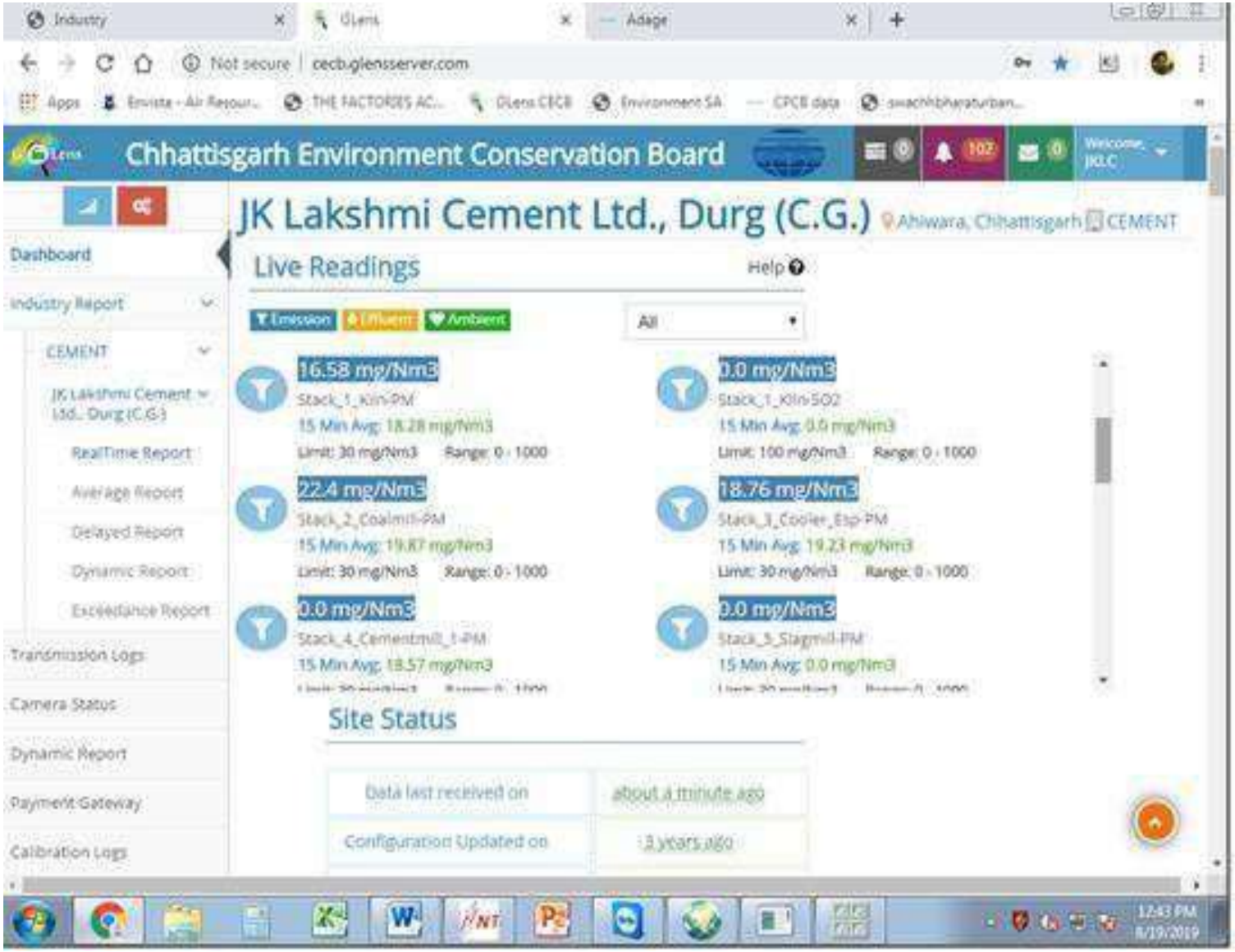
Cement mill- 1 Opacity Meter

Cement Mill-2 Opacity meter

RABH Opacity meter

Slag mill Opacity Meter

Coal Mill Opacity Meter



A snap of data transmission

Annexure-II

ESP connected to Clinker Cooler

SL. No.	Clinker Cooler ESP Details	
1	Volume Flow	699720 m3/h
2	Gas temperature	343.00 0C
3	Pressure	-133
4	Precipitator Current	800 mA
5	Gas Density	0.542 kg/m3
6	Dust Emission designed for	<30 mg/Nm3

ESP connected to AFBC Boiler

SL. No.	AFBC Boiler ESP Details	
1	Volume Flow	699720 m3/h
2	Gas temperature	343.00 0C
3	Pressure	-133
4	Precipitator Current	800 mA
5	Gas Density	0.542 kg/m3
6	Dust Emission designed for	<30 mg/Nm3

Reverse Air Bag House

Sr. No	Bag Filter Location	Main RABH
1	**Equipment Code**	421 BH1
2	**No of bags**	3648
3	**Design Temp**	260
4	**Bag Type**	Woven Fibber Glass with PTFE Membrane
5	**Design Volume of bag filter M^3/hr**	893380
6	**Diameter (m)**	0.292
7	**Length (m)**	9.347
8	**Filtering Area (M^2)**	8.64
9	**Air to Cloth Ratio**	0.47
10	**Dust Emission (mg/Nm^3)**	<50

Slag Mill Bag house

Sr. No	Bag Filter Location	Slag mill Baghouse
1	**Equipment Code**	532 BF2
2	**No of bags**	3200
3	**Design Temp**	120
4	**Bag Type**	Polyester Needle Felt
5	**Design Volume of bag filter M^3/hr**	513000
6	**Diameter (m)**	0.127
7	**Length (m)**	3.35
8	**Filtering Area (M^2)**	1.35
9	**Air to Cloth Ratio**	0.20
10	**Dust Emission (mg/Nm^3)**	<50

Coal Mill Baghouse

Sr. No	Bag Filter Location	Coal Mill Bag house
1	**Equipment Code**	481 BF1
2	**No of bags**	1792
3	**Design Temp**	80
4	**Bag Type**	Poly Acrylo nitrile needle
5	**Design Volume of bag filter M^3/hr**	220000
6	**Diameter (m)**	0.152
7	**Length (m)**	3
8	**Filtering Area (M^2)**	1.45
9	**Air to Cloth Ratio**	1.41
10	**Dust Emission (mg/Nm^3)**	<50

Annexure-II

Air Pollution Control Equipments for Particulate Emission Control:

Details of Bag House at various locations

Sr. No	Bag Filter Location	Main RABH	Coal Bag House Main	Cement Mill Bag House 1	Classifier Vent 1	Cement Mill Bag House 2	Classifier Vent 2	Slag Mill Bag House
1	**Equipment Code**	421 BH1	481 BF1	560 BF1	560 BF2	560 BF2	563 BF2	532 BF2
2	**No of bags**	3648	1792	420	456	456	456	3200
3	**Design Temp**	260	80	105	97	97	97	120
4	**Bag Type**	Woven Fibber Glass with PTFE Membrane	Poly Acrylo nitrile needle	Homo Polymer Needle Felt	Homo Polymer Needle Felt	Homo Polymer Needle Felt	Homo Polymer Needle Felt	Polyester Needle Felt
5	**Design Volume of bag filter M^3/hr**	893380	220000	40680	36620	40680	36620	513000
6	**Diameter (m)**	0.292	0.152	0.13	0.13	0.13	0.13	0.127
7	**Length (m)**	9.347	3	3.35	3.35	3.35	3.35	3.35
8	**Filtering Area (M^2)**	8.64	1.45	1.35	1.35	1.35	1.35	1.35
9	**Air to Cloth Ratio**	0.47	1.41	1.20	0.99	1.20	0.99	0.20
10	**Dust Emission (mg/Nm^3)**	<50	<50	<50	<50	<50	<50	<50

Details of Bag Filters Installed at Packer (Packing Plant)

Sr. No	Bag Filter Location	Packing Plant					
		Bucket elevator to Packing Plant	Bucket elevator to Packing Plant	For packing Plant	For packing Plant	For packing Plant	For packing Plant
1	**Equipment Code**	661 BF1	662 BF2	661 BF2	661 BF3	662 BF3	662 BF1
2	**No of bags**	90	180	252	378	378	90
3	**Design Temp**	130	130	130	130	130	130
4	**Bag Type**	Polyester, Nil, Imported, Fabric	Polyester, Nil, Imported, Fabric	Polyester, Nil, Imported, Fabric	Polyester, Nil, Imported, Fabric	Polyester, Nil, Imported, Fabric	Polyester, Nil, Imported, Fabric
5	**Design Volume of bag filter M^3/hr**	7500	16000	22000	34000	34000	7500
6	**Diameter (m)**	0.149	0.149	0.149	0.149	0.149	0.149
7	**Length (m)**	3.5	3.5	3.5	3.5	3.5	3.5
8	**Filtering Area (M^2)**	1.65	1.65	1.65	1.65	1.65	1.65
9	**Air to Cloth Ratio**	0.84	0.90	0.88	0.91	0.91	0.84
10	**Dust Emission (mg/Nm^3)**	<50	<50	<50	<50	<50	<50

Details of Bag filters Installed at Raw Mill Silo (Storage Silo)

Sr. No	Bag Filter Location	Raw Mill Silo			
		Silo Feed Air Slide	For Kiln Dust Bin System	Silo Feed Air Slide	Silo Feed Air Slide
1	**Equipment Code**	391 BF1	391 BF2	391 BF3	391 BF4
2	**No of bags**	90	60	42	42
3	**Design Temp**	45	45	45	45
4	**Bag Type**	Polyster Needle Felt	Polyster Needle Felt	Polyster Needle Felt	Polyster Needle Felt
5	**Design Volume of bag filter M^3/hr**	10000	7000	5000	5000
6	**Diameter (m)**	0.127	0.127	0.127	0.127
7	**Length (m)**	3.35	3.35	3.35	3.35
8	**Filtering Area (M^2)**	1.35	1.35	1.35	1.35
9	**Air to Cloth Ratio**	1.37	1.44	1.47	1.47
10	**Dust Emission (mg/Nm^3)**	<50	<50	<50	<50

Details of Bag filters Installed at Clinker Silo (Storage Silo)

Sr. No	Bag Filter Location	Clinker Silo Top			
		For Clinker Silo Top	For Clinker Silo Extraction	For Clinker Silo Extraction	For Clinker Silo Extraction
1	**Equipment Code**	451 BF2	711 BF1	711 BF2	711 BF3
2	**No of bags**	256	120	120	120
3	**Design Temp**		150	150	150
4	**Bag Type**	synthetic polyester	Homo Polymer Acrylic	Homo Polymer Acrylic	Homo Polymer Acrylic
5	**Design Volume of bag filter M^3/hr**		10000	10000	10000
6	**Diameter (m)**	0.152	0.152	0.152	0.152
7	**Length (m)**	3	3	3	3
8	**Filtering Area (M^2)**	1.45	1.45	1.45	1.45
9	**Air to Cloth Ratio**	0.00	0.96	0.96	0.96
10	**Dust Emission (mg/Nm^3)**	<50	<50	<50	<50

Details of Bag filters Installed at Cement Silo (Storage Silo)

Sr. No	Bag Filter Location	Cement Silo								
		OPC Silo Top	PPC Silo Top	PSC Silo Top	For OPC Silo Extraction	For PPC Silo Extraction	For PSC Silo Extraction	For OPC Silo Feed	For PPC Silo Feed	FOR PADDLE MIXER
1	**Equipment Code**	591 BF5	591 BF7	591 BF8	611 BF1	613 BF1	614 BF1	591 BF2	591 BF3	611 BF2
2	**No of bags**	40	40	40	40	40	40	60	60	90
3	**Design Temp**	130	130	130	130	130	130	130	130	130
4	**Bag Type**	Polyester, Nil, Imported, Fabric	Polyester, Nil, Imported, Fabric	Polyester, Nil, Imported, Fabric	Polyester, Nil, Imported, Fabric	Polyester, Nil, Imported, Fabric	Polyester, Nil, Imported, Fabric	Polyester, Nil, Imported, Fabric	Polyester, Nil, Imported, Fabric	Polyester, Nil, Imported, Fabric
5	**Design Volume of bag filter M^3/hr**	3500	3500	3500	3500	3500	3500	5000	5000	7500
6	**Diameter (m)**	0.149	0.149	0.149	0.149	0.149	0.149	0.149	0.149	0.149
7	**Length (m)**	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
8	**Filtering Area (M^2)**	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65
9	**Air to Cloth Ratio**	0.88	0.88	0.88	0.88	0.88	0.88	0.84	0.84	0.84
10	**Dust Emission (mg/Nm^3)**	<50	<50	<50	<50	<50	<50	<50	<50	<50

Details of Bag filters Installed at Gypsum storage and Slag Storage

Sr. No	Bag Filter Location	Gypsum Storage		Slag Storage				
		For Dump Hopper	For Gypsum crusher	Slag Silo Top	For Slag Silo Extraction	For Slag Silo Feed	Bucket elevator Discharge	For Slag Hopper
1	**Equipment Code**	751 BF1	751BF2	591 BF6	612 BF1	591 BF1	532 BF1	512 BF1
2	**No of bags**	120	120	40	40	60	90	90
3	**Design Temp**	130	130	130	130	130	45	45
4	**Bag Type**	Polyster Needle Felt	Polyster Needle Felt	Polyster, Nil, Imported, Fabric	Polyster, Nil, Imported, Fabric	Polyster, Nil, Imported, Fabric	Polyster Needle Felt	Polyster Needle Felt
5	**Design Volume of bag filter M^3/hr**	10000	10000	3500	3500	5000	10000	10000
6	**Diameter (m)**	0.152	0.152	0.149	0.149	0.149	0.127	0.127
7	**Length (m)**	3	3	3.5	3.5	3.5	3.35	3.35
8	**Filtering Area (M^2)**	1.45	1.45	1.65	1.65	1.65	1.35	1.35
9	**Air to Cloth Ratio**	0.96	0.96	0.88	0.88	0.84	1.37	1.37
10	**Dust Emission (mg/Nm^3)**	<50	<50	<50	<50	<50	<50	<50

Details of Bag filters Installed at Blending Silo (Kiln Feed)

Sr. No	Bag Filter Location	Blending Silo (Raw Mill Feed)				
		PH Top Kiln Feed air Slide	Kiln Feed Silo Top	For Mixing Bin	For SFF	For Kiln Feed Bucket Elevator
1	**Equipment Code**	411 BF4/351BF410	341 BF1/ 341 BF400	411 BF1/351 BF280	411 BF2/351 BF290	411 BF3 /351BF400
2	**No of bags**	64	100	64	25	64
3	**Design Temp**					
4	**Bag Type**	Synthetic Polyester	Synthetic Polyester	Synthetic Polyester	Synthetic Polyester	Synthetic Polyester
5	**Design Volume of bag filter M^3/hr**	5000	8000	4500	2000	5000
6	**Diameter (m)**	0.152	0.152	0.152	0.152	0.152
7	**Length (m)**	3	3	3	3	3
8	**Filtering Area (M^2)**	1.45	1.45	1.45	1.45	1.45
9	**Air to Cloth Ratio**	0.90	0.92	0.81	0.92	0.90
10	**Dust Emission (mg/Nm^3)**	<50	<50	<50	<50	<50

Details of Bag filters Installed at Material Handling Section, Conveyer Belts and Transfer towers (Raw Material Handling)

Sr. No	Bag Filter Location	Raw Material Handling						
		For Discharge of Pipe conveyor to TT1	For Transfer Tower TT2 (Stacker Belt)	For Transfer Tower TT3 (Reclaimer Belt)	For Raw Material Hopper & (Hopper Feed belt)	For Transfer Tower TT3A (High/low Grade Belt)	For Dump Hopper (Additive Crusher)	For Additive Crusher (TT3B)
1	**Equipment Code**	221 BF2	221 BF3	311 BF1	311 BF2	311 BF3	231 BF1	231 BF2
2	**No of bags**	210	120	180	120	60	120	120
3	**Design Temp**	130	130	130	130	130	130	130
4	**Bag Type**	Polyster Needle Felt	Polyster Needle Felt	Polyster Needle Felt	Polyster Needle Felt	Polyster Needle Felt	Polyster Needle Felt	Polyster Needle Felt
5	**Design Volume of bag filter M^3/hr**	18000	15000	15000	10000	5000	10000	10000
6	**Diameter (m)**	0.152	0.152	0.152	0.152	0.152	0.152	0.152
7	**Length (m)**	3	3	3	3	3	3	3
8	**Filtering Area (M^2)**	1.45	1.45	1.45	1.45	1.45	1.45	1.45
9	**Air to Cloth Ratio**	0.99	1.44	0.96	0.96	0.96	0.96	0.96
10	**Dust Emission (mg/Nm^3)**	<50	<50	<50	<50	<50	<50	<50

