

No. GMR/GCEL/MoEF & CC/2019-20/ 27

Dated: 02/07/2019

**The Additional Principal Chief Conservator of Forests,
Ministry of Environment, Forest & Climate Change,
Regional Office (West Central Zone),
Ground Floor, East Wing,
"New Secretary Building",
Civil Line, Nagpur - 440001**

Sub.: Six monthly compliance status report of environmental clearance for our 2 X 685 MW thermal power plant at Village-Raikheda, Block-Tilda, District - Raipur (C.G.)

Ref.: Environmental clearance (EC) letter no. J-13012/62/2008-IA.II (T) GOI, MOEF, dated 9th May, 2011 and its subsequent amendment vide letter dated 13/06/2013, 18/11/2014, 04/02/2015, 09/12/2015.

Dear Sir,

With reference to the above, we are submitting herewith six monthly environment clearance compliance status report for the period from December 2018 to May 2019 as enclosed herewith.

Hope you will find the same in order.

Yours faithfully,

For GMR Chhattisgarh Energy Limited

Authorized Signatory

Encl : As above



Page 1 of 2

- CC to :
1. The Zonal Officer,
Zonal Office CPCB (MoEF Govt. of India),
Sahkar Bhavan, North TT Nagar,
Infront of Rang Mahal,
Bhopal – 462016, Madhya Pradesh
 2. The Member Secretary,
Chhattisgarh Environment Conservation Board,
Chhattisgarh Housing Board Colony, Kabir Nagar,
Raipur- 492001, Chhattisgarh
 3. The Regional Officer,
Regional Office ,
Chhattisgarh Environment Conservation Board,
Tatibandh, Raipur- 492001, Chhattisgarh

Jeet

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Village – Raikheda, Gayatra and Chicholi, Block – Tilda, Distt – Raipur,
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Half yearly EC compliance Status of 1370 (2*685) MW Thermal Power Plant		
Environmental Clearance Letter No. and dated		J-13012/62/2008-IA.II (T), MoEF GOI 9 th May 2011 (amendments dated 13/06/13, 18/11/14, 04/02/15, 09/12/2015)
Date		02/07/2019
SN	Condition	Compliance Status
A - Specific Condition		
i	Vision document specifying prospective plan for the site shall be formulated and submitted to the Ministry within six months	Latest vision document specifying prospective plan for site has been submitted vide our letter no. GMR/CTPP/MOEF/2014-15/121 dated 28/11/2014.
ii	In case source of fuel supply now proposed to be run on imported coal from South Africa for running the power plant is proposed to be changed to domestic coal at a later stage, the project proponent shall apply for such a change in environmental clearance along with necessary documents as required under EIA notification, 2006 (and its amendments). In such a case the necessity for holding public hearing again or otherwise will be determined by the Ministry in consultation with the Expert Appraisal Committee (Thermal Power).	Amended EC has already been issued by MoEF &CC vide letter no. J-13012/62/2008-IA.II (T) dated 9 th December 2015.
iii	Provision for installation of FGD shall be provided for future use.	Complied, Space provision for FGD has been made.
iv	Stack of 275 m height shall be installed and provided with continuous online monitoring equipment for SO _x , NO _x and PM _{2.5} & PM ₁₀ . Exit velocity of flue gases shall not be less than 22 m/sec. Mercury emissions from stack may also	Stack Height is 275m. On-line continuous emission monitoring system (CEMS) has been installed with exit velocity of 25m/sec. Regular monitoring of mercury emission from

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	monitored on periodic basis.	stack is being conducted. The last Hg monitoring report is attached herewith as Annexure I
v	High Efficiency Electrostatic Precipitators (ESPs) shall be installed followed by installation of Bag Filter and it shall be ensured that particulate emission does not exceed 50 mg/Nm ³ .	High efficiency ESP is installed i.e. 99.95% ensuring emission level not to exceed 50 mg/Nm ³ . An amendment has been obtained from MoEF on this condition for installation of ESP alone. Letter to MOEF bearing No. J-13012/62/2008-IA.II (T) GOI, MOEF dated 13/06/2013 may please be referred in this regard. Copy of letter has already been submitted to your good office vide our letter no. GMR/CTPP/MOEF/2014-15/121 dated 28/11/2014.
vi	Adequate dust extraction system such as cyclones/ bag filters and water spray system in dusty areas such as in coal handling and ash handling points, transfer areas and other vulnerable dusty areas shall be provided.	Dust extraction system has been installed in coal crusher, AHP & coal bunker. Dust suppression system through dry fog method has been installed in coal conveyor transfer point & water spray system in coal yard has also been installed for dust suppression.
vii	Sulphur and ash contents in the coal to be used in the project shall not exceed 0.5 % and 34 % respectively at any given time. In case of variation of coal quality at any point of time fresh reference shall be made to MOEF for suitable amendments to environmental clearance condition wherever necessary.	The stipulated conditions for sulphur & ash contents has been changed from 0.5 % and 34% to 0.7 % and 34% respectively as per the letter issued by MOEF vide no. No. J-13012/62/2008-IA.II (T) GOI, MOEF dated 13/06/2013. The same is being complied.
viii	Transport of coal to the plant site shall be strictly by rail. The project proponent shall therefore	Complied

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	immediately take up the matter with the Railways. Status of implementation shall be submitted to the Regional Office of the Ministry from time to time.	
ix	Existing de-generated water bodies (if any) within 5.0 Km of the site shall be regenerated at the project proponent's expenses in consultation with the state govt.	There is no existing de-generated water body within 5.0 Km of the site.
x	The proponent shall sponsor a detailed study regarding water availability in Mahanadi River for all competing sources such as drinking, agriculture, industrial, minimum flow of water in the river during the lean season etc. through institutions like IIT, Delhi/IIT, and Roorkee. The draft terms of reference shall be submitted within three months which shall be finalized by the Expert Appraisal Committee. The preliminary report on the above study shall be submitted within one year.	Complied. Draft TOR has been submitted vide our letter no. GMR/CTPP/2015-16/88, dated 08/07/2015.
xi	The project proponent shall undertake proactive water harvesting measures and water storage for a larger period not less than 30 days storage shall be developed. The rain water harvesting system shall be put in place before commissioning of the plant. Central Groundwater Authority/ Board shall be consulted for finalization of appropriate rainwater harvesting technology/design within a period of three months from the date of this clearance and details shall be furnished. The design of rain water harvesting shall comprise of rain water collection from the built up and open area in the plant premises. Action plan and road map for implementation shall be submitted to the Ministry within six months.	CGWA has been consulted for finalization of rainwater harvesting technology/design. CGWA has approved our proposed rain water harvesting design vide letter no. 21-4(118)/NCCR/CGWA/2011-1840 dated 14.12.2011. Copy of approval letter is already submitted to your good office vide our letter No. GMR/CTPP/MOEF/2012-13/269 dated 13/06/2012. Construction of rain water harvesting ponds completed.
xii	Hydrogeology in and around the project area shall be reviewed annually from an institute/	The report of the hydrogeology study which was conducted during pre- &