Details of Bag filters Installed at Material Handling Section, Conveyer Belts and Transfer towers (Coal Handling)

Sr. No	Bag Filter Location	Coal Handling									
		For Coal Dump Hopper	For Transfer Tower (TT4)	For Coal Crusher	For Transfer Tower (TT5)	For Transfer Tower (TT6)	For Transfer Tower (TT7)	For Coal Hopper	For Coal FK Pump	For Coal Bin 1	For Coal Bin 2
1	**Equipment Code**	511 BF1	511 BF2	511 BF3	521 BF1	521 BF2	521 BF3	481 BF3	481 BF6	531 BF1	531 BF2
2	**No of bags**	180	88	120	88	88	88	54	54	36	36
3	**Design Temp**	130	130	130	130	130	130	75	75		
4	**Bag Type**	Pan+SS Wire Impregnated	Pan+SS Wire Impregnated	Pan+SS Wire Impregnated	Pan+SS Wire Impregnated	Pan+SS Wire Impregnated	Pan+SS Wire Impregnated	Polyster Needle Felt	Polyster Needle Felt	Polyster Needle Felt	Polyster Needle Felt
5	**Design Volume of bag filter M^3/hr**	15000	7500	10000	7500	7500	7500	6000	6000	3000	3000
6	**Diameter (m)**	0.152	0.152	0.152	0.152	0.152	0.152	0.127	0.127	0.127	0.127
7	**Length (m)**	3	3	3	3	3	3	3.35	3.35	3.35	3.35
8	**Filtering Area (M^2)**	1.45	1.45	1.45	1.45	1.45	1.45	1.35	1.35	1.35	1.35
9	**Air to Cloth Ratio**	0.96	0.98	0.96	0.98	0.98	0.98	1.37	1.37	1.03	1.03
10	**Dust Emission (mg/Nm^3)**	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50

Details of Bag filters Installed at Material Handling Section, Conveyer Belts and Transfer towers (Gypsum Handling)

Sr. No	Bag Filter Location	Gypsum Handling					
		For Transfer Tower (TT9)	For Recliamer and dump Hopper	For Slag Dump Hopper	For Transfer Tower (TT10)	For Transfer Tower (TT11)	For Screen
1	**Equipment Code**	751 BF7	751 BF6	621 BF1	621BF2	621 BF3	621 BF4
2	**No of bags**	88	120	180	88	120	180
3	**Design Temp**	130	130	130	130	130	130
4	**Bag Type**	Polyster Needle Felt	Polyster Needle Felt	Homo Polymer Acrylic	Homo Polymer Acrylic	Homo Polymer Acrylic	Homo Polymer Needle Felt
5	**Design Volume of bag filter M^3/hr**	7500	10000	15000	7500	10000	15000
6	**Diameter (m)**	0.152	0.152	0.152	0.152	0.152	0.152
7	**Length (m)**	3	3	3	3	3	3
8	**Filtering Area (M^2)**	1.45	1.45	1.45	1.45	1.45	1.45
9	**Air to Cloth Ratio**	0.98	0.96	0.96	0.98	0.96	0.96
10	**Dust Emission (mg/Nm^3)**	<50	<50	<50	<50	<50	<50

Annexure-III

Real time Continuous Ambient Air Quality Monitoring Stations

In Mines

Ambient air quality monitoring stations Within Plant Premises

Environmental Data Display boards for General public

Data Display board at Plant Main gate

Data Display board at Mines Main gate

Annexure: IV

Closed Storage Sheds and Silo to store Raw materials and Products

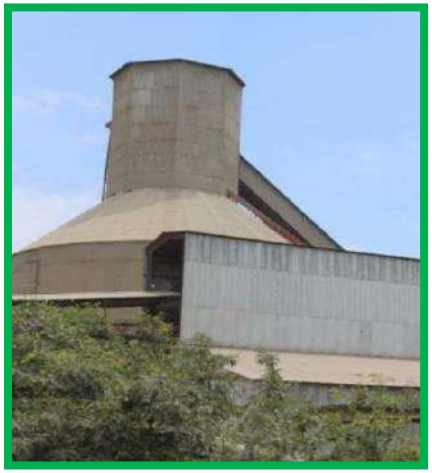
Slag Storage Shed: 10000 Tonne

Limestone Storage Shed: 50000 Tonne

Coal Storage Shed: 10000 Tonne

Additives Storage Shed: 15000 Tonne

Gypsum Storage shed: 5000 Tonne



Clinker Silo: 45000 Tonne

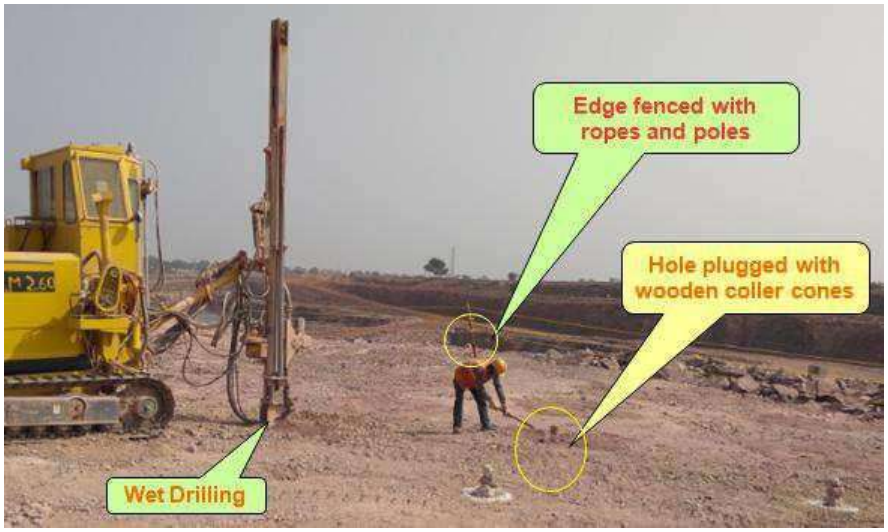
Raw meal Silo: 15000

Cement Silo: 4×5000 Tonne

Water Sprinkling at Material Loading, Unloading points and on Mine Haul roads to Control Fugitive Dust Emissions

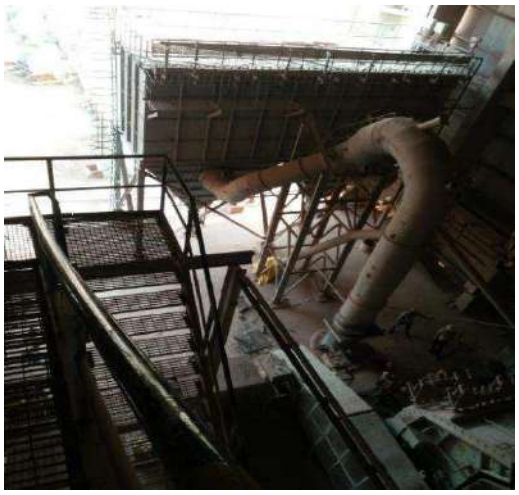
Mining best Practices

All bench edges are being fenced with rope and steel pipes to check fall of men during Blast Hole Drilling and Blast Hole charging operations.



Wet drilling is being practiced regularly to control dust emission.

After drilling all drill holes are being plugged with wooden collar cones.



As a dust control measures we have installed Bag houses and Water sprinkling system over conveyor belts.

Annexure V

Environmental Data Display boards for General public

Data Display board at Plant Main gate

Data Display board at Mines Main gate

Annexure-VI

Dust Collection and Extraction system

Using 2 sweeping machines, out of which one is Truck mounted and the other is mechanical sweeping machine.

Truck Mounted Sweeping Machine

Mechanical Sweeping Machine

Concrete Roads for Raw material Transportation in both Plant and Mines

Concrete Roads within Plant Premises

Concrete roads connecting limestone mine and Plant

Status of Pipe Conveyor Belt Progress

Covered Trucks engaged in Transportation of Raw material and Products

Bulkers used for Transporting Fly ash

Tarpaulin covered trucks for transporting Raw materials from Limestone mines

Air Cooled Condensers installed at Captive Power Plant and Waste Heat Recovery unit

Air Cooled Condensers installed at Captive Power Plant

Air Cooled Condenser installed at Waste Heat Recovery

Annexure-X

Green Belt development at Cement Plant:

Total 70,686 plants have been planted in 63.72 Ha, against total factory area of 79.4Ha,

This is more than 38%.






Plant Premises

Greenbelt Development at both Mines:

Total 92,913 plants have been planted in 81.5 Ha. In this FY. We are planting 20,000 saplings in Mines

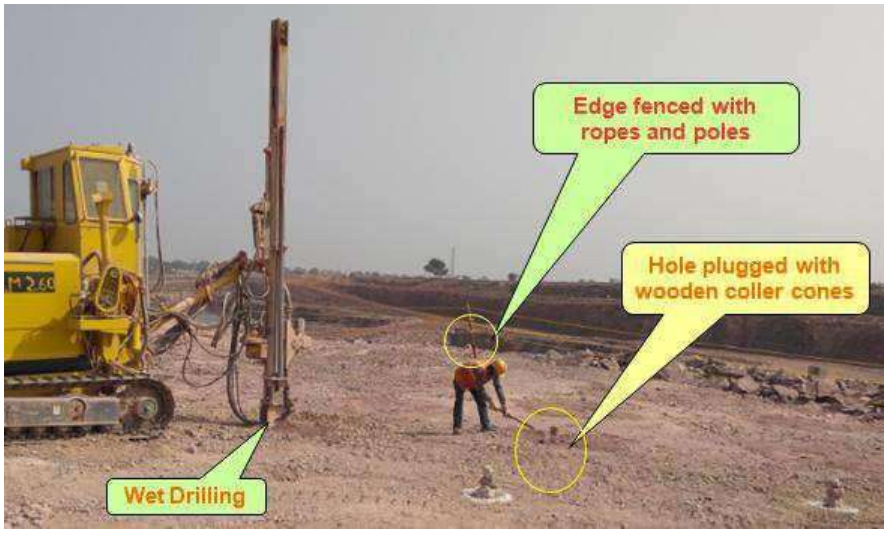
Mines Premises

JKLC In-house Nursery at both Plant and Mines

Annexure- XI

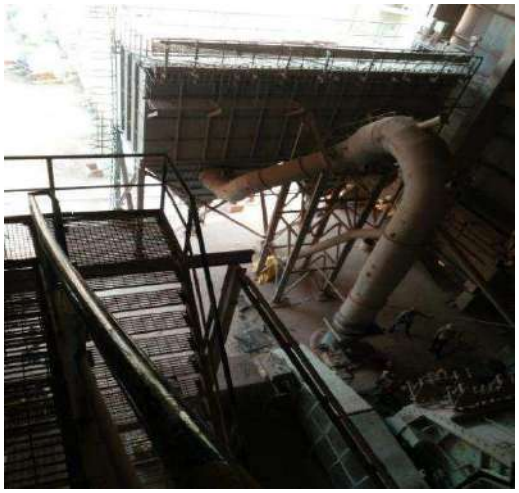
Mining best Practices

All bench edges are being fenced with rope and steel pipes to check fall of men during Blast Hole Drilling and Blast Hole charging operations.



Wet drilling is being practiced regularly to control dust emission.

After drilling all drill holes are being plugged with wooden collar cones.



As a dust control measures we have installed Bag houses and Water sprinkling system over conveyor belts.

To control dust generation during hauling regular water sprinkling is being done with water tanker.

Annexure- XII

Implementation Plan of CREP Recommendations

Sl. No.	CREP CONDITION	ACTION PLANNED
1	Cement plant, which are not complying with notified standards, shall do the following to meet the standards: Augmentation of existing Air pollution Control Devices - by July 2003. *No compliance units shall submit bank guarantee equivalent to 10% value of Pollution Control Equipment required.	**Not Applicable**
2	Cement plants located in critically polluted or urban areas(including 5 Km distance outside urban boundary) will meet 100 mg/Nm3 limit of particulate matter by December 2004 and continue working to reduce the emission of particulate matter 50 mg/Nm^3.	**Not Applicable**
3	The new cement kiln to be accorded NOC/ Environmental Clearance w.e.f 1/4/03 will meet the limit of 50 mg/Nm^3 for particulate matter emission.	• **Efficient bag Filters and All Pollution Control Equipments designed to meet the limit of 30 mg/Nm^3 for particulate matter emission are installed at various dust prone areas.**
4	CPCB will evolve load-based standards by December 2003.	-
5	CPCB and NCBM will evolve So^2 and Nox emission standards by June -2004	-
6	The cement industries will control fugitive emission from all raw material and product storage and transfer points by December 2003. However, the National Task Force will decide the feasibility for the control of fugitive emission from limestone and coal storage areas. The NTF shall submit its recommendations within months.	• **Efficient dust extraction systems (Bag filters) are installed at all transfer points covering work of transfer points, conveyors, Crushing plants, Material handling units, materials storage area, storage silos, and Electrostatic precipitator (ESP) for clinker are installed. Photographs of the same are enclosed as annexure - A** • **Storage shades are constructed for storage of raw materials, silos are constructed for the storage of Clinker, Fly Ash and Cement etc.**

7	CPCB, NCBM, BIS and Oil refineries will jointly prepare the policy on use of petroleum cock as fuel in Cement Kiln by July 2003.	• **Policy is yet to be released.**
8	After performance evaluation of various types of continuous monitoring equipment and feedback from the industries and equipment manufacturers, NTF will decide feasible unit operation/section for installation of continuous monitoring equipment. The industry will install the continuous monitoring system (CMS) BY December 2003.	• **Continuous SPM emission monitors on all major stacks are already installed.**
9	Tripping in Kiln to be minimized by July 2003 as per the recommendation on NTF	• **Not applicable**
10	Industries will submit the target date to enhance the utilization of waste material by April 2003.	**It will be utilized once recently commissioned Cement Plant gets established.**
11	NCBM will carry out a study on hazardous waste utilization in cement kiln by December 2003.	• **Study findings not received till date.**
12	Cement industries will carry out feasible study and submit target dates to CPCB co-generation of power by July-2003.	• **Point dropped by the NTF. However JKLCL shall look into the possibility of co-generation of power through waste gases.**

Rain water harvesting structures

Our integrated approach to harvest Rain water, company has constructed 55 rain water harvesting systems with a rain water harvesting potential of 1583038 m^3/year @ rainfall of 960 mm. Apart from this company has constructed 6 rain water harvesting structures in nearby villages, to recharge Rain water, making a total recharge of 1659782 m^3/Year.






CSR Activities undertaken last financial year

Annexure-XIV

CSR Budget /Expenses for the FY 2018-19					
Area of Operation as per Schedule VII	**Sub-Head**	**Activity**	**Budget (Lakhs)**	**Expenses (Lakhs)**	**Breif Detail**
Eradicating Hunger, Poverty and Malnutrition promoting Preventive Health Care & Sanitation and making avaialble Safe Drinking Water	**Health Care**	Free Health Camp	8.4	**8.1**	**Free health camp at 6 near by village**
		Medicines	5.4	**3.48**	
	Sanitation in Rural Areas	Hygine & Sanitation work at Schools & villages	0.6	**4.87**	**Support to hygine compaigning,Fogging and Awareness program**
		Garbage Management at village level	3.84	**3.9**	**Maintance and Diesel & petrol expeses expenses**
	Drinking Water	Water huts	**0.9**	**0.76**	**Drinking Water facility throught Water huts**
Promoting Education including special education and employment especially among children, Women, Elderly and the differently abled and Livelihood enhancement projects	**Education**	Establishment of Community Library at Nandini Khundani	**6**	**7.25**	**Expenses of Community library with Rent charges**
		Coaching Classes for weaker students for exams & competive exams.	**0.96**	**2.23**	**Coaching Classes for weaker students & women Elderly and the differently abled**

Contd.