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	organization of repute to assess impact of surface water and ground regime (especially around ash dyke). In case and deterioration is observed specific mitigation measures shall be undertaken and reports/ data of water quality monitored regularly and maintained shall be submitted to the Regional Office of the Ministry.	post- monsoon period in the year 2018 is attached herewith as Annexure-II .
xiii	No ground water shall be extracted for use in operation of the power plant even in lean season.	Complied.
Xiv	No water bodies (including natural drainage system) in the area shall be disturbed due to activities associated with the setting up / operation of the power plant.	Complied.
Xv	Water requirement shall be optimized to around 32 MCM and shall accordingly adopt higher COC of at least not less than 5.0.	Being complied.
xvi	Minimum required environmental flow suggested by the Competent Authority of the State Govt. shall be maintained in the Channel/ Rivers (as applicable) even in lean season.	Being complied.
xvii	Regular monitoring of ground water level shall be carried out by establishing a network of existing wells and constructing new piezometers. Monitoring around the ash pond area shall be carried out particularly for heavy metals (Hg, Cr, As, Pb) and records maintained and submitted to the Regional Office of this Ministry. The data so obtained should be compared with the baseline data so as to ensure that the ground water quality is not adversely affected due to the project	Six nos. piezometers constructed around periphery of the plant and ash pond. Photograph of piezometers have been submitted to your good office vide our letter No. GMR/CTPP/MOEF/2012-13/269 dated 13/06/2012. Regularly monitoring of ground water level and quality is being done and monitored data being submitted to the MOEF/CPCB/CECB regularly.
xviii	Monitoring surface water quality in the region shall also be regularly conducted and records maintained. The monitored data shall be	Monitoring of surface water is being done. The monitored data being submitted to MOEF, CPCB & CECB

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	submitted to the Ministry regularly. Further, monitoring points shall be located between the plant and drainage in the direction of flow of ground water and records maintained. Monitoring for heavy metals in ground water shall be undertaken.	regularly.
Xix	Additional soil for levelling of the proposed site shall be generated within the sites (to the extent possible) so that natural drainage system of the area is protected and improved.	Complied.
Xx	The project proponent shall undertake measures and ensure that no fugitive fly ash emissions take place at any point of time.	Being complied.
xxi	Utilization of 100% Fly Ash generated shall be made from 4th year of operation. Status of implementation shall be reported to the Regional Office of the Ministry from time to time.	Generated fly ash is being supplied to nearest cement industry and brick manufacturer. Being complied as per Notification.
xxii	Fly ash shall be collected in dry form and storage facility (silos) shall be provided. Unutilized fly ash shall be disposed of in the ash pond in the form of slurry form. Mercury and other heavy metals (As, Hg, Cr, Pb etc.) will be monitored in the bottom ash as also in the effluents emanating from the existing ash pond. No ash shall be disposed off in low lying area.	As per the stipulation, fly ash is being collected in the dry form in our silo. No effluent is emanating from our existing ash pond. No ash is disposed of in the low lying area. Heavy metals are also monitored.
xxiii	Ash pond shall be lined with HDPE/LDPE lining or any other suitable impermeable media such that no leachate takes place at any point of time. Adequate safety measures shall also be implemented to protect the ash dyke from getting breached.	Complied.

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xxiv	For disposal of Bottom Ash in abandoned mines (if proposed to be undertaken) shall be done after obtaining due permission from DGMS and after ensuring that the bottom and sides of the mined out areas are adequately lined with clay before Bottom Ash is filled up. The project proponent shall inform the State Pollution Control Board well in advance before undertaking the activity.	Shall be complied as & when required.
xxv	Green Belt consisting of 3 tiers of plantations of native species around plant and at least 75 m width shall be raised. Tree density shall not less than 2500 per ha with survival rate not less than 80 %.	Being complied
xxvi	At least three nearest village shall be adopted and basic amenities like development of roads, drinking water supply, primary health centre, primary school etc. shall be developed in co-ordination with the district administration.	GMR Varalakshmi Foundation (CSR arm of GMR group) initiated community services in three project affected villages namely Raikheda, Chicholi & Gaitera in June, 2009 and expanded its reach to two new villages namely Sontara and Gaurkheda in June, 2012. One peripheral village “Murra” has been taken up from July, 2013. The outreach is expanded to other nearby villages namely Khamariya, Konari, Tulsi, Tarashiv, Bartori, Chatod and Samoda in year 2015. Annual report of CSR activities is enclosed as Annexure- III .
xxvii	The project proponent shall also adequately contribute in the development of the neighbouring villages. Special package with implementation schedule for providing potable drinking water supply in the nearby villages and schools shall be undertaken in a time bound manner.	Currently GMRVF is working in Four directly project affected villages and Nine indirectly affected and villages near railway siding namely Sontara, Gaurkheda, Khamariya, Konari Murra, Tulsi, Tarashiv, Bartori, Chatod located on western and northern boundary of the proposed plant. The development work in these villages is implemented in planned and time bound manner.

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xxviii	<p>A time bound implementation of the CSR shall be formulated within six months and submitted to the Ministry. While identifying CSR activities it shall be ensured that need based assessment for the nearby villages within study area shall be conducted to study economic measures with action plan which can help in upliftment of poor section of society. Income generating projects consistent with the traditional skills of the people shall be undertaken. Development of fodder farm, fruit bearing orchards, vocational training etc. can form a part of such programme. Company shall provide separate budget for community development activities and income generating programmes. Vocational training programme for possible self-employment and jobs shall be imparted to identify villagers free of cost.</p>	<p>CSR Plan for the villages is made as per local need and CSR activities are identified by Social work professionals employed exclusively for CSR through GMR Varalakshmi Foundation in consultation with communities and their representatives. Poorest of the poor families are identified basing village Panchayats statistics and special interventions have been planned for their upliftment. Separate budget has been allocated for community development activities, income generation activities. Vocational training is being provided to youth for self-employment free of cost. We have started Pratibha center for local youths. To increase access of youth to educational and employment opportunities through helping them become aware of and to prepare for these. To prepare youth to become self-reliant through education and employment opportunities at Pratibha centres.</p>
xxix	<p>An amount of Rs 33.16 Crores shall be earmarked as one time capital cost for CSR programme as committed by the project proponent. Subsequently a recurring expenditure of Rs 6.63 Crores per annum shall be earmarked as recurring expenditure for CSR activities. Details of the activities to be undertaken shall be submitted within six month along with road map for implementation.</p>	<p>Time bound implementation of CSR activities has been planned and same is being implemented in nearby project villages. Expenditure details are attached herewith as Annexure – IV.</p>
xxx	<p>It shall be ensured that in-built monitoring mechanism for the schemes identified is in place and annual social audit shall be got done from the nearest government institute of repute in the region. The project proponent shall also submit the status of implementation of the scheme from time to time</p>	<p>The social audits for year 2016-17 conducted by GPR strategies & solutions, Raipur and the same has been submitted vide our letter no. GMR/GCEL/MOEF & CC/18-19/16.</p>

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B - General Conditions		
i	The treated effluents conforming to the prescribed standards only shall be re-circulated and reused within the plant. Arrangements shall be made that effluents and storm water do not get mixed.	Complied.
ii	A sewage treatment plant shall be provided (as applicable) and the treated sewage shall be used for raising greenbelt/plantation.	Complied.
iii	Adequate safety measures shall be provided in the plant area to check/minimize spontaneous fires in coal yard, especially during summer season. Copy of these measures with full details along with location plant layout shall be submitted to the Ministry as well as to the Regional Office of the ministry.	Being complied. The drawing of the fire detection, protection & fighting system has been submitted vide our previous compliance letter No. GMR/CTPP/MOEF/2014-15/40, dated 25/06/2014.
iv	Storage facilities for auxiliary liquid fuel such as LDO and/ HFO/LSHS shall be made in the plant area in consultation with Department of Explosives, Nagpur. Sulphur content in the liquid fuel will not exceed 0.5%. Disaster Management Plan shall be prepared to meet any eventuality in case of an accident taking place due to storage of oil.	Complied. A copy of approval for storage facilities for auxiliary liquid fuel such as LDO and/ HFO/LSHS obtained from Department of Explosives, Nagpur has been submitted. Disaster Management Plan also is in place.
v	First Aid and sanitation arrangements shall be made for the drivers and other contract workers during construction phase.	Now our construction phase is over, however it was being complied with during construction.
vi	Noise levels emanating for turbines shall be so controlled such that the noise in the work zone shall be limited to 85 dBA from the source. For people working in the high noise area, requisite personal protective equipment like ear plugs/ear muffs etc. shall be provided. Workers engaged in noisy areas such as turbine area, air compressors	Engineering control for noise such as acoustic enclosure, silencer have been installed in the turbine. Moreover also ear plug, muff etc. is provided to workers in high noise area. Noise level monitoring report is being