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Empowerments and livelihood	**Livelihood Intervention & Vocational Skills**	Vocational training at 7 villages for Youth employability program	**2.8**	**4.3**	**Honorarium of 6 trainer of tailorng center and rent charges of Khasadih and Semaria center.**
		Computer Training (1 Computer Centres)	**1.02**	**1.7**	**Skill delelopment through Computer training at Near by Village**
		SHG Formation for creating Livelihood opportunities	**1**	**0.5**	**Support to Enterprenurship development**
		Entrepreneurship development program group /individual level	**1.5**	**0.25**	**Summer claasess / Vocational Training**
		Kichen Garden for farmers & market channelization	**1.5**		**Farmers Training / SHGs**
Ensuring environmental sustainability, ecological balance, protection of flora and fauna animal welfare, agroforestry, conversation of natural resources and maintain quality of soil, air and water.	**Anilmal Welfare**	Veterinary Camps (6 camps)	**0.6**		**Water Conservation / Harvesting**
		Breed upgradation for cattles	**2**	**1.97**	**Shifted to establishment of Digital Learning center at Science Bhavan Durg,**
Training to promote rural sports, Nationally recognised Sports, Paralympic Sports Budget	**Promoting Rural Sports**	Establishment of Sport acadamy & distribution of sports materials	**1**	**0.48**	**Promoting to Organize Sports and help for procuring Sports and Games Materials**
Rural Development Projects	**Rural Development**	Maintenance of Community Plantation and others activity	**6.5**	**6.49**	
Total Expenses			**44.02**	**46.28**	

Annexure- XV

Piezometer installed to measure Ground water Level

Annexure-XVI

Water meters installed to assess Water withdrawal at our Plant & Mines

Annexure XVII

Corporate Environment Responsibility

- An amount of around Rs. 1,550 Lakh will be incurred towards expenditure for carrying out up-gradation / optimization activities.
- As per MOEF&CC Circular N0. 22-65/2017-IA-III dated 01.05.2018; we propose to make an expenditure of 1% of additional capital investment, in area around our project under Corporate Environment Responsibility (CER).

SL.No	Proposed Activities under CER at nearby villages	Amount to be incurred Rs.	Exp.	Villages for CER activities
1	Plantation in Community Area / Avenue Plantation	5.0 L	5.5	Plantation work at Nandani Khundani, Pitaura, Girhola, Khasadih
2	Establishment of Library to improve the quality of Educational	5.0 L	5.77	Establishment and Renovation of Community library at Nandini Khundani
3	Rain Water harvesting systems	2.0 L	2.2	Unit Establishment and Awareness program of Rain Water harvesting systems at Khasadih, Pitaura & Semaria
4	Hygiene & Rural Sanitation	2.0 L	2.1	Under Sanitation Program JKLC has deputed 03 Number of Garbage Tippler to collect garbage from door step at Khasadih. To control the mosquito growth and to control the malaria in nearby villages regular fogging work at Khasadih villages once in a month.
5	Establishment of Skill Development Centre	2.0 L	2.05	Establishment & Renovation of skill development center at Girhola
	TOTAL	16.0 L	17.62	

Annexure XVIII (A)

ENVIRONMENTAL STATUS REPORT

(Half-yearly Report for April-2019 to September-2019)

for

INTEGRATED CEMENT PLANT

of

M/s JK LAKSHMI CEMENT LIMITED

at

Village-Malpuri Khurd & Khasadih,
Dist-Durg (C.G.)

Prepared By

MAHARASHTRA ENVIRO POWER LIMITED

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Lab.: **'MoEF recognized & NABL Accredited Environmental Laboratory'**
CHW-01, Mouza-Mandwa, MIDC Industrial Area
Butibori, Dist. Nagpur

APRIL-SEPTEMBER - 2019

TABLE OF CONTENTS

1.0 INTRODUCTION

This Summarized Environmental Baseline Data report represents the environmental status regarding Micro-meteorological Data, Ambient Air Quality, Noise Level (Day & Night), Stack Emission Quality, Water (Surface & Ground) Quality and Soil Quality in & around the **Integrated Cement Plant** of **M/s JK Lakshmi Cement Limited** at village- Semaria, Ghikuria & Nandini-Kundini, Distt. Durg (C.G.).

This report has been prepared on basis of data collected during environmental monitoring & sample collection in & around the Integrated Cement Plant area for the period **April-2019 to Septemebr-2019**.

SUMMARIZED ENVIRONMENTAL BASELINE DATA FOR PERIOD APRIL-2019 TO SEPTEMEBR-2019

Regular environmental monitoring in & around the Integrated Cement Plant area is carried out. **'Summarized Environmental Baseline Data'** for the period April-2019 to Septemebr-2019 is presented below.

MICRO-METEOROLOGICAL DATA

OBSERVATION

Micro-meteorological data regarding wind speed, wind direction, temperature, relative humidity, solar radiation, atmospheric pressure and rainfall collected from IMD station at Plant site of M/s JK Lakshmi Cement Limited on hourly/daily basis. Data is summarized for individual parameters for respective month and tabulated below in **Table– 2.1**. Respective graphical presentations are also stated for tabulated values.

TABLE – 2.1:
Micro-Meteorological Data for Period April-2019 to Septemebr-2019

Sr. No.	Months	Minimum	Maximum
WIND SPEED (km/hr)			
1.	April - 2019	0.0	6.3
2.	May - 2019	0.0	6.9
3.	June - 2019	0.0	5.5
4.	July - 2019	0.0	14.2
5.	August - 2019	0.0	16.5
6.	September - 2019	0.0	9.9
AMBIENT TEMPERATURE (^{0}C)			
1.	April - 2019	19.9	37.3
2.	May - 2019	26.3	44.5
3.	June - 2019	25.2	45.6
4.	July - 2019	24.8	39.0
5.	August - 2019	25.5	34.2
6.	September - 2019	22.6	35.4

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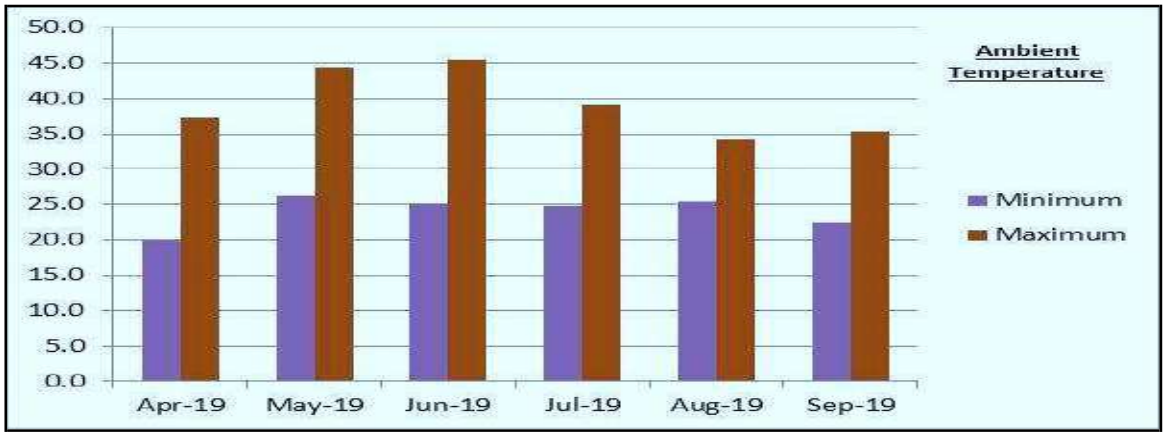
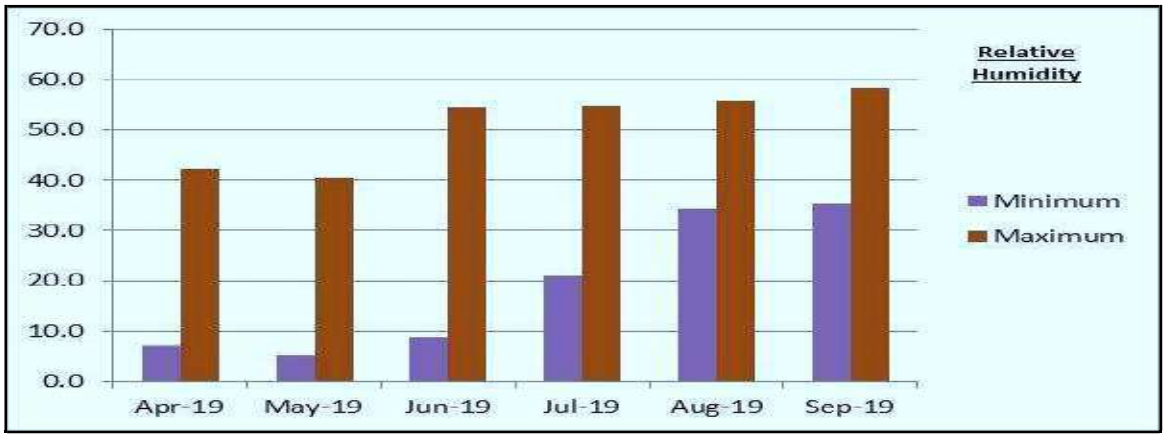
RELATIVE HUMIDITY (%)			
1.	April - 2019	7.3	42.1
2.	May - 2019	5.4	40.4
3.	June - 2019	8.8	54.5
4.	July - 2019	21.1	54.6
5.	August - 2019	34.3	55.8
6.	September - 2019	35.2	58.4
ATMOSPHERIC PRESSURE (mm-Hg)			
1.	April - 2019	816.7	832.5
2.	May - 2019	810.0	833.9
3.	June - 2019	817.4	857.7
4.	July - 2019	835.7	860.4
5.	August - 2019	848.2	860.4
6.	September - 2019	852.8	864.0

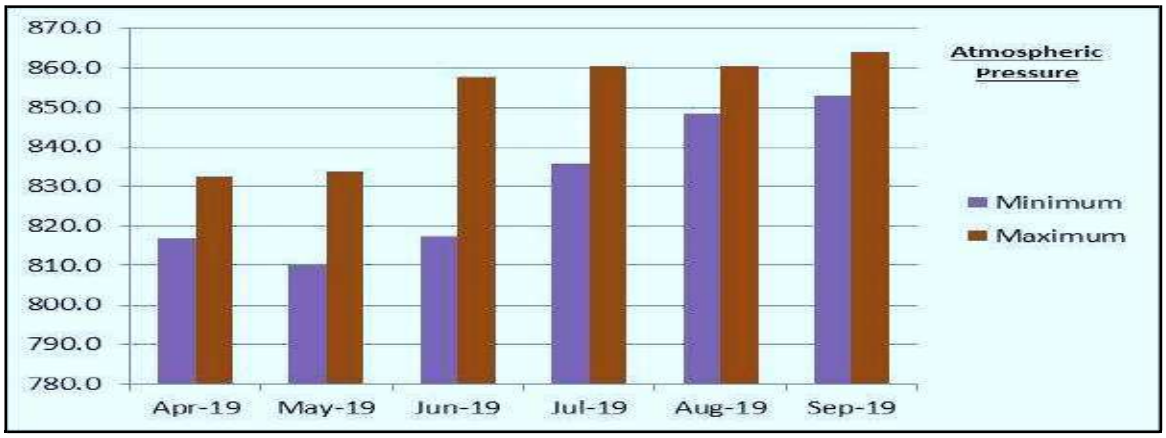
Graphical Presentation of Ambient Temperature



Graphical Presentation of Relative Humidity



Graphical Presentation of Atmospheric Pressure



RESULTS AND DISCUSSION

Total **rainfall** for the period April-2019 to September-2019 was 771.0 mm and out of which, 344.0 mm rainfall was found in month September-2019.

Mostly **wind** was found calm (<1.0 km/hr) and maximum time wind was predominated from East and E-SE direction during period April-2019 to September-2019. Maximum wind speed was observed in month of August-2019 and speed was 16.5 km/hr.

Ambient **temperature** was monitored on hourly basis for minimum & maximum during period April-2019 to September-2019. Observed minimum temperature was 19.9 ^{0}C in month April-2019 and maximum temperature was 45.6 ^{0}C in month June-2019.

Relative **humidity** was monitored on hourly basis for minimum & maximum during period April-2019 to September-2019. Observed minimum humidity was 5.4% in months May-2019 and maximum humidity was 58.4% also in month September-2019.

Atmospheric pressure was monitored on daily basis during period April-2019 to September-2019. Observed minimum atmospheric pressure was 810.0 mm-Hg in month May-2019 and maximum atmospheric pressure was 864.0 mm-Hg in months Spetember-2019.

AMBIENT AIR QUALITY (AAQ)

Monitored Ambient Air Quality values (parameter-wise) in & around the plant site for the period April-2019 to Septemebr-2019 are given below in **Table- 2.2** to **Table- 2.6**.

TABLE – 2.2: PM_{10} Particulate Matter (<10 µm)

Code	Stations	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	MIN	MAX	AVG	98 percentile
AAQ-1	Boundary towards West Direction	63.2	57.1	54.7	58.8	53.1	50.9	50.9	63.2	56.3	62.8
AAQ-2	Boundary towards North-East Direction	59.2	54.1	51.3	65.1	59.5	56.4	51.3	65.1	57.6	64.6
AAQ-3	Boundary towards East Direction	61.7	58.3	49.1	67.9	64.1	54.0	49.1	67.9	59.2	67.5
AAQ-4	Boundary towards North Direction	65.3	59.4	52.4	60.1	54.6	48.2	48.2	65.3	56.7	64.8
AAQ-5	Boundary towards South West Direction	56.3	54.2	48.7	51.8	49.9	44.8	44.8	56.3	50.9	56.1

TABLE – 2.3: $PM_{2.5}$ Particulate Matter (<2.5 µm)

Code	Stations	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	MIN	MAX	AVG	98 percentile
AAQ-1	Boundary towards West Direction	33.2	31.7	28.5	30.9	29.5	26.5	26.5	33.2	30.0	33.1
AAQ-2	Boundary towards North-East Direction	37.1	34.2	26.8	40.8	37.6	29.5	26.8	40.8	34.3	40.5
AAQ-3	Boundary towards East Direction	35.1	32.7	31.4	38.6	36.0	34.5	31.4	38.6	34.7	38.3
AAQ-4	Boundary towards North Direction	42.3	38.6	34.8	38.9	35.5	32.0	32.0	42.3	37.0	42.0
AAQ-5	Boundary towards South West Direction	34.8	30.2	28.9	32.0	27.8	26.6	26.6	34.8	30.0	34.5

TABLE – 2.4: Sulphur Dioxide (SO_2)

Code	Stations	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	MIN	MAX	AVG	98 percentile
AAQ-1	Boundary towards West Direction	16.4	16.1	14.1	16.4	16.1	14.1	14.1	16.4	15.5	16.4

AAQ-2	Boundary towards North-East Direction	21.8	18.4	15.8	21.8	18.4	15.8	15.8	21.8	18.7	21.8
AAQ-3	Boundary towards East Direction	17.2	15.6	14.7	17.2	15.6	14.7	14.7	17.2	15.8	17.2
AAQ-4	Boundary towards North Direction	13.2	14.7	13.4	13.2	14.7	13.4	13.2	14.7	13.8	14.7
AAQ-5	Boundary towards South West Direction	16.4	14.6	12.2	16.4	14.6	12.2	12.2	16.4	14.4	16.4

TABLE – 2.5: Oxides of Nitrogen (NO_X)

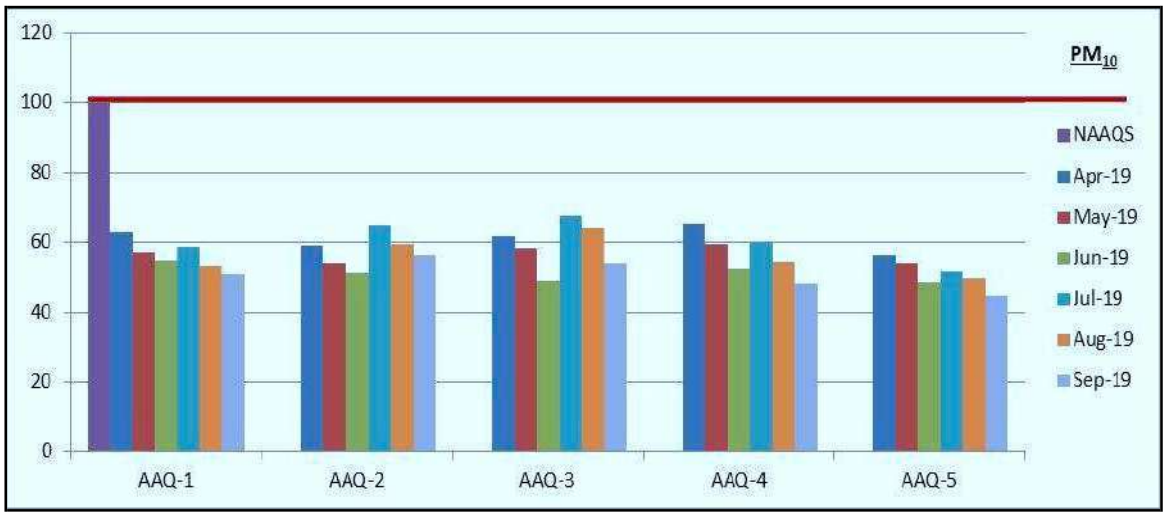
Code	Stations	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	MIN	MAX	AVG	98 percentile
AAQ-1	Boundary towards West Direction	21.7	19.7	18.4	19.9	21.3	23.4	18.4	23.4	20.7	23.3
AAQ-2	Boundary towards North-East Direction	19.3	18.4	16.7	18.7	20.6	21.6	16.7	21.6	19.2	21.5
AAQ-3	Boundary towards East Direction	24.8	22.6	20.4	23.5	26.0	28.5	20.4	28.5	24.3	28.3
AAQ-4	Boundary towards North Direction	19.4	17.7	18.8	21.2	20.0	21.9	17.7	21.9	19.8	21.9
AAQ-5	Boundary towards South West Direction	17.3	18.1	17.5	19.8	20.5	19.5	17.3	20.5	18.8	20.4

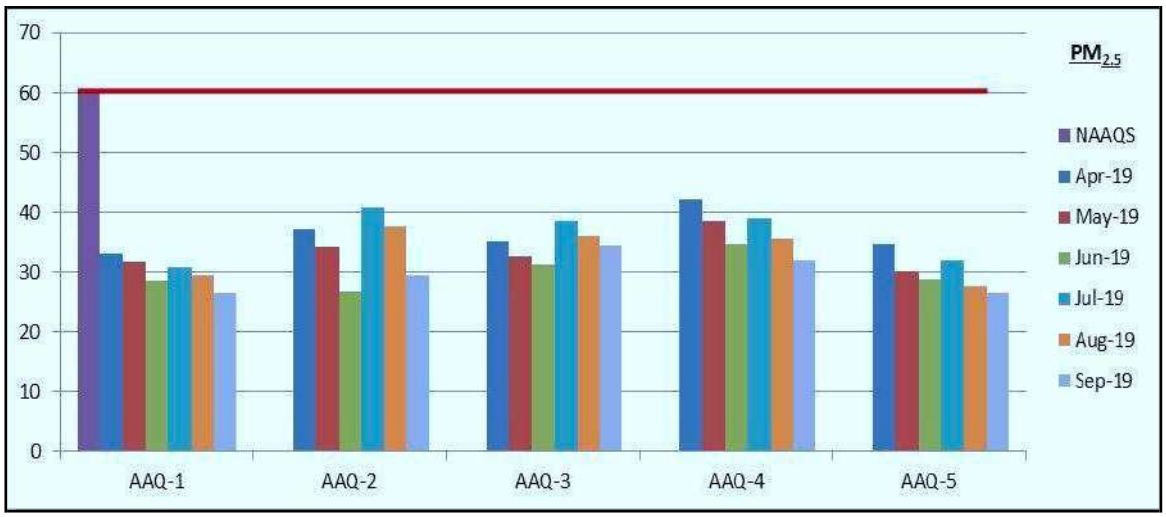
TABLE – 2.6: Carbon Monoxide (CO)

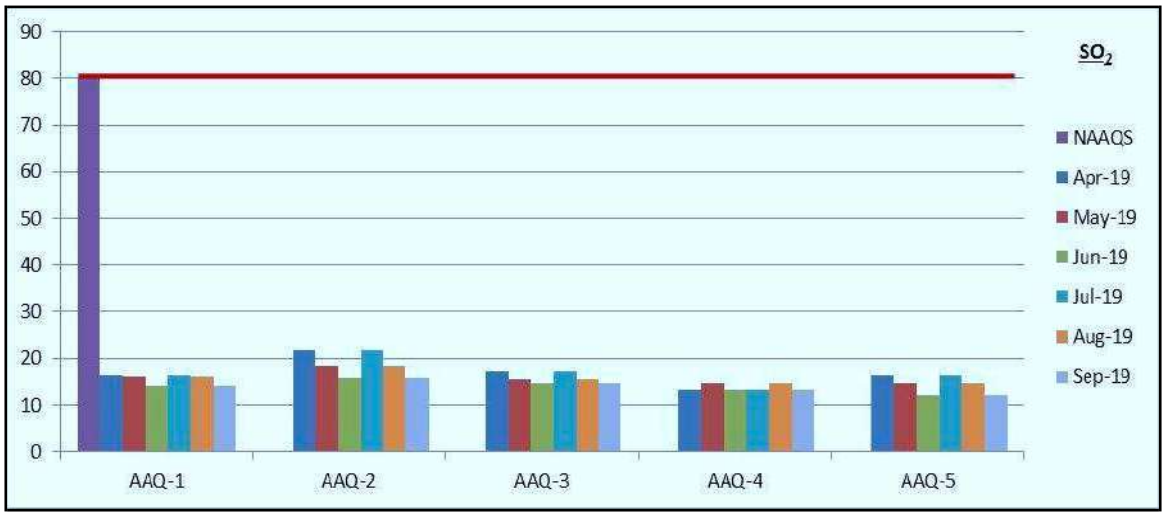
Code	Stations	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	MIN	MAX	AVG	98 percentile
AAQ-1	Boundary towards West Direction	426	420	416	449	453	460	416	460	437	459
AAQ-2	Boundary towards North-East Direction	458	476	468	524	533	513	458	533	495	532
AAQ-3	Boundary towards East Direction	464	446	433	497	512	534	433	534	481	532
AAQ-4	Boundary towards North Direction	480	468	464	524	528	542	464	542	501	541
AAQ-5	Boundary towards South West Direction	364	338	328	370	381	411	328	411	365	408

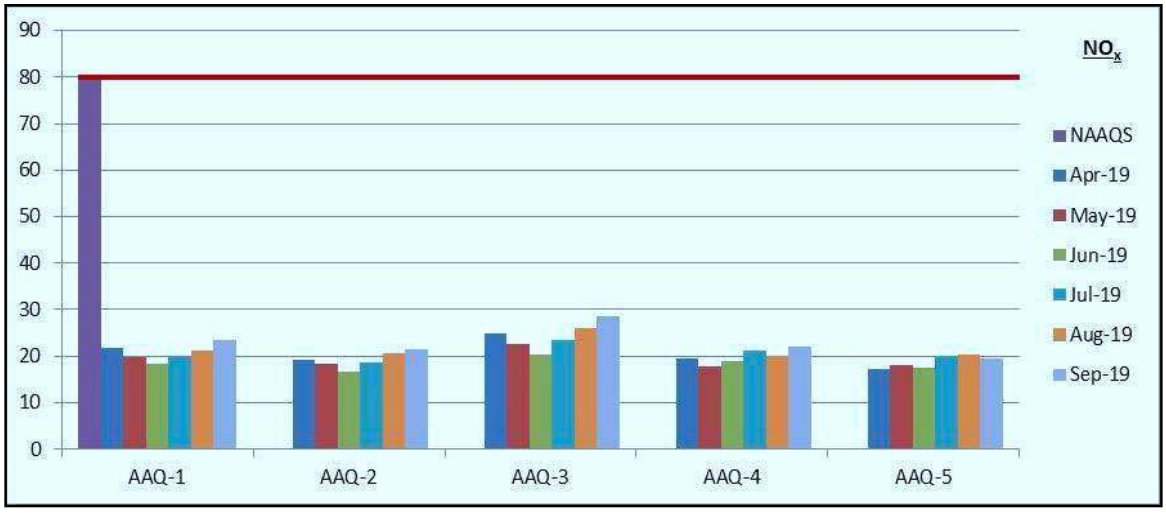
The graphical presentations (parameter-wise) of above observations are presented below in **Figure – 2.1**.

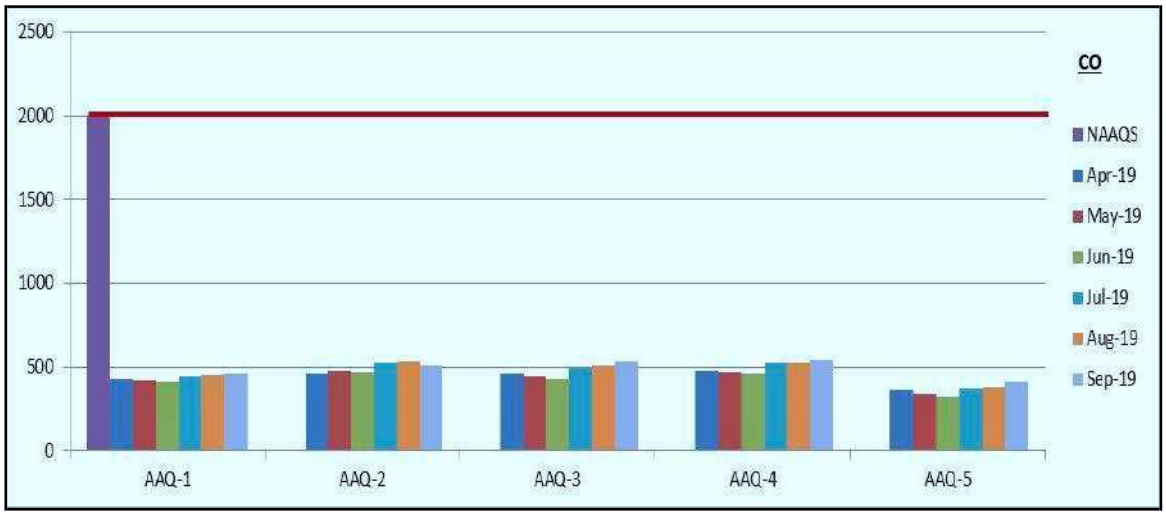
Figure – 2.1: GRAPHICAL PRESENTATION (Parameter-wise)











RESULTS & DISCUSSION

These monitored values represent quite satisfactory condition regarding Air Quality in & around the mine lease area in comparison of the National Ambient Air Quality standards (NAAQS).

NOISE LEVEL

Noise Levels in & around the plant site are monitored on regular basis in day & night hours separately. Summarized observed values of Noise Level for the period April-2019 to Septemebr-2019 are given below in **Table-2.7** & **Table-2.8**.

TABLE – 2.7: NOISE LEVEL (DAY HOURS)

Code	Stations	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	MIN	MAX	AVG
NL – 1	Boundary towards West Direction	52.8	54.1	53.4	56.5	53.0	49.7	49.7	56.5	53.2
NL – 2	Boundary towards North-East Direction	54.7	52.9	55.2	58.5	51.8	51.3	51.3	58.5	54.1
NL – 3	Boundary towards East Direction	51.2	52.7	49.7	54.8	51.6	46.2	46.2	54.8	51.0
NL – 4	Boundary towards North Direction	54.2	56.1	57.9	58.0	55.0	53.8	53.8	58.0	55.8
NL – 5	Boundary towards South West Direction	51.3	50.8	52.1	54.9	49.8	48.5	48.5	54.9	51.2

TABLE – 2.8: NOISE LEVEL (NIGHT HOURS)

Code	Stations	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	MIN	MAX	AVG
NL – 1	Boundary towards West Direction	38.5	42.5	40.2	41.2	41.7	37.4	37.4	42.5	40.2
NL – 2	Boundary towards North-East Direction	45.8	44.6	46.8	49.0	43.7	43.5	43.5	49.0	45.6
NL – 3	Boundary towards East Direction	46.2	38.3	47.4	49.4	37.5	44.1	37.5	49.4	43.8
NL – 4	Boundary towards North Direction	52.3	43.4	53.1	56.0	42.5	49.4	42.5	56.0	49.4
NL – 5	Boundary towards South West Direction	48.1	39.8	49.6	51.5	39.0	46.1	39.0	51.5	45.7

RESULTS & DISCUSSION

In comparison of the prescribed National Ambient Noise Level Standards, the observed values of Noise level are well within stipulated limits prescribed for industrial/commercial/residential area. The monitored values represent quite satisfactory condition regarding Noise pollution in & around the plant site.

STACK EMISSIONS

Operations of different unit stacks are going-on and monitoring was carried out for emissions. All stacks have been monitored during reporting period from April-2019 to Septemebr-2019 for required parameters. Month-wise results are presented in **Table- 2.9A, Table- 2.9B & Table- 2.9C**.

TABLE – 2.9A: STACK EMISSION ANALYSIS REPORT

Particulars	Unit	Stack #1	Stack #2	Stack #3	Stack #4	Stack #5	Stack #6	Consent Status
Stack Attached with	-	Raw Mill RABH	Clinker Cooler ESP	Coal Mill Bag House	Cement Mill-1 Bag House	Cement Mill-2 Bag House	Slag Mill Bag House	
Stack Height	meter	64.0	43.0	57.7	56.1	56.1	48.0	-
Stack Inner Dia	meter	6.0	3.55	2.8	1.4	1.4	4.3	-
April-2019								
Ambient Temperature	^{0}C	37.0	39.0	38.0	38.0	37.0	38.0	-
Flue Gas Temperature	^{0}C	78.0	116.0	77.0	78.0	76.0	79.0	-
Velocity	m/s	7.1	7.6	7.1	7.5	7.3	7.6	-
Total Volumetric Flow	Nm^3/sec	172.6	63.9	38.9	10.3	10.0	98.2	-
Total Particulate Matter (TPM)	mg/Nm^3	28.2	27.5	26.6	25.7	27.8	26.4	<50.0
May-2019								
Ambient Temperature	^{0}C	39.0	42.0	39.0	39.0	40.0	38.0	-
Flue Gas Temperature	^{0}C	79.0	119.0	78.0	82.0	77.0	79.0	-
Velocity	m/s	7.3	7.9	7.3	7.4	7.7	7.5	-
Total Volumetric Flow	Nm^3/sec	177.4	66.4	40.0	10.1	10.5	96.9	-
Total Particulate Matter (TPM)	mg/Nm^3	27.5	28.8	26.2	28.4	27.3	26.9	<50.0

TABLE – 2.9B: STACK EMISSION ANALYSIS REPORT

Particulars	Unit	Stack #1	Stack #2	Stack #3	Stack #4	Stack #5	Stack #6	Consent Status
Stack Attached with	-	Raw Mill RABH	Clinker Cooler ESP	Coal Mill Bag House	Cement Mill-1 Bag House	Cement Mill-2 Bag House	Slag Mill Bag House	
Stack Height	meter	64.0	43.0	57.7	56.1	56.1	48.0	-
Stack Inner Dia	meter	6.0	3.55	2.8	1.4	1.4	4.3	-
Jun-2019								
Ambient Temperature	^{0}C	39.0	41.0	39.0	39.0	38.0	39.0	-
Flue Gas Temperature	^{0}C	79.0	121.0	77.0	79.0	78.0	78.0	-
Velocity	m/s	7.2	7.8	6.9	7.1	7.9	7.7	-
Total Volumetric Flow	Nm^3/sec	175.0	65.6	37.8	9.7	10.8	99.5	-
Total Particulate Matter (TPM)	mg/Nm^3	26.3	27.5	23.9	27.1	28.2	24.8	<50.0
July-2019								
Ambient Temperature	^{0}C	30.0	31.0	30.0	29.0	30.0	29.0	-
Flue Gas Temperature	^{0}C	76.0	111.0	73.0	75.0	77.0	78.0	-
Velocity	m/s	6.7	7.2	6.8	7.1	6.9	7.2	-
Total Volumetric Flow	Nm^3/sec	162.8	60.5	37.2	9.7	9.4	93.0	-
Total Particulate Matter (TPM)	mg/Nm^3	23.5	24.2	25.8	23.4	26.1	25.3	<50.0