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	etc. shall be periodically examined to maintain audiometric record and for treatment for any hearing loss including shifting to non-noisy/less noisy areas.	submitted to your good office regularly.
vii	Regular monitoring of ambient air ground level concentration of SO ₂ , NO _x , PM _{2.5} & PM ₁₀ and Hg shall be carried out in the impact zone and records maintained. If at any stage these levels are found to exceed the prescribed limits, necessary control measures shall be provided immediately. The location of the monitoring stations and frequency of monitoring shall be decided in consultation with SPCB. Periodic reports shall be submitted to the Regional Office of this Ministry. The data shall also be put on the website of the company.	Being complied.
viii	Provision shall be made for the housing of construction labor (as applicable) within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after completion of the project.	Complied
ix	The project proponent shall advertise in at least two local newspapers widely circulated in the region around the project. one of which shall be in the vernacular language of the Quality concerned within seven days from the date of this clearance letter, informing that the project has been accorded environmental clearance an copies of clearance letter are available with the State Pollution Control Board/Committee and may also be seen at Website of the Ministry of environment and Forests at http://envfor.nic.in	Complied.
x	A copy of the clearance letter shall be sent by the	Complied.

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	proponent to concerned Panchayat, Zilla Parisad/ Municipal Corporation, urban local Body and the Local NGO, if any, from whom suggestions/representations. If any, receive while processing the proposal. The clearance letter shall also be put on the website of the Company by the proponent.	
xi	An Environmental Cell comprising of at least one expert in environmental science / engineering, occupational health and social scientist, shall be created at the project site itself and shall be headed by an officer of appropriate superiority and qualification it shall be ensured that the Head the Cell shall directly report to the head of the organization and he shall be held responsible for implementation of environmental regulations and social impact improvement/mitigation measures.	Complied.
xii	The proponent shall upload the status of compliance of the stipulated environmental clearance conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MOEF, the respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely SPM, RSPM (PM2.5 & PM10), SO2, NOX (ambient levels as well as stack emissions) shall display at a convenient location near the main gate of the company in the public domain.	Being complied. The previous compliance status report can be viewed at following web-link http://www.gmrgroup.in/Energy/GMR_Chhattisgarh_Power_Project.html Display board has also been installed at main gate.
xiii	The environment statement for each financial year ending 31 March in Form- V as is mandated to be submitted by the project proponent to the concerned: State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with	Being complied. The Environmental Statement report can be viewed at following web-link http://www.gmrgroup.in/Energy/GM

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	the status of compliance of environmental clearance conditions and shall also be sent to the respective Regional Offices at the Ministry.	R Chhattisgarh Power Project.html
xiv	The project proponent shall submit six monthly reports on the status of the implementation of the stipulated environmental safeguards to the Ministry of environment and Forests, its Regional Office, Central Pollution Control Board and State Pollution Control board. The project proponent shall upload the status of compliance of the environment of the environmental clearance conditions on their website and update the same periodically and simultaneously send the same by e-mail to the Regional Office, Ministry of Environment and Forests.	Being complied. The previous compliance status report can be viewed at following web-link http://www.gmrgroup.in/Energy/GMR Chhattisgarh Power Project.html
xv	Regional Office of the Ministry of Environment, forest and climate change will monitor the implementation of the stipulated conditions. A complete set of documents including environmental impact Assessment Report and Environment Management Plan along with the additional, information submitted from time to time shall be forwarded to the regional office for their use during monitoring. Project proponent will upload the compliance status in their website and update the same from time to time at least six monthly basis Criteria pollutants levels including NOX (from stack & ambient air) shall be displayed at the main gate of the power plant.	Complied.

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xvi	Separate funds shall be allocated for implementation of environmental, protection measures along with item-wise break-up. These cost shall be included as part of the project cost. The funds earmarked for the environment protection measures shall not be diverted for other purposes and year-wise expenditure should be reported to the Ministry.	Complied.
xvii	The project authorities shall inform the Regional Office as well as the Ministry regarding the date of financial closure and final approval of the project by the concerned authorities and the date of start of land development work a commissioning of plant.	Financial Closure granted on 10 th Dec'10. The Project development started after receiving Consent to establish dated 13 th Jun'11.
xviii	Full cooperation shall be extended to the Scientists/Officers from the Ministry Regional Office of the Ministry at Bangalore / CPCB/ SPCB who would be monitoring the compliance of environmental status.	Agreed and complied.
Compliance status of EC amendment dated 16/06/2013 with respect to ash pond coordinate change and removal of bag filter in place of ESP along with bag filter		
xxxi	The GCV of the imported coal from south Africa shall not be less than 4911Kcal/kg and the ash and sulphur contents shall not exceed the limits stated under: Ash contents : 33.7% Sulphur Contents : 0.7%	Being complied as per latest norms.
xxxii	A long term study of radioactive and heavy metals contents on coal to be used shall be carried out through a reputed institute. Thereafter mechanism for an in-built continuous monitoring for radio activity and heavy metals in coal and fly ash (including bottom ash) shall be put in place.	Monitoring of radioactive and heavy metals of coal and bottom ash have been conducted and its values were not detectable.
xxxiii	Continuous monitoring for heavy metals in and around the ash pond area shall be carried out through reputed institutes like IIT, Kanpur and records/data maintained.	Complied

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Compliance Status of environmental clearance letter No. J-13012/62/2018-IA.II (T), MoEF GOI, dated 18/11/14 with respect to road transportation of coal.		
Sr. No. 2	Condition	Compliance Status
I	The coal transportation by road shall be through mechanically covered trucks to the extent feasible, else, shall be through tarpaulin covered trucks.	After completion of our railway line, coal is now being transported in rail.
Ii	Avenue plantation of 2/3 row all along the road shall be carried out by the project proponent at its own expenses in consultation with the State Government Authority.	Avenue plantation all along the road has already been done and there is no scope for further plantation.
Iii	Periodic maintenance of the road shall be done by the project proponent at its own expenses and shall facilitate the traffic control on the road in consultation with State Government Authorities.	Not applicable as the coal is now being transported by rail.
iv	The PP shall advertise in the newspaper and place on the website, the amendment issued by the Ministry for public information.	Complied.
Sr. No. 3	Other condition	
xxxiv	Harnessing solar power within the premises of the plant particularly at available rooftops shall be undertaken and status of the implementation shall be submitted periodically to the regional Office of the Ministry.	We have already started working on this. Solar power has been utilised for fencing of boundary wall.
xxxv	Greenbelt shall also be developed around the ash pond over and above the Green belt around the plant boundary.	Complied.
xxxvi	The project proponent shall formulate a well-laid corporate environment policy, identify and designate responsible officers at all levels of its hierarchy for ensuring adherence to the policy and compliance with the condition stipulated in this clearance letter and other applicable environmental laws and regulations.	Complied.

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Compliance status of the EC amendment letter dated 04/02/2015 with respect to usage of 50% e-auction domestic coal issued		
i	Sulphur and ash content in the coal to be used in the project shall not exceed 0.7% and 34% respectively for at any given time. In case of variation of coal quality at any point of time, fresh reference shall be made to the Ministry for suitable amendment to environmental clearance condition wherever necessary.	Being complied.
ii	The PP shall advertise in the local newspapers and place on the on the website, the proposed amendment for public information.	Complied.
Compliance Status of environmental clearance letter No. J-13012/62/2018-IA.II (T), MoEF GOI, dated 09/12/15 with respect to usage of 100% domestic coal.		
Sr. No. 2	Condition	Compliance Status
I	Sulphur and ash content of coal shall not exceed 0.7 % and 34 % respectively. In case of variation quality at any point of time, fresh reference shall be made to the ministry for consideration.	Being complied.
Ii	The PP shall advertise in the local leading newspaper and place on the website, the proposed amendment of EC (after receiving from ministry) for change in source of coal for public information.	Complied.