TABLE – 2.9C: STACK EMISSION ANALYSIS REPORT

Particulars	Unit	Stack #1	Stack #2	Stack #3	Stack #4	Stack #5	Stack #6	Consent Status
Stack Attached with	-	Raw Mill RABH	Clinker Cooler ESP	Coal Mill Bag House	Cement Mill-1 Bag House	Cement Mill-2 Bag House	Slag Mill Bag House	
Stack Height	meter	64.0	43.0	57.7	56.1	56.1	48.0	-
Stack Inner Dia	meter	6.0	3.55	2.8	1.4	1.4	4.3	-
August-2019								
Ambient Temperature	^{0}C	30.0	31.0	29.0	30.0	29.0	29.0	-
Flue Gas Temperature	^{0}C	77.0	115.0	76.0	81.0	75.0	78.0	-
Velocity	m/s	6.9	7.5	7.1	6.9	7.2	7.1	-
Total Volumetric Flow	Nm^3/sec	167.7	63.1	38.9	9.4	9.9	91.7	-
Total Particulate Matter (TPM)	mg/Nm^3	24.7	26.1	25.5	26.2	25.1	25.3	<50.0
Septemebr-2019								
Ambient Temperature	^{0}C	29.0	30.0	30.0	29.0	30.0	30.0	-
Flue Gas Temperature	^{0}C	78.0	118.0	76.0	77.0	76.0	78.0	-
Velocity	m/s	6.8	7.3	6.6	6.9	7.4	7.2	-
Total Volumetric Flow	Nm^3/sec	165.3	61.4	36.2	9.4	10.1	93.0	-
Total Particulate Matter (TPM)	mg/Nm^3	24.5	26.1	23.2	24.7	25.5	23.2	<50.0

RESULTS & DISCUSSION

The observations show that stack emissions are well within standards prescribed in the 'Consent for Operation'.

WATER (GROUND & SURFACE) QUALITY

GENERAL

A routine analysis of Water Quality is required to find out any contamination of natural water sources. The plant site is maintaining the **'Zero Discharge'** condition and Ponds are lined. There is no chance of ground water contamination. However, as per stipulated condition, surface water and ground water quality have monitored for routine parameters.

LOCATION OF WATER QUALITY SAMPLING

The water quality monitoring was selected with a view to check out the impact on ground water sources in and around plant site. Total 05 (five) number, 04 (four) ground water sample and 01 (one) surface water sample from Shivnath river flowing near the plant, were collected and analyzed.

Location of sampling stations is given in **Table – 2.10**.

Table – 2.10: Description of Ground & Surface Water Sampling Stations

Sr. No.	Sampling Stations	Station Code	Approx. Distance from Plant site	Direction from Plant site
1.	Bore well within plant site	GW – 1	Within	-
2.	Bore well in Malpuri village	GW – 2	1.0 km	E
3.	Bore well in Girhola village	GW – 3	1.5 km	N
4.	Bore well in Khasadih village	GW – 4	1.5 km	SW
5.	Shivnath river	SW – 1	5.0 km	NW

2.4.3 OBSERVATIONS

The characteristics of ground water samples and surface water sample for the period April-2019 to Septemebr-2019, are presented below in **Table – 2.11** & **Table – 2.12**.

TABLE – 2.11: GROUND & SURFACE WATER QUALITY REPORT

Date of Sampling	11.06.2019

Sr. No.	Parameters	Unit	As per IS 10500:2012		Values				
			Desirable	Permissible	GW-1	GW-2	GW-3	GW-4	SW-1
A.	**ITEMS RELATING TO PRESERVATION OF LIVING ENVIRONMENT**								
1.	Colour	Hazen	5	15	CL	CL	CL	CL	CL
2.	Odour	UO	AG	AG	AG	AG	AG	AG	AG
3.	Taste	AG	AG	AG	AG	AG	AG	AG	ND
4.	Turbidity	NTU	1	5	< 1.0	< 1.0	< 1.0	< 1.0	1.7
5.	Total Dissolved Solids	mg/l	500	2000	583	584	595	556	444
6.	pH at 25 ^{0}C	-	6.5 – 8.5	NR	7.36	7.24	7.4	7.35	7.94
7.	Dissolved Oxygen (DO)	mg/l	-	-	3.9	3.8	4.1	3.6	7.3
8.	Biochemical Oxygen Demand (BOD) 3 days 27 ^{0}C	mg/l	-	-	<3.0	<3.0	<3.0	<3.0	<3.0
9.	Chemical Oxygen Demand (COD)	mg/l	-	-	12	12	8	8	16
10.	Conductivity	S/cm	-	-	911	913	930	883	705
11.	Total Alkalinity as $CaCO_3$	mg/l	200	600	216	230	218	208	180
12.	Total Hardness as $CaCO_3$	mg/l	200	600	212	224	230	216	172
13.	Calcium as Ca^{++}	mg/l	75	200	55.1	58.2	59.8	56.2	44.7
14.	Magnesium as Mg^{++}	mg/l	30	100	17.8	18.8	19.3	18.1	14.4
15.	Chlorides as Cl	mg/l	250	1000	88	74	76	72	64
16.	Sulphates as SO_4	mg/l	200	400	58.2	54.6	70.8	60.4	28.2

Table contd…

Table contd…

Sr. No.	Parameters	Unit	As per IS 10500:2012		Values				
			Desirable	Permissible	GW-1	GW-2	GW-3	GW-4	SW-1
17.	Fluoride as F	mg/l	1.0	1.5	0.54	0.66	0.57	0.66	0.18
18.	Nitrates as NO_3	mg/l	45	NR	6.7	9.4	11.2	11.6	5.8
19.	Iron as Fe	mg/l	0.3	NR	0.18	0.26	0.27	0.23	0.07
20.	Manganese as Mn	mg/l	0.1	0.3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
21.	Zinc as Zn	mg/l	5.0	15.0	BDL	BDL	BDL	BDL	BDL
22.	Copper as Cu	mg/l	0.05	1.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
23.	Aluminium as Al	mg/l	0.03	0.2	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
24.	Boron as B	mg/l	0.5	1.0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
25.	Total Coliform	MPN/100 ml	Absent	NR	0	0	0	0	49
26.	E. Coli	MPN/100 ml	Absent	NR	0	0	0	0	7
B.	**TOXIC SUBSTANCES**								
27.	Cadmium & its Compounds as Cd	mg/l	0.003	NR	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
28.	Arsenic & its Compounds as As	mg/l	0.01	0.05	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
29.	Lead & its Compounds as Pb	mg/l	0.05	NR	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
30.	Chromium & its Compounds as Cr	mg/l	0.01	NR	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
31.	Selenium & its Compounds as Se	mg/l	0.01	NR	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
32.	Mercury as Hg	mg/l	0.001	NR	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005

Note: CL- Colorless; UO- unobjectionable; AG- agreeable; NR- no relaxation; BDL- below detectable limit; MPN- most probable number; NR- not determined

TABLE – 2.12: GROUND & SURFACE WATER QUALITY REPORT

Date of Sampling	19.09.2019

Sr. No.	Parameters	Unit	As per IS 10500:2012		Values				
			Desirable	Permissible	GW-1	GW-2	GW-3	GW-4	SW-1
A.	**ITEMS RELATING TO PRESERVATION OF LIVING ENVIRONMENT**								
1.	Colour	Hazen	5	15	CL	CL	CL	CL	CL
2.	Odour	UO	AG	AG	AG	AG	AG	AG	AG
3.	Taste	AG	AG	AG	AG	AG	AG	AG	ND
4.	Turbidity	NTU	1	5	< 1.0	< 1.0	< 1.0	< 1.0	4.3
5.	Total Dissolved Solids	mg/l	500	2000	526	530	542	494	392
6.	pH at 25 ^{0}C	-	6.5 – 8.5	NR	7.24	7.11	7.23	7.21	7.82
7.	Dissolved Oxygen (DO)	mg/l	-	-	3.6	3.8	3.9	3.6	7.1
8.	Biochemical Oxygen Demand (BOD) 3 days 27 ^{0}C	mg/l	-	-	<3.0	<3.0	<3.0	<3.0	<3.0
9.	Chemical Oxygen Demand (COD)	mg/l	-	-	8	12	8	8	20
10.	Conductivity	S/cm	-	-	822	826	844	782	626
11.	Total Alkalinity as $CaCO_3$	mg/l	200	600	194	208	196	184	162
12.	Total Hardness as $CaCO_3$	mg/l	200	600	188	198	204	192	154
13.	Calcium as Ca^{++}	mg/l	75	200	48.9	51.5	53.0	49.9	40.0
14.	Magnesium as Mg^{++}	mg/l	30	100	15.8	16.6	17.1	16.1	12.9
15.	Chlorides as Cl	mg/l	250	1000	81	68	71	64	56
16.	Sulphates as SO_4	mg/l	200	400	51.4	49.5	64.7	52.3	21.8

Table contd…

Table contd…

Sr. No.	Parameters	Unit	As per IS 10500:2012		Values				
			Desirable	Permissible	GW-1	GW-2	GW-3	GW-4	SW-1
17.	Fluoride as F	mg/l	1.0	1.5	0.49	0.62	0.51	0.59	0.11
18.	Nitrates as NO_3	mg/l	45	NR	4.3	6.8	7.5	8.1	3.2
19.	Iron as Fe	mg/l	0.3	NR	0.14	0.21	0.22	0.18	0.04
20.	Manganese as Mn	mg/l	0.1	0.3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
21.	Zinc as Zn	mg/l	5.0	15.0	BDL	BDL	BDL	BDL	BDL
22.	Copper as Cu	mg/l	0.05	1.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
23.	Aluminium as Al	mg/l	0.03	0.2	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
24.	Boron as B	mg/l	0.5	1.0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
25.	Total Coliform	MPN/100 ml	Absent	NR	0	0	0	0	140
26.	E. Coli	MPN/100 ml	Absent	NR	0	0	0	0	21
B.	**TOXIC SUBSTANCES**								
27.	Cadmium & its Compounds as Cd	mg/l	0.003	NR	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
28.	Arsenic & its Compounds as As	mg/l	0.01	0.05	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
29.	Lead & its Compounds as Pb	mg/l	0.05	NR	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
30.	Chromium & its Compounds as Cr	mg/l	0.01	NR	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
31.	Selenium & its Compounds as Se	mg/l	0.01	NR	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
32.	Mercury as Hg	mg/l	0.001	NR	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005

Note: CL- Colorless; UO- unobjectionable; AG- agreeable; NR- no relaxation; BDL- below detectable limit; MPN- most probable number; NR- not determined

2.5.4 RESULTS AND DISCUSSION

The results of ground & surface water quality are discussed as per findings and its significance over environment and human being.

Overall quality of water samples are showing the water sources of the area are not polluted except the surface water samples getting contamination from surface run-off or domestic uses. The coliforms values are exception otherwise all the water samples are indicating its characteristics within limit as given in relevant Indian Standards.

Zero discharge condition of waste water from plant site makes the entire area free from water pollution. Overall quality of water samples also presents that the water sources of the area are not polluted.

SOIL QUALITY

GENERAL

Soil samples were collected from inside & near by location of plant site, so that any adverse impact may be identified.

LOCATIONS OF SOIL MONITORING

Total two soil samples were collected from plant site and village side. Sampling locations have described in **Table – 2.13**.

TABLE – 2.13: DETAILS OF SAMPLING STATIONS OF SOIL ANALYSIS

Sr. No.	Sampling Stations	Station Code	Approx. Distance from plant site	Direction from plant site
1.	Plant Site; (Barren Land)	S - 1	Within	-
2.	Malpuri village; (Agriculture Land)	S - 3	1.0 km	E

OBSERVATIONS

The physico-chemical characteristics of soil sample for the period April-2019 to Septemebr-2019 have reported in **Table- 2.14** & **Table- 2.15**.

TABLE – 2.14: SOIL QUALITY REPORT

Date of Sampling	11.06.2019

Sr. No.	Parameters	Unit	S-1	S-2
A.	**Physical Properties**			
1.	Bulk Density	g/cc	1.33	1.24
2.	Particle Size Distribution	% Gravel	8.8	3.8
		% Sand	35.9	32.7
		% Silt	28.4	31.9
		% Clay	26.9	31.6

Table contd…

Table contd…

Sr. No.	Parameters	Unit	S-1	S-2
3.	Soil Texture	-	Clay Loam	Clay Loam
4.	Porosity	%	42.3	47.6
5.	Water Holding Capacity	%	34.7	38.2
B.	**Chemical Properties**			
1.	pH at 25 ^{0}C	-	7.06	6.85
2.	Electrical Conductivity	mmhos/cm	0.157	0.194
3.	Organic Carbon	%	0.45	0.78
4.	Cation Exchange Capacity	meq/100 gm	26.9	38.4
5.	Exchangeable Calcium as Ca^{++}	mg/kg	48.4	64.1
6.	Exchangeable Magnesium as Mg^{++}	mg/kg	16.2	22.6
7.	Chlorides as Cl	mg/kg	94.2	128.4
8.	Sulphate as SO_4	mg/kg	107.6	146.2
9.	Nitrogen as N	kg/ha	94.2	370.1
10.	Phosphorous as P_2O_5	kg/ha	68.8	119.5
11.	Potassium as K_2O	kg/ha	96.2	297.2

TABLE – 2.15: SOIL QUALITY REPORT

Date of Sampling	19.09.2019

Sr. No.	Parameters	Unit	S-1	S-2
A.	**Physical Properties**			
1.	Bulk Density	g/cc	1.31	1.2
2.	Particle Size Distribution	% Gravel	7.5	4.3
		% Sand	36.3	33.1
		% Silt	28.6	31.5
		% Clay	27.6	31.1

Table contd…

Table contd…

Sr. No.	Parameters	Unit	S-1	S-2
3.	Soil Texture	-	Clay Loam	Clay Loam
4.	Porosity	%	41.1	45.4
5.	Water Holding Capacity	%	33.5	36.8
B.	**Chemical Properties**			
1.	pH at 25 ^{0}C	-	6.97	6.72
2.	Electrical Conductivity	mmhos/cm	0.149	0.185
3.	Organic Carbon	%	0.42	0.71
4.	Cation Exchange Capacity	meq/100 gm	26.3	37.6
5.	Exchangeable Calcium as Ca^{++}	mg/kg	46.7	61.4
6.	Exchangeable Magnesium as Mg^{++}	mg/kg	15.4	22.1
7.	Chlorides as Cl	mg/kg	90.6	119.8
8.	Sulphate as SO_4	mg/kg	102.4	138.5
9.	Nitrogen as N	kg/ha	88.3	314.9
10.	Phosphorous as P_2O_5	kg/ha	62.7	108.3
11.	Potassium as K_2O	kg/ha	91.5	276.7

STANDARD SOIL CLASSIFICATION

Standard soil classification regarding agriculture, in view of its test parameters, is detailed below in **Table – 2.16**. The use of soil for agriculture or for other use may be decided on basis of soil characteristics.

TABLE – 2.16: STANDARD SOIL CLASSIFICATION

Sr. No.	Test Parameters	Classification	
1.	pH	< 4.50 extremely acidic 4.51-5.00 very strongly acidic 5.01-5.50 strongly acidic 5.51-6.00 moderately acidic 6.01-6.50 slightly acidic 6.51-7.30 neutral	7.31-7.80 slightly alkaline 7.81-8.50 moderately alkaline 8.51-9.0 strongly alkaline > 9.0 very strongly alkaline (* tolerable to crops)
2.	Salinity or Electrical Conductivity (mmhos/cm) (1mmhos/cm = 640 ppm)	upto 1.00 average 1.01-2.00 harmful to germination 2.01-3.00 harmful to crops > 3.00 sensitive to salts	
3.	Organic Carbon (%)	upto 0.30 very less 0.31-0.40 less 0.41-0.50 medium 0.51-0.80 on an average sufficient	0.81-1.00 sufficient > 1.0 more than sufficient
4.	Nitrogen (kg/ha)	upto 50 very less 51-100 less 101-150 good	151-300 better > 300 sufficient
5.	Phosphorous (kg/ha)	upto 15 very less 16-30 less 31-50 medium	51-65 on an average sufficient 65-80 sufficient > 80 more than sufficient
6.	Potassium (kg/ha)	0 very less 120-180 less 181-240 medium	241-300 average 301-360 better > 360 more than sufficient

RESULTS AND DISCUSSION

The observations of soil characteristics of both time samples have discussed parameter wise as under;

(a) The **bulk density** of soil samples are 1.33 & 1.24 and 1.31 & 1.20 g/cm^3 respectively.

(b) Soil samples have 7.06 & 6.85 and 6.97 & 6.72 **pH value** respectively. The pH value is indicating neutral to slightly alkaline in nature.

(c) Soil samples have **conductivity** 0.157 & 0.194 and 0.149 & 0.185 mmhos/cm respectively.

(d) Soil samples have **Organic Carbon** 0.45 & 0.78 and 0.42 & 0.71% respectively. This represents medium fertility of soils.

(e) Soil samples have sufficient concentration of **Available Nitrogen** as its values is 94.2 & 370.1 and 88.3 & 314.9 kg/ha respectively.

(f) Soil samples have also sufficient concentration of **Available Phosphorous** as its value is 68.8 & 119.5 and 62.7 & 108.3 kg/ha respectively.

(g) Soil samples have less concentration of **Available Potassium** as its value is 96.2 & 297.2 and 91.5 & 276.7 kg/ha respectively.

Characteristic of Agriculture land is representing good nutrients concentration and over-all soil quality is suitable for cultivation of climatic crops and has average fertility.

TREATED WASTEWATER QUALITY

GENERAL

There is no wastewater discharge outside the plant premises. All the wastewater quantity generated from plant operations is being treated effectively and reused for plantation or dust suppression within plant premises. Hence, the 'zero discharge' condition has been maintained.

LOCATION OF WASTEWATER QUALITY SAMPLING

The treated wastewater samples have been regularly collected & analyzed from Sewage Treatment plant and WHR recycled water with grab samples in every month for required parameters.

OBSERVATIONS

The monthly characteristics of Sewage Treatment plant and WHR recycled water samples for the period from April-2019 to Septemebr-2019, are presented below in **Table – 2.17** & **Table – 2.18** respectively.

TABLE – 2.17: STP WATER QUALITY REPORT

Sr. No.	Parameter	Unit	Standards as EPA-1986 (Schedule-VI)	Values					
				Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
1.	pH	-	5.5-9.0	7.64	7.68	7.76	7.52	7.47	7.45
2.	BOD	mg/l	30	5.0	6.0	6.0	5.0	5.0	4.0
3.	COD	mg/l	250	24	20	36	28	28	20
4.	TSS	mg/l	100	20	16	16	14	16	12
5.	N-Total	mg/l	100	6.9	7.4	8.8	7.1	5.5	5.9
6.	NH4- N	mg/l	50	2.8	2.5	2.8	2.4	1.8	2.1

TABLE – 2.18: WHR RECYCLED WATER QUALITY REPORT

Sr. No.	Parameter	Unit	Standards as EPA-1986 (Schedule-VI)	Values					
				Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
1.	pH	-	5.5-9.0	7.22	7.27	7.25	7.41	7.36	7.37
2.	BOD	mg/l	30	4.0	4.2	5.0	4.0	4.5	4.0
3.	COD	mg/l	250	32	44	28	32	36	28
4.	TSS	mg/l	100	12	10	14	10	10	8
5.	N-Total	mg/l	100	9.6	8.6	5.8	8.3	7.5	7.2
6.	NH4- N	mg/l	50	3.6	3.2	1.8	3.1	2.7	2.6

OBSERVATIONS

Treated Wastewater quality report represents that all the checked parameters are well within the limits prescribed for wastewater in Schedule-IV of the EPA standards.

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Annexure XVIII (B)

ENVIRONMENTAL STATUS REPORT

(Half-yearly Report for April-2019 to September-2019)

for

LIME STONE MINES (LEASE AREA)

of

M/s JK LAKSHMI CEMENT LIMITED

at

Village-Semaria, Ghikuria & Nandini-Kundini
Dist-Durg (C.G.)

Prepared By

MAHARASHTRA ENVIRO POWER LIMITED

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CHW-01, Mouza-Mandwa, MIDC Industrial Area
Butibori, Dist. Nagpur

APRIL-SEPTEMBER - 2019

TABLE OF CONTENTS

1.0 INTRODUCTION

This Summarized Environmental Baseline Data report represents the environmental status regarding Micro-meteorological Data, Ambient Air Quality, Noise Level (Day & Night), Water (Surface & Ground) Quality and Soil Quality in & around the **Lime Stone Mines** of **M/s JK Lakshmi Cement Limited** at village- Semaria, Ghikuria & Nandini-Kundini, Dist. Durg (C.G.).

This report has been prepared on basis of data collected during environmental monitoring & sample collection in & around the mine lease area for the period **April-2019 to September-2019**.

SUMMARIZED ENVIRONMENTAL BASELINE DATA FOR PERIOD APRIL-2019 TO SEPTEMBER-2019

Regular environmental monitoring in & around the mine lease area is carried out. **'Summarized Environmental Baseline Data'** for the period April-2019 to September-2019 is presented below.

MICRO-METEOROLOGICAL DATA

OBSERVATION

Micro-meteorological data regarding wind speed, wind direction, temperature, relative humidity, solar radiation, atmospheric pressure and rainfall collected from IMD station at Plant site of M/s JK Lakshmi Cement Limited on hourly/daily basis. Data is summarized for individual parameters for respective month and tabulated below in **Table– 2.1**. Respective graphical presentations are also stated for tabulated values.

TABLE – 2.1:
Micro-Meteorological Data for Period April-2019 to September-2019

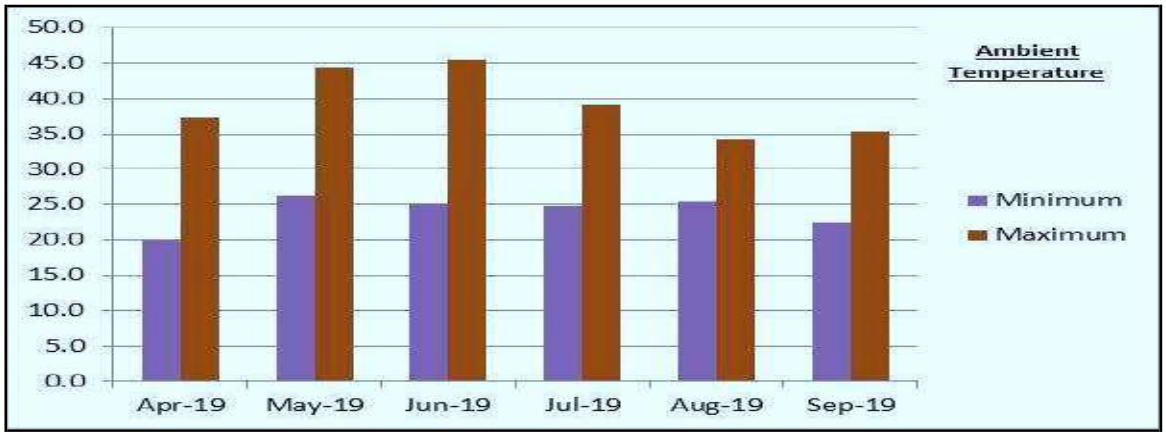
Sr. No.	Months	Minimum	Maximum
WIND SPEED (km/hr)			
1.	April - 2019	0.0	6.3
2.	May - 2019	0.0	6.9
3.	June - 2019	0.0	5.5
4.	July - 2019	0.0	14.2
5.	August - 2019	0.0	16.5
6.	September - 2019	0.0	9.9
AMBIENT TEMPERATURE (^{0}C)			
1.	April - 2019	19.9	37.3
2.	May - 2019	26.3	44.5
3.	June - 2019	25.2	45.6
4.	July - 2019	24.8	39.0
5.	August - 2019	25.5	34.2
6.	September - 2019	22.6	35.4

table contd…

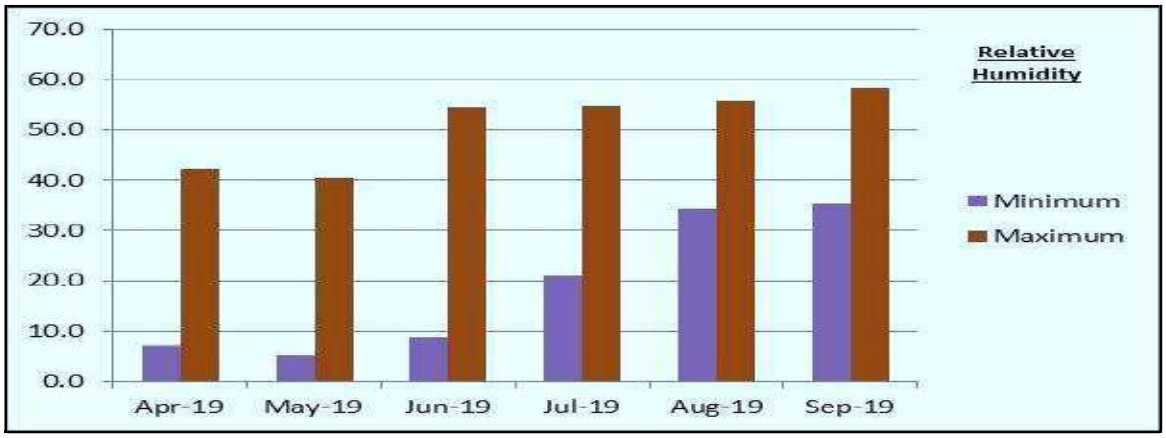
table contd…

RELATIVE HUMIDITY (%)			
1.	April - 2019	7.3	42.1
2.	May - 2019	5.4	40.4
3.	June - 2019	8.8	54.5
4.	July - 2019	21.1	54.6
5.	August - 2019	34.3	55.8
6.	September - 2019	35.2	58.4
ATMOSPHERIC PRESSURE (mm-Hg)			
1.	April - 2019	816.7	832.5
2.	May - 2019	810.0	833.9
3.	June - 2019	817.4	857.7
4.	July - 2019	835.7	860.4
5.	August - 2019	848.2	860.4
6.	September - 2019	852.8	864.0

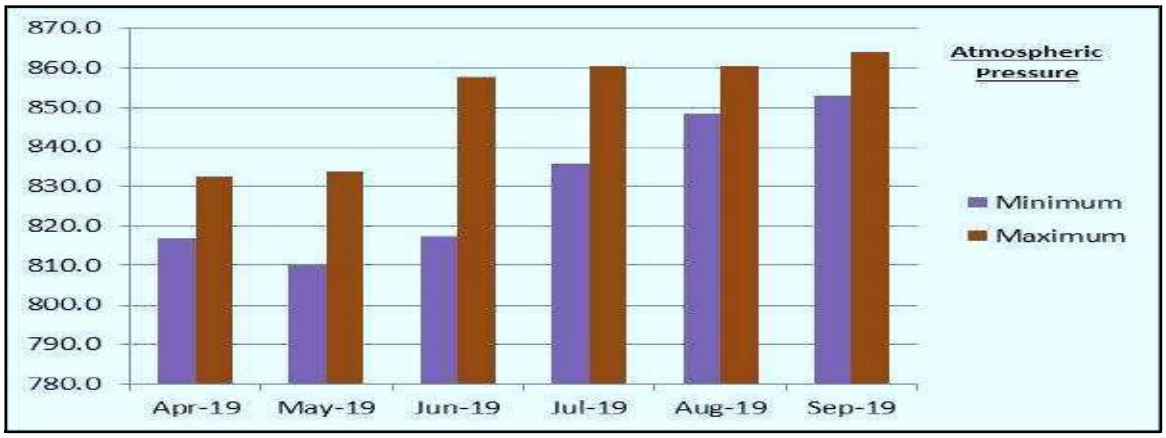
Graphical Presentation of Ambient Temperature



Graphical Presentation of Relative Humidity



Graphical Presentation of Atmospheric Pressure



RESULTS AND DISCUSSION

Total **rainfall** for the period April-2019 to September-2019 was 771.0 mm and out of which, 344.0 mm rainfall was found in month September-2019.

Mostly **wind** was found calm (<1.0 km/hr) and maximum time wind was predominated from East and E-SE direction during period April-2019 to September-2019. Maximum wind speed was observed in month of August-2019 and speed was 16.5 km/hr.

Ambient **temperature** was monitored on hourly basis for minimum & maximum during period April-2019 to September-2019. Observed minimum temperature was 19.9 ^{0}C in month April-2019 and maximum temperature was 45.6 ^{0}C in month June-2019.

Relative **humidity** was monitored on hourly basis for minimum & maximum during period April-2019 to September-2019. Observed minimum humidity was 5.4% in months May-2019 and maximum humidity was 58.4% also in month September-2019.

Atmospheric pressure was monitored on daily basis during period April-2019 to September-2019. Observed minimum atmospheric pressure was 810.0 mm-Hg in month May-2019 and maximum atmospheric pressure was 864.0 mm-Hg in months Spetember-2019.

AMBIENT AIR QUALITY (AAQ)

Monitored Ambient Air Quality values (parameter-wise) in & around the mine lease area for the period April-2019 to September-2019 are given below in **Table- 2.2** to **Table- 2.6**.