Annexure I

ANACON LABORATORIES PVT. LTD.

ISO 9001:2008, ISO 14001:2004, OHSAS 18001 Certified Organization,
 Recognized By Ministry of Environment & Forests (MoEF), New Delhi
 Accredited By Quality Council of India by NABET - Environment Impact Assessment Studies
 Authorised by Food Safety & Standards Authority of India Under FSS Act
 Approved by Bureau of Indian Standards (BIS)

Stack Emission Monitoring Report

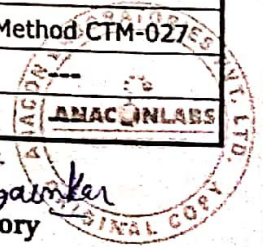
Report No.: AN/SE/GMR/2019-20/07		Date: 17.04.2019	
Name and Address of Company :		GMR CHHATTISGARH ENERGY LTD Village : Raikhada, Block Tilda, Raipur-493225 (C.G)	
Sample Description/Type	Stack Emission Monitoring	Sample Collected by	Anacon Representative
Sampling Location	Main Stack (S1)	Sample Quantity/ Packing	Thimble: 1 X 1 No. SO ₂ : 30 mL X 1 No. PVC Bottle NO _x : 25 mL X 1 No. PVC Bottle
Date of Sampling	10.04.2019	Date of Receipt of Sample	11.04.2019
Sampling Procedure	As per Method Reference		
Date of Start of Analysis	12.04.2019	Date of Completion of Analysis	13.04.2019

Stack Details			
Stack Identity		S-1	-
Stack height above ground level		275	Meter
Flue can diameter		7.0	Meter
Type of Fuel		Coal	-
Parameter	Unit	Result	Method Reference
Flue gas temperature	°C	125	IS:11255 (Part 3)
Flue gas Velocity	m/s	22.87	IS:11255 (Part 3)
Total gas quantity	Nm ³ /h	2373701.7	IS:11255 (Part 3)
Total Particulate Matter (PM)	mg/Nm ³	26.3	IS:11255 (Part 1)
Sulphur Dioxide (SO ₂)	mg/Nm ³	654	IS:11255 (Part 2)
Oxide of Nitrogen (NO _x)	mg/Nm ³	225.6	IS:11255 (Part 7)
Mercury (Hg)	mg/Nm ³	0.002	USEPA-0060
O ₂ (%)	%	9.8	Gas Analyser
CO ₂ (%)	%	8.5	Gas Analyser
CO (%)	%	306	Gas Analyser
H ₂ S	mg/Nm ³	0.008	EPA Method-15
AMMONIA (NH ₃)	µg /m ³	ND	EPA Method-CTM-027
Water vapour (%)	%	8.2	
Carbon (C %)	%	3.8	

• ND-Not Detected.

Head Office: EQ Building, Pithu Nagar, Nagpur - 440033 India. Ph. No. (0712) 2242077, 9372404924, Email : ngp@anacon.in
 Lab : FP-34-35, Food Park, Food Star Estate, MIDC Butibori, Nagpur - 441122. Mob. No. 9373287475, Email : labngp@anacon.in
 Sulphur Dioxide (SO₂) (9373287475), Accounts Division (9326960081, 9372960079), Administration (9372860078, 9975947666) Email : info@anacon.in. You may also visit us at www.anaconlaboratories.com
 Branches : Maharashtra | Chhattisgarh | Madhya Pradesh | Jharkhand | Delhi

Authorized Signatory



Annexure II



**REPORT ON HYDROGEOLOGICAL STUDY
OF**

**GMR CHHATTISGARH ENERGY LIMITED
VILLAGE - RAIKHEDA, BLOCK - TILDA, DISTRICT-RAIPUR
CHHATTISGARH**



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HYDROGEOLOGICAL REPORT ON GMR CHHATTISGARH ENERGY LTD.VILLAGE -RAIKHEDA, BLOCK- TILDA, DIST. - RAIPUR

1) INTRODUCTION:

M/S. GMR CHHATTISGARH ENERGY LTD. Vill.-Raikheda,Block- Tilda,District-Raipur has established a Thermal Power Unit of 2x 685 MW. The hydro-geological study of the area is to be conducted to comply with one of the conditions of the environmental clearance issued to the above company. The study was conducted in the power plant area as well as the buffer zone of 10 km, around the plant site taking the plant as center.

The scope of work is as under.

1. Hydrogeological study in and around the project area
2. Monitoring Hg and other heavy metal in surface and ground water near and around ash pond
3. Monitoring of Hg and other heavy metals near and around ash pond

Accordingly, GMR CHHATTISGARH ENERGY LTD has engaged us for the above assignment as per the order of GMR CHHATTISGARH ENERGY LTD vide Service order no.4800128934 dt.16.5.2016

2) LOCATION:

Proposed project is located near a village - Raikheda in Tilda block of Raipur district. It is within the N 21°20'35"E; 21°32'28. to 81°14'13"E, 81°56'30"N and is covered in parts of Survey of India Topo-sheet no. G/14; & G/15 (Fig.1)

The site is approachable in all seasons by pucca roads from all directions. The Mumbai-Howrah railway route passes through adjacent to the area. All infrastructure facilities like Electricity, Post-Office, Rest House, Railway Station and bus stand etc. are available near the site.

3) PHYSIOGRAPHY AND DRAINAGE:

The area is having a gentle southwesterly slope.

Mahanadi River, a major river flows west to east direction and is about 15 km. due north direction from the plant area.

The buffer area is at the top of the study area. The small nalas are flowing in all direction which are meeting to big nalas and ultimately to Mahanadi. The watersheds will show the direction of drainage is. The watersheds are the divide line of the drainages existing. The nalas generating nearly from the buffer zone area. All the drainages flow in to Mahanadi River, outside Of buffer zone. The general altitude of the area is minimum 200 m to maximum 220m above mean sea level. The northern portion is elevated than the southern. The average fall of 20 mts is located that means there is also a gentle slop.

The area is drained mainly by Sheonath River and its tributaries especially by Kharun, Kulhan, Jamunia River and Deorani -Jethani nala. Sheonath River flows south to north while Jamunia flows south to north in northern part of the study area. Devrani-Jethani nala flows westerly in western part of the study area & Kulhan flows south-westerly in south-western part of the study area. Thus the proposed area is in the interfluves zone of all these tributaries. Sheonath River is a perennial river while rest of the tributaries is ephemeral in nature. This tributary system comes under Mahanadi basin. The drainage pattern in the area is sub-parallel and dendrite in nature with medium drainage density indicating the formations in the area are moderately porous & permeable in nature and are having moderate surface run-off. The drainage density is more or less same in the study area. The drainage map of the study area is presented in Fig 3..

4) HYDROMETEROLOGY:

Rainfall– The rainfall in the area receives from the SW monsoon nearly for four months i.e. from June to September every year. The month wise rainfall data from 1988 to 2017 and of the four months of 2018 i.e. from January to April, is collected from Tilda rainfall station of Tilda taluka and average rainfall is 1118 mm .Which has been derived from the rainfall data as collected for 30 years. Total rainy days come to 55 to 60 days.

Temperature – The normal temperature in the area ranges from 30⁰C to 40⁰ C. The maximum temperature in summer months touches to 40⁰C to 45⁰C, while minimum temperature is 5⁰C to 7⁰C in December/January months. This data has been obtained from the IMD stations.

Soil – Soil In the study area two main soil categories are present namely Vertisols and Ultisols. The vertisols are occupies major area, however, the project area is underlain by Ultisols. The brief description of the soil types are as below .

Soil moisture: - In the study area, two types of verticals i.e. Medium black & deep black soils are exposed. Medium black soil is exposed in western & eastern part of the study area while deep black soil is exposed in extreme southern-eastern part in small patch. Vertical is a soil in which the content of clay size particles is 30% or more by mass in all horizons of the upper half-meter of the soil profile. They are characterized by a high content of expanding and shrinking clay known as montmorillonite. They may also be characterized by salinity and well defined layers of calcium carbonate or gypsum. Evidence of strong vertical mixing of the soil particles over many periods of wetting and drying can be observed in this type of soil. Vertisols typically form from highly basic rocks such as basalts and are found typically on level or mildly sloping topography in climatic zones that have distinct wet and dry seasons. Depending on the parent material and the climate, they can range from grey or red to the more familiar deep black. Vertisols contain high level of plant nutrients, but, owing to their high clay content, they are not

well suited to cultivation without painstaking management. Vertisols are especially suitable for rice because they are almost impermeable when saturated. Rainfed farming is very difficult because vertisols can be worked only under a very narrow range of moisture conditions as they become very hard when dry and become very sticky when wet.

There is only one category in this soil namely Lateritic soil is exposed in the study area in northern & eastern part. Ultisoil is the ultimate product of continuous weathering of minerals in a humid climate. This is a highly weathered and leached acid soil with high levels of clay below top layer. They are characterized by a humus-rich surface horizon and by a layer of clay that has migrated below the surface horizon. This soil has variety of clay minerals but in many cases the dominant mineral is Kaolinite. This clay has good bearing capacity and no shrink-swell property. They are red to yellow in color and are quite acidic having pH less than 5. The red and yellow color results from the accumulation of iron oxide which is highly insoluble in water. The soil distribution of the study area is given in Fig .

2.4 LAND

TABLE

Location	Soil type	Available water mm/ m	Root Zone	Available moisture retention
Tilda	Silt loam	200	1.00	200

The value 200 mm/m has been taken as available water capacity AWC for all climatic water balance calculation of the project.

Infiltration through Soil: - In the study area two main soil categories are present namely Vertisols and Ultisols. The vertisols are occupies major area, however, the project area is underlain by Ultisols. The brief description of the soil types is as below.

Vertisols: In the study area, two types of vertisols i.e. Medium black & deep black soils are exposed. Medium black soil is exposed in western & eastern part of the study

area while deep black soil is exposed in extreme southern-eastern part in small patch. Vertisol is a soil in which the content of clay size particles is 30% or more by mass in all horizons of the upper half-metre of the soil profile. They are characterized by a high content of expanding and shrinking clay known as montmorillonite. They may also be characterized by salinity and well defined layers of calcium carbonate or gypsum. Evidence of strong vertical mixing of the soil particles over many periods of wetting and drying can be observed in this type of soil. Vertisols typically form from highly basic rocks such as basalts and are found typically on level or mildly sloping topography in climatic zones that have distinct wet and dry seasons. Depending on the parent material and the climate, they can range from grey or red to the more familiar deep black. Vertisols contain high level of plant nutrients, but, owing to their high clay content, they are not well suited to cultivation without painstaking management. Vertisols are especially suitable for rice because they are almost impermeable when saturated. Rainfed farming is very difficult because vertisols can be worked only under a very narrow range of moisture conditions as they become very hard when dry and become very sticky when wet.

ULTISOLS: There is only one category in this soil namely Lateritic soil is exposed in the study area in northern & eastern part. Ultisoil is the ultimate product of continuous weathering of minerals in a humid climate. This is a highly weathered and leached acid soil with high levels of clay below top layer. They are characterized by a humus-rich surface horizon and by a layer of clay that has migrated below the surface horizon. This soil has variety of clay minerals but in many cases the dominant mineral is Kaolinite. This clay has good bearing capacity and no shrink-swell property. They are red to yellow in color and are quite acidic having pH less than 5. The red and yellow color results from the accumulation of iron oxide which is highly insoluble in water. TABLE

TABLE NO---1

Type of area	Type of soil	Site infiltration capacity mm/ m	Average infiltration capacity mm/ m
Pre-mining area A	Clayey	14	31.53
B	Sandy, clay, loam	37.17	31.53
C	Sandy clay loam	37.17	31.53
D	Sandy clay loam	37.17	31.53
B	Sandy loose loam	111.51	31.53

5) GEOLOGY:

In the area rocks of Raipur group of Chhattisgarh Super group of Proterozoic age are exposed. These rocks are of Chandi formation which are mainly represented by limestone and shale sequence. However, the generalized stratigraphic sequence of Raipur district is given in Table 5 below:

Regional Geology:

The complete area which is under belongs to Chandi group. This Chandi group falls under Raipur series. Most of the Raipur group series is having limestone and shales. The limestone is fracture up to 15 to 16 mts. followed by hard limestone. At places shales are notice the weathering formations were is from village to village. Weathering is mostly shelling and clayey. Hence less dug wells are notice in the area. Most of the places have bore wells penetrating the fractured limestone from were groundwater is available.

The complete area is having is only the limestone of Chandi group only.

Table-5 Generalized stratigraphic sequence of Raipur District, C.G.

Quaternary	Recent to sub-recent		Alluvium and Laterite	Sand ,clay ,silt and lateritic soil		
	Chattisgarh super group	Raipur group	Maniyari fm	Gypsiferous Shale		
			Hirri fm	Dolomitic limestone		
			Tarenga fm	Shale & Dolomite		
			Chandi fm	Limestone & Shale		
			Gunderdehi fm	Shale		
			Charmuria fm	Limestone & Shale		
		Chandrapur group	Kanspathar fm	Sandstone, Siltstone Shale & Conglomerate		
			Choparadih fm			
			Lohardi fm			
		Bilari group Sonakhan gr Baya grou	Intrusive, lakhadabri, Jonk & Chikhali	Quartz veins, basic dyke ,Meta basalt Schist & Gneisses		
		ARCHAEAN	Basement crystalline- Granite, gneisses ,granulites and Amphibolites			

Local geology of project and buffer block:

▲ The area is mostly covered by a soil mantle; the average thickness is from 1.5m to 3m. Clayey and loamy formed from shales or limestone is up to 18m to 22m depth followed by fractured and hard limestone.

TABLE – 2 DETAILS OF STRATIGRAPHIC UNITS IN BLOCK AREA

Formation	Lithology	Thickness range in meters
Soil Weathered	Black cotton soil	1.5 to 03
Limestone and shale	Clays and loamy formation	18 to 22
Fractured and compact limestone	Fractured and cavernous limestone	42 to 50
	Compact and hard limestone	Up to 100mts and beyond

5.1 Discussions of Geophysical Results:

Resistivity surveys were carried out in 09 places to know the sequence and probable thickness of the formation encountered beneath the project and villages occurring in the buffer zone.

The Geophysical surveys comprised of resistivity profiling and Vertical Electrical Soundings (VES) were carried out to cover the entire area of GMR project and buffer zone at Raikheda Village, in Raipur district, C.G. To get the desired information about the prevailing aquifer conditions beneath the GMR project area, the maximum current electrode (AB) spacing for VES were kept 120 m. The VES curves obtained from the area are H, KH, HKH and AKH

type in nature, which indicate the wide variation in subsurface hydro geological conditions. The VES curves were interpreted manually by two and three layer master curves and by computer software IPI2Win to get the geoelectric layer parameters. These results were further refined with help of computer aided program SCHLUM through automatic curve matching technique. In this computer aided curve matching technique, an initial model is given for which the computer arrives at the theoretical curve and compares with the field data; then it takes difference between the recomputed and field curves and modifies old model parameters to start with a new model for reducing this difference (error). Again computes new theoretical curve and compares with the field curve, and sets another new model to reduce the differences. This process of interaction goes on till the error is minimized and finally displays the match between the field and theoretical curves giving the final model parameters. The final results were corroborated with the known hydro geological conditions existing in the area.