TABLE – 2.2: PM_{10} Particulate Matter (<10 µm)

Code	Stations	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	MIN	MAX	AVG	98 percentile
AAQ-1	Near Mine Office	58.3	56.7	51.2	50.2	55.6	57.1	50.2	58.3	54.8	58.2
AAQ-2	Lease Boundary towards North Direction	63.4	61.8	56.3	58.6	64.3	65.9	56.3	65.9	61.7	65.8
AAQ-3	Lease Boundary towards East Direction	62.5	59.2	57.4	63.1	65.1	68.8	57.4	68.8	62.7	68.4
AAQ-4	Lease Boundary towards South Direction	66.7	62.4	54.7	50.3	57.4	61.4	50.3	66.7	58.8	66.3
AAQ-5	Lease Boundary towards South -East	54.2	54.7	52.9	51.8	53.6	53.1	51.8	54.7	53.4	54.7

TABLE – 2.3: $PM_{2.5}$ Particulate Matter (<2.5 µm)

Code	Stations	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	MIN	MAX	AVG	98 percentile
AAQ-1	Near Mine Office	25.3	26.4	24.7	24.8	25.9	25.4	24.7	26.4	25.4	26.3
AAQ-2	Lease Boundary towards North Direction	32.1	29.7	25.2	33.4	30.9	27.5	25.2	33.4	29.8	33.3
AAQ-3	Lease Boundary towards East Direction	28.4	27.5	24.3	31.2	30.3	26.7	24.3	31.2	28.1	31.1
AAQ-4	Lease Boundary towards South Direction	33.7	26.3	26.5	31.0	24.2	24.4	24.2	33.7	27.7	33.4
AAQ-5	Lease Boundary towards South -East	25.4	23.6	24.5	24.9	23.1	24.0	23.1	25.4	24.3	25.3

TABLE – 2.4: Sulphur Dioxide (SO_2)

Code	Stations	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	MIN	MAX	AVG	98 percentile
AAQ-1	Near Mine Office	16.2	17.8	16.4	19.4	19.7	21.4	16.2	21.4	18.5	21.2

AAQ-2	Lease Boundary towards North Direction	18.4	16.7	17.2	21.3	20.0	19.4	16.7	21.3	18.8	21.2
AAQ-3	Lease Boundary towards East Direction	15.1	17.9	15.3	17.4	17.6	20.6	15.1	20.6	17.3	20.3
AAQ-4	Lease Boundary towards South Direction	16.7	19.1	18.6	20.0	22.3	22.9	16.7	22.9	19.9	22.9
AAQ-5	Lease Boundary towards South -East	19.4	16.3	16.7	19.0	16.4	16.0	16.0	19.4	17.3	19.4

TABLE – 2.5: Oxides of Nitrogen (NO_X)

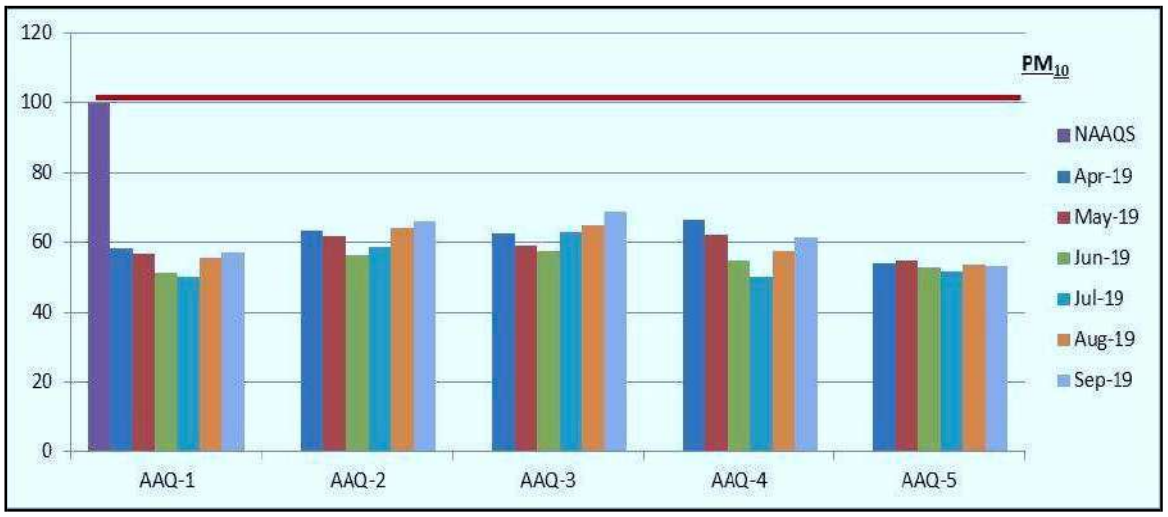
Code	Stations	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	MIN	MAX	AVG	98 percentile
AAQ-1	Near Mine Office	21.3	22.4	20.6	24.7	25.6	26.9	20.6	26.9	23.6	26.7
AAQ-2	Lease Boundary towards North Direction	18.4	21.4	21.5	24.9	21.3	24.8	18.4	24.9	22.1	24.9
AAQ-3	Lease Boundary towards East Direction	19.7	22.4	19.4	22.3	22.7	25.8	19.4	25.8	22.0	25.4
AAQ-4	Lease Boundary towards South Direction	17.5	18.1	20.3	24.4	21.0	21.7	17.5	24.4	20.5	24.1
AAQ-5	Lease Boundary towards South -East	19.1	18.8	18.6	18.2	18.7	18.4	18.2	19.1	18.6	19.1

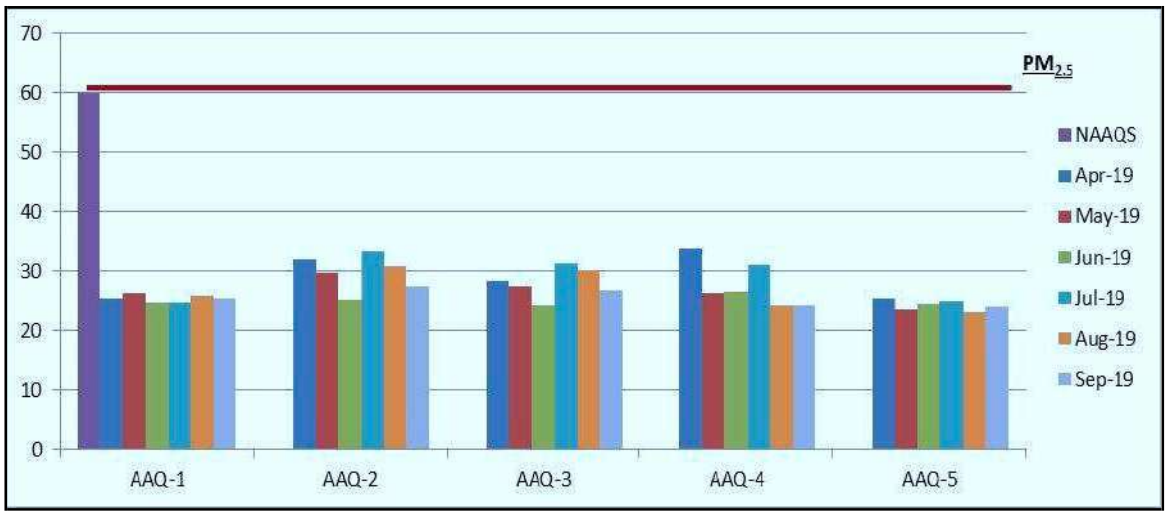
TABLE – 2.6: Carbon Monoxide (CO)

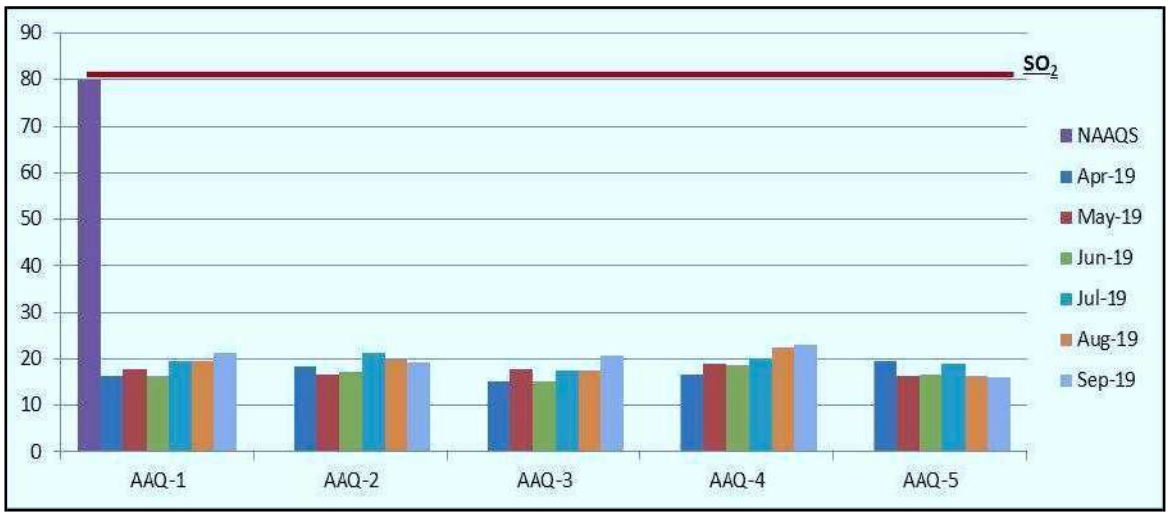
Code	Stations	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	MIN	MAX	AVG	98 percentile
AAQ-1	Near Mine Office	340	334	352	401	408	422	334	422	376	421
AAQ-2	Lease Boundary towards North Direction	356	362	396	420	413	459	356	459	401	455
AAQ-3	Lease Boundary towards East Direction	352	342	358	393	405	412	342	412	377	411
AAQ-4	Lease Boundary towards South Direction	340	338	346	406	408	415	338	415	376	414
AAQ-5	Lease Boundary towards South -East	348	352	374	345	341	367	341	374	355	373

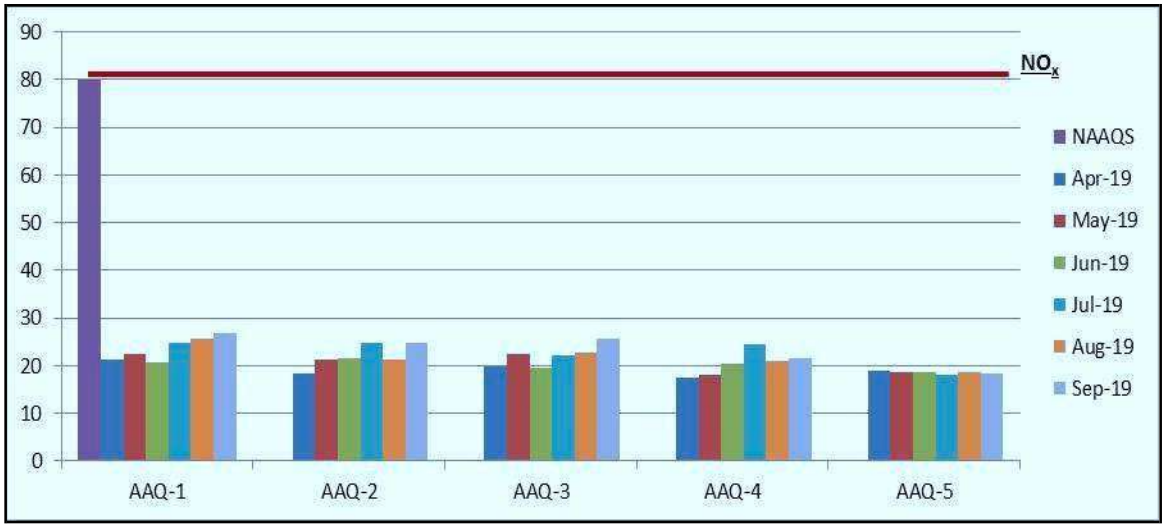
The graphical presentations (parameter-wise) of above observations are presented below in **Figure – 2.1**.

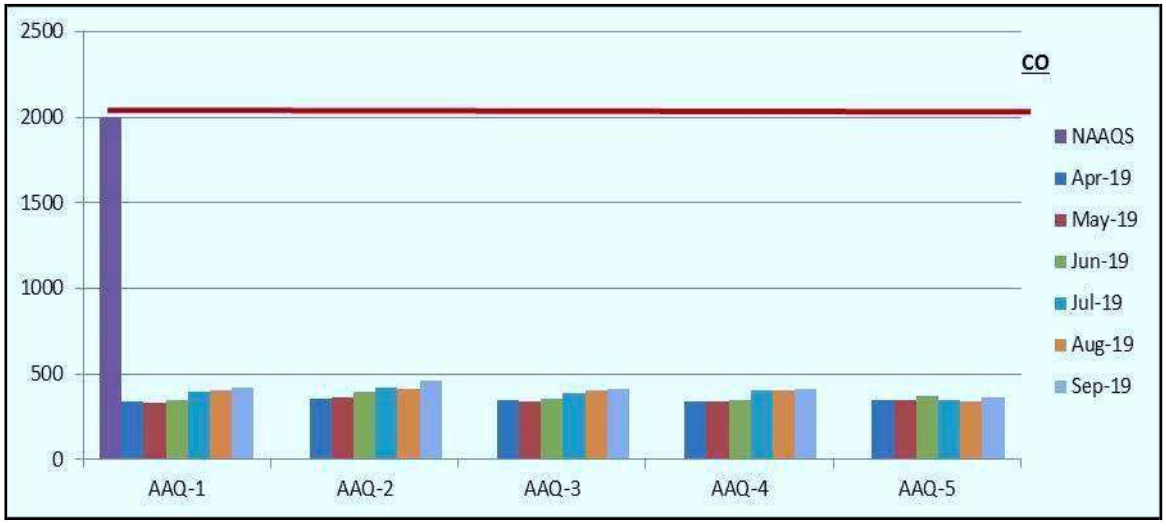
Figure – 2.1: GRAPHICAL PRESENTATION (Parameter-wise)











RESULTS & DISCUSSION

These monitored values represent quite satisfactory condition regarding Air Quality in & around the mine lease area in comparison of the National Ambient Air Quality standards (NAAQS).

NOISE LEVEL

Noise Levels in & around the mine lease area are monitored on regular basis in day & night hours separately. Summarized observed values of Noise Level for the period April-2019 to September-2019 are given below in **Table-2.7** & **Table-2.8**.

TABLE – 2.7: NOISE LEVEL (DAY HOURS)

Code	Stations	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	MIN	MAX	AVG
NL – 1	Near Mine Office	55.3	52.7	54.2	57.0	54.3	55.8	52.7	57.0	54.9
NL – 2	Lease Boundary towards North Direction	52.9	50.4	51.6	54.5	51.9	53.1	50.4	54.5	52.4
NL – 3	Lease Boundary towards East Direction	54.1	53.8	52.7	55.7	55.4	54.3	52.7	55.7	54.3
NL – 4	Lease Boundary towards South Direction	53.7	55.6	55.9	55.3	57.3	57.6	53.7	57.6	55.9
NL – 5	Lease Boundary towards South - East	55.3	52.4	53.6	57.0	54.0	55.2	52.4	57.0	54.6

TABLE – 2.8: NOISE LEVEL (NIGHT HOURS)

Code	Stations	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	MIN	MAX	AVG
NL – 1	Near Mine Office	44.7	47.2	46.8	46.0	48.6	48.2	44.7	48.6	46.9
NL – 2	Lease Boundary towards North Direction	46.9	45.2	44.2	48.3	46.6	45.5	44.2	48.3	46.1
NL – 3	Lease Boundary towards East Direction	45.3	44.8	43.7	46.7	46.1	45.0	43.7	46.7	45.3
NL – 4	Lease Boundary towards South Direction	46.1	47.1	44.2	47.5	48.5	45.5	44.2	48.5	46.5
NL – 5	Lease Boundary towards South - East	43.7	42.8	41.5	45.0	44.1	42.7	41.5	45.0	43.3

RESULTS & DISCUSSION

In comparison of the prescribed National Ambient Noise Level Standards, the observed values of Noise level are well within stipulated limits prescribed for industrial/commercial/residential area. The monitored values represent quite satisfactory condition regarding Noise pollution in & around the mine lease area.

STACK EMISSIONS

Crusher stack is operational and monitoring was carried out for emissions. Stack attached to 800 TPH Crusher has been monitored for the period April-2019 to September-2019 for required parameters. Results are presented in **Table – 2.9**.

TABLE – 2.9: STACK EMISSION ANALYSIS REPORT

Particulars	Unit	Stack #1						Consent Status
		Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	-
Stack Attached with	-	800 TPH Crusher						-
Stack Height	Meter	32.0						-
Stack Diameter	Meter	1.5						-
Ambient Temperature	^{0}C	38.0	39.0	41.0	31.0	30.0	30.0	-
Flue Gas Temperature	^{0}C	49.0	49.0	49.0	47.0	45.0	44.0	-
Velocity	m/s	7.2	7.4	7.2	6.8	7.1	6.8	-
Total Volumetric Flow	Nm^3/sec	11.3	11.6	11.1	10.7	11.2	10.4	-
Total Particulate Matter (TPM)	mg/Nm^3	27.9	28.5	27.4	25.4	24.7	24.1	< 50.0

RESULTS & DISCUSSION

The observations show that stack emissions are well within standards prescribed in the 'Consent for Operation'.

WATER (GROUND & SURFACE) QUALITY

GENERAL

A routine analysis of Water Quality is required to find out any contamination of natural water sources. The mine lease area is maintaining the **'Zero Discharge'** condition and Ponds are lined. There is no chance of ground water contamination. However, as per stipulated condition, surface water and ground water quality have monitored for routine parameters.

LOCATION OF WATER QUALITY SAMPLING

The water quality monitoring was selected with a view to check out the impact on ground water sources in and around mine lease area. Total 04 (four) number, 03 (three) ground water sample and 01 (one) surface water sample from Shivnath river flowing near the mine lease area, were collected and analyzed.

Location of sampling stations is given in **Table – 2.10**.