The VES curves obtained from the area are H, KH, HKH and AKH type in nature, which indicate the wide variation in subsurface hydro geological conditions. The measured apparent resistivity values have indicated wide variation in resistivity, which vary between 16 ohm-m and 4000 ohm-m. The interpreted results of VESs show the presence of 2 to 4 geo electrical layer sequences in the area within the depth range of about 80 m BGL under the investigated depth range of 120 m. It is also observed that the interpreted layer parameters have the wide range of resistivity variations in different layers. The tube wells have been recommended to drill at VES-1 of 50 m depth and VES-2 of depth 55m. As the area under survey i.e. Township premises the loamy soil, shales and limestone. Hence the tube wells with the combination of blank and perforated casing is proposed. The final interpreted geo-electrical layer parameters of VES's (layer resistivity and layer thicknesses) are given in table

Sr. No.	VES No.	Layer's Resistivity (ohm-m)					Layer's Thickness (m)					Total Thickness (m)
		ρ_1	ρ_2	ρ_3	ρ_4	ρ_5	h_1	h_2	h_3	h_4	h_5	
1	1	10	18	95	68	---	10	7	25	33	---	100
2	2	11	65	34	270	---	06	09	45	20	---	100
3	3	8	16	6	50	100	1.5	6.5	4	40	28	100
4	4	4	120	---	--	---	46	34	--	--	--	100
5	5	12	18	120	--	-	30	39	31	--	--	100
6	6	12	10	--	---	---	1.5	78.5	--	--	---	100
7	7	6	90	--	---	---	17	63	--	---	---	100
8	8	8	140	--	--	--	81	19	---	---	---	100
9	9	18	56	120	--	---	10	07	83	-	--	100
10	10	30	50	396	--	--	03	06	91		--	100
11	11	15	40	115	--	--	18	10	72		--	100
12	12	115	31	235	--	---	03	18	79	--	---	100
13	13	63	126	325	---	--	1.5	6.5	92	--	---	100
14	14	110	24	125	--	--	03	14	83	--	---	100
15	15	37	84	140	--	--	10	15	75	--	--	100
16	16	110	26	155	---	---	03	16	81	--	--	100
17	18	115	31	175	--	--	03	17	80	---	--	100
18	19	44	31	260	--	--	1.5	51.5	47	---	---	100
19	20	63	228	--	---	---	1.5	98.5	--	---	---	100
20	21	110	32	210	--	--	05	23	72	--	---	100

Table -Interpreted Geo-Electrical Layer Parameters of VES Conducted

It is very much confirmed from the geo physical investigation that the weathered loamy and clay formation is up to 18to 22 mts averagely .It is also confirmed that the fractured and compact limestone is available up to 100mts.The geo physical survey are very much of important to know the geo logy formation beneath the earth.

6) HYDROLOGY:

The hydrogeological and aquifer properties of the study area have been compiled and attempt has been made to depict the same in the hydrogeological map as shown in Fig 10. The water table configuration, ground water flow pattern and yield of aquifers, water divide etc. present in the study area has been deciphered and shown on the map. The study of Hydrogeological map reveals that, there are six prominent flow directions i.e. in western part of the study area it is towards north & south, in eastern part of the study area it is in east direction while in southern part of the study area it is in south direction which indicates surface water divides in the central part of the study area. This surface water divides or zone on eastern periphery represents deep water levels. All the drainage present over the area is effluent in nature which indicates that during lean periods ground water contributes to the river. The water table elevation in the study area ranges between 260 to 280 m amsl indicating more or less the plain/gently undulating terrain & water table elevation increases to the zone of surface water divides. The gradient of water table is also variable. It is high near zone of surface water divides low in remaining part of the study area.

In general, the aquifers in the study area are not very prolific. In major portion of the area occupied by shales and limestone, the yield is between 0.75 to 1.5 lps

There are no scanty dug wells. Bore wells are also poor yielding these bore wells are irrigating as protected irrigation.

Run Off

In the present study rainfall/ runoff model has been developed for the Tilda block based on model development under UNDP study. The model is for complete Tilda block i.e. Tilda belt including the study area. The relationship in the model between rainfall and the resulting runoff is quite complex and is influenced by host of factors relating to catchment and climatic environment.

The present model has been developed for two specific conditions.

- 1) Rainfall runoff in pre monsoon conditions.
- 2) Rainfall runoff in post monsoon conditions.

TABLE-3 RAINFALL – RUNOFF

Condition	Rain fall (m)	Area $M^2 \times 10^6$	Runoff factor	Runoff generation $M^3 \times 10^6$
Pre monsoon	1.118	78.63	0.25	23.29
Post monsoon	1.118	78.63	0.23	21.43

The study area is having thick mantle of loamy soil and the gradient of the area is very sloppy, hence runoff in the area will not affect the water regime of block area.

This data is incorporated from MINE WATER INFLOW ESTIMATION prepared for C.G. Mining Corporation Ltd. for Raipur

HYDROLOGICAL STUDIES

The main source of water for Thermal Power Plant is Mahanadi River. The detailed hydrological report of Mahanadi River at pick up point is already prepared by the Company. **The intake from river is 3.5m³/MWH**

The hydrological studies already submitted involves (i) The importance of studies (ii) Factors involved in studies (iii) Probability and statistics in Hydrological computation and (iv) Objectives of statistics in Hydrology.

Importance of the Studies

Hydrological Studies play a vital role in the design and formulation of a Water Resources Project.

The ultimate outcomes expected from the hydrological studies are –

- Availability of the inflow both in quantum as well as in the periodicity.
- Maximum floods that may have to be faced with various Return periodicities.

The first outcome helps in identifying the availability of the River flow in various months which in turn helps in properly planning the project undertaken. The second one helps in safeguarding the structures / installations from over running by the

flood waters, submergence and other related damages, by locating them at suitable elevations as well as making provisions for safe evacuation of the floods.

Thus the Hydrological Studies involve:

Determination of the inflows in the River at a particular location both in terms of the maximum and minimum and the variations over the period of a year for various levels of dependability's in order to assess the viability of locating the project proposed. The levels of dependability's that cater to the various needs such as Irrigation, Domestic Water Supply, Navigation, Hydropower generation and other usages such as replenishment supply for thermal power plants vary from 50% to 90%. The 75% dependability is enough to initiate an irrigation project whereas the highest of 90% dependability is the requirement indeed for investing in a hydro-electric project. For this thermal power project also, a dependability of 90% is considered.

Working out the probable flood discharges in the river with their water levels for various Return periods of their occurrence say 50 years, 100 years, 200 years, 1000 years or the Project Maximum Flood anytime in the life of the project, depending upon the type of structure being designed such as weirs, barrages, storage behind the structure that has the potential to create the human and economic disasters in case of failure of the structure.

Probability and Statistics in Hydrological computation:

Most of the hydrologic processes such as precipitation, run-off are rather random processes. Statistics and Probability are therefore essentially required to analyze and interpret the observed data of such processes.

Planning and designing of water resources projects needs information on different hydrologic events that are not governed by the known physical and chemical laws, but are governed by laws of chance. For example, stream flow in any given river

varies from day to day and from year to year. The fact is that no one can predict the discharge of Mahanadi or any given location on any particular day. Since the exact discharge cannot be predicted, the hydrologist has to be content with the probability with which a certain discharge value, say x cum sec, is likely to exceed, so as to determine the risk involved in designing the structure for that discharge. This can only be determined through the statistical and probabilistic analysis of past observed hydrologic data. Statistics deals with the computation of sampled data, while Probability deals with the measure of chance or likely hood based on the sampled data.

The fact is that many hydrologic phenomena are highly erratic, complex and random in nature and hence they can be interpreted only in a probabilistic sense. One of the important problems in hydrology deals with interpreting a past record of hydrologic events in terms of future probabilities of occurrence. This problem arises in the estimates of frequencies of floods, droughts, storages, rainfall, etc. the procedure involved is known as frequency analysis.

Data required for hydrological analyses can be classified into two kinds: experimental data and historical data. The experimental data are measured through experiments and usually can be obtained repeatedly by experiments. On the other hand historical data are collected from natural phenomena that can be observed only once and then will not occur again. Most hydrologic data are historical data that were observed from natural hydrological phenomena, e.g. stream flow data of a river.

Thus statistical analysis involves two basic sets of problems; one descriptive and the other inferential. The former is a straightforward application of statistical methods requiring few decisions and representing little risk. The latter, on the other hand, entails decisions bearing some risks and requires an understanding of the methods employed and the dangers involved in predicting and estimating.

Objectives of Statistics in Hydrology

The objectives of statistics in hydrology may be listed as follows:

1. Interpretation of observations;
2. Search for hydrological probabilistic regularities;
3. Extraction of maximum information from hydrological data; and
4. Presentation of hydrological information in condensed form as graphs, tables of numbers, and mathematical equations, basically for decision-making in water resources planning.

Thus the basic objective of applying statistics in hydrology is to derive information from the past observed hydrologic phenomena and then to make inferences about what is expected in the future.

The details of Mahanadi river system near the source for project are submitted as a separate report.

7) HYDROGEOLOGY:

Hydrogeology relates to groundwater conditions with respect of geological formations of that area. Hence the entire buffer zone is considered as a study area. The complete study area is surveyed physically. Probable geological formations, dug wells (DW) / bore-wells (BW) inventory data is collected. The depths of winter and summer static water levels (SWL), their fluctuations, status of irrigation and domestic DW/BW, were recorded. This statistics helps to draw the water balance and status of ground water development of the area. (Annexure 1)

Some geophysical probes were also taken up for to confirm the nature of aquifers.

WATERSHEDS:

Watersheds are drawn from the drainage pattern of the area. The drainages mostly follow the geological formations, their tectonic behavior and geological structures like faults, folds and intrusions etc. Mostly the watersheds are drawn basin wise such as etc. (Fig. 3)..

▲ To facilitate the proper hydro geological study, the buffer zone is divided into six mini watersheds within the radius of 10 km from the centre of the project. These

watersheds are as per the drainage of the area. The groundwater movements generally do not cross the divide line of the watershed and hence the flow of surface water and groundwater restrict themselves to the boundaries of each watershed. Out of these six watersheds, the surface and groundwater movements of five watersheds are away from the watershed. The project area is located in K-1.K-2, K-3, J-1,J-2 and CH-1 are having water flows away from the area.

▲ The details of these watersheds are as follow:

TABLE – 5 DETAILS OF WATERSHED IN STUDY AREA

Sr. No.	Water shed	Area in Hect.	No. of Villages	No. of DW/BW/ With EM-OE	Average SWL summer in mts	Average SWL in winter in mts	Average fluctuation in mts
1	K-1	132605182.17	15	338/196	7.26	3.73	3.53
2	K- 2	22631421.03	04	143/134	7.26	4.16	3.1
3	K-3	31090849.13	05	152/140	12.20	5.45	6.75
4	J-1	43466153.905	06	103/92	5.45	2.77	2.67
5	J-2	45984035.86	06	351/339	6.51	3.78	2.72
6	Ch-1	38508072.19	07	152/133	6.87	4.84	2.03

Abbreviations used

DW—Dug Well BW--- Bore Well EM--- Electric Motor OE--- Oil Engine

SWL—Static Water Level

All these watersheds are in plain terrain. But the recuperation will be slow as most of the areas where thick soil and clays are present.

From the study of watersheds derived in the buffer zone area the fluctuation in SWL in Ch--I is less than the other water sheds. This may be due to Basaltic formation and Lametas. Lametas is geological formations. The numbers of wells are more in J-2.It means that the development and use of groundwater is more. But this development will not affect on the water regime of project area as the groundwater discharge will be away from the project. This watershed comprises of only one village i.e. Raikheda. This town is having a population of nearly 1 lack. Hence the numbers of wells/bore wells are more than the other areas.

WATER BALANCE:

Water balance of each watershed is the difference between the recharge into water shed and drawl from that watershed. The field data in all villages in watershed was collected and water table fluctuation is determined. Actually the water shed in which plant is situated will be important. Other watersheds will not affect the plant area zone as discussed in previous pares.

The watershed wise balance is computed as below. Specific yield and rain water fluctuation is taken from estimation methodology established by Central Ground Water Board. (C.G.W.B.)

Water Shed No. K-1:

▲ Recharge by way of rainfall infiltrations method. As per C.G.W.B.

Area hect	Rainfall mts.	Rainfall infiltration factor	Recharge HAM
132605182.17 X	1.118 X	0.08 =	11860207.49 Ham

RECHARGE BY WATER TABLE fluctuation method

Area Hect	Water table fluctuation in mts.	Sq. yield	Total recharge
132605182.17 x	3.53 x	0.015 =	7021444.39 Ham

The complete area of watershed is taken into consideration

▲ WITHDRAWAL IN WATER SHED. The withdrawal in this water shed is limited .The crop pattern is mostly cotton. This crop requires a protective irrigation. This irrigation is limited to three months when there are no rains. Hence fraction water is withdrawn in the year. Hence 1/3 withdrawal is considered for the calculation of annual draft from the existing irrigated dug wells / bore wells..

The complete area of watershed is taken into consideration.

▲ WITHDRAWAL IN WATER SHED.

1. Total DW/BW = 338
2. Total DW/BW with EM/OE = 196
3. Domestic DW/BW = 142
4. Draft by OE/EM @ 0.52 Ham/year = 101.92 Ham
(1/3 of 1.57 ham as suggested by C.G.W.B.)
5. Draft of DW/BW for domestic purpose @ 0.1 Ham annually = 14.2 Ham
6. Hence total draft. = 116.12Ham
7. Additional recharge by DW/BW for irrigation purpose

Total water draft in water shed in Ham	Return Water factor for recharge	Recharge
116.12 X	0.25 =	29.03 Ham

$$\begin{aligned} \text{Total water recharge} + \text{return water} &= \text{Recharge total} \\ 11860207.49 + 29.03 &= 11860236.52 \text{ Ham} \end{aligned}$$

$$\text{Total recharge - Total withdrawal} = 11860236.52 - 116.12 = 11860120 \text{ Ham}$$

(Ham --- Hector-meter).This watershed has a balance as mentioned.

Existing project area falls under this water shed. The project area is at the top of area. Thus the runoff is more. Hence recharged through rainfall is limited due to high altitude. Secondly the water balance in this water shed is sufficient. So there will not be any difficulty of ground water regime at the project area. The water shed is in safe category.

Water Shed No. K-II

▲ Recharge by way of rainfall infiltrations method

Area hect	Rainfall mts.	Rainfall infiltration factor	Recharge Ham
22631421.03 X	1.118 X	0.08 =	2024154.29 Ham

RECHARGE BY WATER TABLE. Fluctuation Method

Area hect.	Water table fluctuation in mts.	Sq. Yield	Total recharge
22631421.03 X	3.1 X	0.015 =	1052361.07 Ham

The complete area of watershed is taken into consideration.

▲ Withdrawal in water shed.

1. Total DW/BW = 143
2. Total DW/BW with EM/OE = 134
3. Domestic DW/BW = 09
4. Draft by OE/EM @ 0.52 Ham/year = 69.68 Ham
5. Draft of DW/BW for domestic purpose @ 0.1 Ham annually = 0.9 Ham
6. Hence total draft. = 70.58 Ham
7. Additional recharge by DW/BW through irrigation wells

Total water draft in water shed in Ham	Return water	Recharge
70.58 X	0.25 =	17.64 Ham

In additions to the recharge by all means in this water shed a rain water harvesting (roof water and surface) is tabulated in artificial recharge chapter which come to(page no.) 88.91 ham.