Table – 2.10: Description of Ground & Surface Water Sampling Stations

Sr. No.	Sampling Stations	Station Code	Approx. Distance from Mine Lease	Direction from Mine Lease
1.	Bore well within mine lease area	GW – 1	Within	-
2.	Bore well in Hardi village	GW – 2	1.0 km	E
3.	Bore well in Pitora village	GW – 3	1.5 km	N
4.	Shivnath river	SW – 1	5.0 km	NW

2.4.3 OBSERVATIONS

The characteristics of ground water samples and surface water sample for the period April-2019 to September-2019, are presented below in **Table – 2.11** & **Table – 2.12**.

TABLE – 2.11: GROUND & SURFACE WATER QUALITY REPORT

Date of Sampling	12.06.2019

Sr. No.	Parameters	Unit	As per IS 10500:2012		Values			
			Desirable	Permissible	GW-1	GW-2	GW-3	SW-1
A.	**ITEMS RELATING TO PRESERVATION OF LIVING ENVIRONMENT**							
1.	Colour	Hazen	5	15	CL	CL	CL	CL
2.	Odour	UO	AG	AG	AG	AG	AG	AG
3.	Taste	AG	AG	AG	AG	AG	AG	ND
4.	Turbidity	NTU	1	5	< 1.0	< 1.0	< 1.0	1.7
5.	Total Dissolved Solids	mg/l	500	2000	642	522	508	444
6.	pH at 25 ^{0}C	-	6.5 – 8.5	NR	7.26	7.28	7.34	7.94
7.	Dissolved Oxygen (DO)	mg/l	-	-	3.8	3.6	3.8	7.3
8.	Biochemical Oxygen Demand (BOD) 3 days 27 ^{0}C	mg/l	-	-	<3.0	<3.0	<3.0	<3.0
9.	Chemical Oxygen Demand (COD)	mg/l	-	-	12	8	8	16
10.	Conductivity	S/cm	-	-	958	790	770	705
11.	Total Alkalinity as $CaCO_3$	mg/l	200	600	168	192	186	180
12.	Total Hardness as $CaCO_3$	mg/l	200	600	234	228	216	172
13.	Calcium as Ca^{++}	mg/l	75	200	60.8	59.3	56.2	44.7
14.	Magnesium as Mg^{++}	mg/l	30	100	19.7	19.2	18.1	14.4
15.	Chlorides as Cl	mg/l	250	1000	196.2	74	76	64
16.	Sulphates as SO_4	mg/l	200	400	48.6	56.4	54.8	28.2

Table contd…

Table contd…

Sr. No.	Parameters	Unit	As per IS 10500:2012		Values			
			Desirable	Permissible	GW-1	GW-2	GW-3	SW-1
17.	Fluoride as F	mg/l	1.0	1.5	0.52	0.56	0.62	0.18
18.	Nitrates as NO_3	mg/l	45	NR	6.6	8.4	9.2	5.8
19.	Iron as Fe	mg/l	0.3	NR	0.08	0.22	0.16	0.07
20.	Manganese as Mn	mg/l	0.1	0.3	< 0.01	< 0.01	< 0.01	< 0.01
21.	Zinc as Zn	mg/l	5.0	15.0	BDL	BDL	BDL	BDL
22.	Copper as Cu	mg/l	0.05	1.5	< 0.01	< 0.01	< 0.01	< 0.01
23.	Aluminium as Al	mg/l	0.03	0.2	< 0.01	< 0.01	< 0.01	< 0.01
24.	Boron as B	mg/l	0.5	1.0	< 0.01	< 0.01	< 0.01	< 0.01
25.	Total Coliform	MPN/100 ml	Absent	NR	0	0	0	49
26.	E. Coli	MPN/100 ml	Absent	NR	0	0	0	7
B.	**TOXIC SUBSTANCES**							
27.	Cadmium & its Compounds as Cd	mg/l	0.003	NR	< 0.001	< 0.001	< 0.001	< 0.001
28.	Arsenic & its Compounds as As	mg/l	0.01	0.05	< 0.005	< 0.005	< 0.005	< 0.005
29.	Lead & its Compounds as Pb	mg/l	0.05	NR	< 0.005	< 0.005	< 0.005	< 0.005
30.	Chromium & its Compounds as Cr	mg/l	0.01	NR	< 0.001	< 0.001	< 0.001	< 0.001
31.	Selenium & its Compounds as Se	mg/l	0.01	NR	< 0.005	< 0.005	< 0.005	< 0.005
32.	Mercury as Hg	mg/l	0.001	NR	< 0.0005	< 0.0005	< 0.0005	< 0.0005

Note: CL – Colorless; UO – unobjectionable; AG – agreeable; NR – no relaxation; BDL – below detectable limit; MPN – most probable number

TABLE – 2.12: GROUND & SURFACE WATER QUALITY REPORT

Date of Sampling	20.09.2019

Sr. No.	Parameters	Unit	As per IS 10500:2012		Values			
			Desirable	Permissible	GW-1	GW-2	GW-3	SW-1
A.	**ITEMS RELATING TO PRESERVATION OF LIVING ENVIRONMENT**							
1.	Colour	Hazen	5	15	CL	CL	CL	CL
2.	Odour	UO	AG	AG	AG	AG	AG	AG
3.	Taste	AG	AG	AG	AG	AG	AG	ND
4.	Turbidity	NTU	1	5	< 1.0	< 1.0	< 1.0	4.3
5.	Total Dissolved Solids	mg/l	500	2000	564	468	464	392
6.	pH $_{at\ 25\ ^0C}$	-	6.5 – 8.5	NR	7.12	7.15	7.14	7.82
7.	Dissolved Oxygen (DO)	mg/l	-	-	3.6	3.6	3.6	7.1
8.	Biochemical Oxygen Demand (BOD) 3 days 27 ^0C	mg/l	-	-	<3.0	<3.0	<3.0	<3.0
9.	Chemical Oxygen Demand (COD)	mg/l	-	-	8	8	8	20
10.	Conductivity	S/cm	-	-	842	708	706	626
11.	Total Alkalinity as $CaCO_3$	mg/l	200	600	146	168	170	162
12.	Total Hardness as $CaCO_3$	mg/l	200	600	208	212	204	154
13.	Calcium as Ca^{++}	mg/l	75	200	54.1	55.1	53.0	40.0
14.	Magnesium as Mg^{++}	mg/l	30	100	17.5	17.8	17.1	12.9
15.	Chlorides as Cl	mg/l	250	1000	173	66	69	56
16.	Sulphates as SO_4	mg/l	200	400	41.4	49.7	48.2	21.8

Table contd…

Table contd…

Sr. No.	Parameters	Unit	As per IS 10500:2012		Values			
			Desirable	Permissible	GW-1	GW-2	GW-3	SW-1
17.	Fluoride as F	mg/l	1.0	1.5	0.45	0.48	0.54	0.11
18.	Nitrates as NO_3	mg/l	45	NR	4.1	5.7	6.4	3.2
19.	Iron as Fe	mg/l	0.3	NR	0.05	0.17	0.13	0.04
20.	Manganese as Mn	mg/l	0.1	0.3	< 0.01	< 0.01	< 0.01	< 0.01
21.	Zinc as Zn	mg/l	5.0	15.0	BDL	BDL	BDL	BDL
22.	Copper as Cu	mg/l	0.05	1.5	< 0.01	< 0.01	< 0.01	< 0.01
23.	Aluminium as Al	mg/l	0.03	0.2	< 0.01	< 0.01	< 0.01	< 0.01
24.	Boron as B	mg/l	0.5	1.0	< 0.01	< 0.01	< 0.01	< 0.01
25.	Total Coliform	MPN/100 ml	Absent	NR	0	0	0	140
26.	E. Coli	MPN/100 ml	Absent	NR	0	0	0	21
B.	**TOXIC SUBSTANCES**							
27.	Cadmium & its Compounds as Cd	mg/l	0.003	NR	< 0.005	< 0.005	< 0.005	< 0.005
28.	Arsenic & its Compounds as As	mg/l	0.01	0.05	< 0.005	< 0.005	< 0.005	< 0.005
29.	Lead & its Compounds as Pb	mg/l	0.05	NR	< 0.001	< 0.001	< 0.001	< 0.001
30.	Chromium & its Compounds as Cr	mg/l	0.01	NR	< 0.01	< 0.01	< 0.01	< 0.01
31.	Selenium & its Compounds as Se	mg/l	0.01	NR	< 0.005	< 0.005	< 0.005	< 0.005
32.	Mercury as Hg	mg/l	0.001	NR	< 0.001	< 0.001	< 0.001	< 0.001

Note: CL – Colorless; UO – unobjectionable; AG – agreeable; NR – no relaxation; BDL – below detectable limit; MPN – most probable number

2.5.4 RESULTS AND DISCUSSION

The results of ground & surface water quality are discussed as per findings and its significance over environment and human being.

Overall quality of water samples are showing the water sources of the area are not polluted except the surface water samples getting contamination from surface run-off or domestic uses. The coliforms values are exception otherwise all the water samples are indicating its characteristics within limit as given in relevant Indian Standards.

Zero discharge condition of waste water from mine lease area makes the entire area free from water pollution. Overall quality of water samples also presents that the water sources of the area are not polluted.

SOIL QUALITY

GENERAL

Soil samples were collected at near by location of mine lease area, so that any adverse impact may be identified.

LOCATION OF SOIL MONITORING

Total three soil samples were collected from lease area and village side. Sampling locations have described in **Table – 2.13**.

TABLE –2.13: DETAILS OF SAMPLING STATIONS OF SOIL ANALYSIS

Sr. No.	Sampling Stations	Station Code	Approx. Distance from Mine Lease	Direction from Mine Lease
1.	Mine Lease Area; (Barren Land)	S - 1	Within	-
2.	Pitora village; (Barren Land)	S - 2	1.5 km	SE
3.	Hardi village; (Agriculture Land)	S - 3	1.0 km	N

OBSERVATIONS

The physico-chemical characteristics of soil sample for the period April-2019 to September-2019 have reported in **Table– 2.14** & **Table– 2.15**.

TABLE – 2.14: SOIL QUALITY REPORT

Date of Sampling	12.06.2019

Sr. No.	Parameters	Unit	S-1	S-2	S-3
A.	**Physical Properties**				
1.	Bulk Density	g/cc	1.35	1.34	1.24
2.	Particle Size Distribution	% Gravel	9.8	10.2	3.9
		% Sand	37.3	36.9	34.6
		% Silt	29.5	30.4	33.2
		% Clay	23.4	22.5	28.3

Table contd…

Table contd…

Sr. No.	Parameters	Unit	S-1	S-2	S-3
3.	Soil Texture	-	Clay Loam	Clay Loam	Clay Loam
4.	Porosity	%	42.3	41.8	44.4
5.	Water Holding Capacity	%	34.5	33.1	36.7
B.	**Chemical Properties**				
1.	pH at 25 ^{0}C	-	7.19	7.22	6.89
2.	Electrical Conductivity	mmhos/cm	0.155	0.163	0.191
3.	Organic Carbon	%	0.42	0.44	0.84
4.	Cation Exchange Capacity	meq/100 gm	27.3	28.6	35.2
5.	Exchangeable Calcium as Ca^{++}	mg/kg	48.1	48.8	59.5
6.	Exchangeable Magnesium as Mg^{++}	mg/kg	11.7	13.1	20.2
7.	Chlorides as Cl	mg/kg	91.7	89.8	90.6
8.	Sulphate as SO_4	mg/kg	93.6	88.6	110.4
9.	Nitrogen as N	kg/ha	82.8	87.5	395.2
10.	Phosphorous as P_2O_5	kg/ha	67.6	69.8	109.1
11.	Potassium as K_2O	kg/ha	84.8	85.4	289.7

TABLE – 2.15: SOIL QUALITY REPORT

Date of Sampling	20.09.2019

Sr. No.	Parameters	Unit	S-1	S-2	S-3
A.	**Physical Properties**				
1.	Bulk Density	g/cc	1.32	1.3	1.21
2.	Particle Size Distribution	% Gravel	8.3	9.6	4.5
		% Sand	36.6	36.1	34.2
		% Silt	29.7	30.2	32.8
		% Clay	25.4	24.1	28.5

Table contd…

Table contd…

Sr. No.	Parameters	Unit	S-1	S-2	S-3
3.	Soil Texture	-	Clay Loam	Clay Loam	Clay Loam
4.	Porosity	%	41.6	40.3	42.2
5.	Water Holding Capacity	%	33.2	32.4	34.9
B.	**Chemical Properties**				
1.	pH at 25 ^{0}C	-	7.07	7.09	6.65
2.	Electrical Conductivity	mmhos/cm	0.147	0.151	0.185
3.	Organic Carbon	%	0.39	0.41	0.77
4.	Cation Exchange Capacity	meq/100 gm	26.7	27.2	33.5
5.	Exchangeable Calcium as Ca^{++}	mg/kg	46.8	47.4	57.1
6.	Exchangeable Magnesium as Mg^{++}	mg/kg	11.2	12.5	18.8
7.	Chlorides as Cl	mg/kg	86.3	83.2	88.7
8.	Sulphate as SO_4	mg/kg	85.8	82.4	103.5
9.	Nitrogen as N	kg/ha	78.2	82.8	352.4
10.	Phosphorous as P_2O_5	kg/ha	63.1	62.5	102.8
11.	Potassium as K_2O	kg/ha	81.3	79.7	234.6

STANDARD SOIL CLASSIFICATION

Standard soil classification regarding agriculture, in view of its test parameters, is detailed below in **Table – 2.16**. The use of soil for agriculture or for other use may be decided on basis of soil characteristics.

TABLE – 2.16: STANDARD SOIL CLASSIFICATION

Sr. No.	Test Parameters	Classification	
1.	pH	< 4.50 extremely acidic 4.51-5.00 very strongly acidic 5.01-5.50 strongly acidic 5.51-6.00 moderately acidic 6.01-6.50 slightly acidic 6.51-7.30 neutral	7.31-7.80 slightly alkaline 7.81-8.50 moderately alkaline 8.51-9.0 strongly alkaline > 9.0 very strongly alkaline (* tolerable to crops)
2.	Salinity or Electrical Conductivity (mmhos/cm) (1mmhos/cm = 640 ppm)	upto 1.00 average 1.01-2.00 harmful to germination 2.01-3.00 harmful to crops > 3.00 sensitive to salts	
3.	Organic Carbon (%)	upto 0.30 very less 0.31-0.40 less 0.41-0.50 medium 0.51-0.80 on an average sufficient	0.81-1.00 sufficient > 1.0 more than sufficient
4.	Nitrogen (kg/ha)	upto 50 very less 51-100 less 101-150 good	151-300 better > 300 sufficient
5.	Phosphorous (kg/ha)	upto 15 very less 16-30 less 31-50 medium	51-65 on an average sufficient 65-80 sufficient > 80 more than sufficient
6.	Potassium (kg/ha)	0 very less 120-180 less 181-240 medium	241-300 average 301-360 better > 360 more than sufficient

RESULTS AND DISCUSSION

The observations of soil characteristics of both time samples have discussed parameter wise as under;

(a) The **bulk density** of all soil samples are 1.35, 1.34 & 1.24 and 1.32, 1.30 & 1.21 g/cm^3 respectively.

(b) All soil samples have 7.19, 7.22 & 6.89 and 7.07, 7.09 & 6.65 **pH value** respectively. The pH value is indicating neutral to slightly alkaline in nature.

(c) All soil samples have **conductivity** 0.155, 0.163 & 0.191 and 0.147, 0.151 & 0.185 mmhos/cm respectively.

(d) All soil samples have **Organic Carbon** 0.42, 0.44 & 0.84 and 0.39, 0.41 & 0.77% respectively. This represents medium fertility of soils.

(e) All soil samples have sufficient concentration of **Available Nitrogen** as its values are 82.8, 87.5 & 395.2 and 78.2, 82.8 & 352.4 kg/ha respectively.

(f) All soil samples have also sufficient concentration of **Available Phosphorous** as its values are 67.6, 69.8 & 109.1 and 63.1, 62.5 & 102.8 kg/ha respectively.

(g) All soil samples have less concentration of **Available Potassium** as its values are 84.8, 85.4 & 289.7 and 81.3, 79.7 & 234.6 kg/ha respectively.

Characteristic of barren & agriculture land is representing good nutrients concentration and over-all soil quality is suitable for cultivation of climatic crops and has average fertility.

---X--X--X---