Hence Total recharge = 2024154.29 + 17.64 = 2024171.93 Ham

Total recharge - Total draft = Hence balance

2024171.93 - 70.58 = 2024101.35 ham

(Ham --- Hector-meter)

Additional Recharge in the factory area

There is no any major, medium or minor project in the area. Even nala, bhandaras of any type is rarely seen. The required water for thermal generation is from Mahanadi River which is not in our study area.

This mini water shed have sufficient water balance. Due to this there is great a scope for development. The nalas in this water shed flow away from the project area. Hence there will not be any recuperation threat through the project area.

Water Shed No. K –3

▲ Recharge by way of rainfall infiltrations method

Area Hect	Rainfall mts	Rainfall infiltration factor	Recharge Ham
31090849.13	1.118 X	0.08 =	2780765.54 Ham

The complete area of watershed is taken into consideration.

RECHARGE BY WAY OF WATER TABLE Fluctuation Method

Area Hect	W. T. fluctuation in mts.	Sq. Yield	Recharge
31090849.13 X	6.75 X	0.015 =	3147948.47Ham

▲ Withdrawal in water shed.

1. Total DW/BW =152
2. Total DW/BW with EM/OE = 140
3. Domestic DW/BW =12
4. Draft by OE/EM @ 0.52 Ham/year = 72.8Ham
5. Draft of DW/BW for domestic purpose @ 0.1 Ham annually = 1.2 Ham
6. Hence total draft. = 74 ham
7. Additional recharge by DW/BW for irrigation

Total water recharge In water shed	Return flow factor	Recharge
74 X	0.25 =	18.5 Ham

Hence Total recharge = 2780765.54 + 18.5 = 2780784.04 ham

Total recharge - Total withdrawal = Hence balance

2780784.04 - 74 = 2780710.04Ham

This mini water shed have sufficient water balance. Due to this there is great a scope for development. The nals in this water shed flow away from the project area. Hence there will not be any recuperation threat through the project area.

. ((Ham --- Hector-meter) this watershed will not effect on the water regime of the actual project area.

Water Shed No. J-1

▲ RECHARGE BY WAY OF RAINFALL Infiltrations Method

Area Hect	Rainfall mts.	Rainfall infiltration factor	Recharge ham
43466153.905 X	1.118 X	0.08 =	3887612.8 Ham

The complete area of watershed is taken into consideration.

RECHARGE BY WAY OF WATER TABLE. Fluctuation Method

Total area Hect	W. T. Fluctuation in mts.	Sq. Yield	Recharge
43466153.905 X	2.67 X	0.015 =	1740819.46 Ham

▲ Withdrawal in water shed.

1. Total DW/BW = 103
2. Total DW/BW with EM/OE = 92
3. Domestic DW/BW = 11
4. Draft by OE/EM @ 0.52 Ham/year = 47.84 ham
5. Draft of DW/BW for domestic purpose @ 0.1 Ham annually = 1.1 ham
6. Hence total draft. = 48.94 hams
7. Additional recharge by DW/BW through irrigation

Water recharge	Return flow factor	Recharge
48.94 X	0.25 =	12.2 Ham

Hence Total recharge = 3887612.8 + 12.2 = 3887625 ham

Total recharge - Total withdrawal = Hence balance

3887625 - 48.94 = 3887576.06 ham

This mini water shed have sufficient water balance. Due to this there is great a scope for development. The nalas in this water shed flow away from the project area. Hence there will not be any recuperation threat through the project area.

. ((Ham --- Hector-meter) this watershed will not effect on the water regime of the actual project area.

Water Shed No. J-2

▲ RECHARGE BY WAY OF RAINFALL Infiltrations Method

Area Hect	Rainfall mts.	Rainfall infiltration factor	Recharge ham
45984035.86 X	1.118 X	0.08 =	4112812.16 Ham

The complete area of watershed is taken into consideration.

RECHARGE BY WAY OF WATER TABLE. Fluctuation Method

Total area Hect	W. T. Fluctuation in mts.	Sq. Yield	Recharge
45984035.86 X	2.75 X	0.015 =	1896841.4 Ham

▲ Withdrawal in water shed.

1. Total DW/BW = 351
2. Total DW/BW with EM/OE = 339
3. Domestic DW/BW = 12
4. Draft by OE/EM @ 0.52 Ham/year =176.28 ham
5. Draft of DW/BW for domestic purpose @ 0.1 Ham annually = 1.2 ham
6. Hence total draft. = 177.48 hams
7. Additional recharge by DW/BW through irrigation

Water recharge	Return flow factor	Recharge
177.48 X	0.25 =	44.37 Ham

Hence Total recharge = 4112812.16 + 44.37 = 4112767.79 ham

$$\begin{aligned} \text{Total recharge} - \text{Total withdrawal} &= \text{Hence balance} \\ 4112767.79 - 177.48 &= 4112590.31 \text{ ham} \end{aligned}$$

This mini water shed have sufficient water balance. Due to this there is great a scope for development. The nalas in this water shed flow away from the project area. Hence there will not be any recuperation threat through the project area.

. ((Ham --- Hector-meter) this watershed will not affect on the water regime of the actual project area.

Water Shed No. CH

▲ RECHARGE BY WAY OF RAINFALL Infiltrations Method

Area Hect	Rainfall mts.	Rainfall infiltration factor	Recharge ham
38508072.19 X	1.118 X	0.08 =	3444161.9 Ham

The complete area of watershed is taken into consideration.

RECHARGE BY WAY OF WATER TABLE. Fluctuation Method

Total area Hect	W. T. Fluctuation in mts.	Sq. Yield	Recharge
38508072.19 X	2.03 X	0.015 =	1172570.7Ham

▲ Withdrawal in water shed.

1. Total DW/BW = 152
2. Total DW/BW with EM/OE = 133
3. Domestic DW/BW = 19
4. Draft by OE/EM @ 0.52 Ham/year = 69.16ham
5. Draft of DW/BW for domestic purpose @ 0.1 Ham annually = 1.9 ham
6. Hence total draft. = 71.06 hams
7. Additional recharge by DW/BW through irrigation

Water recharge	Return flow factor	Recharge
71.06 X	0.25 =	17.76Ham

Hence Total recharge = 3444161.9 + 17.76 = 3444179.66 ham

Total recharge - Total withdrawal = Hence balance
3444179.66 - 71.06 = 3444108.6 ham

This mini water shed have sufficient water balance. Due to this there is great a scope for development. The nalas in this water shed flow away from the project area. Hence there will not be any recuperation threat through the project area.

. **((Ham --- Hector-meter) this watershed will not effect on the water regime of the actual project area .**

GEOPHYSICAL SURVEY:

Totally 16 geophysical probes were taken to know the aquifer thicknesses of the different formations. The probes are taken with the help of resistivity meter using schlumbereger configurations. After field data on two cycles the apparent resistivity values were calculated & a graph was plotted on log –log paper. True resistivity values are to be calculated to know the thicknesses & nature of aquifers up-to certain depths.



TABLE – 7

DETAILS OF GEOPHYSICAL SURVEY

Sr. no.	Village	Direction From block	probable geological Formation	water shed no.	probe done For mt.	True Resistivity values ohm/mt.
(1)	Katiya	E/W	Clays, limestone	J-2	100	63,220
(2)	Raikheda	E/W	Clays, limestone	K-1	100	11,20,95,200
(3)	Janjira	N/S	Clays, limestone	K-2	100	112,11,71,122
(4)	Plant	p. site	Clays, limestone	K-1	100	15,40,115
(5)	Chicholi	N/S	Clays, limestone	J-1	100	110,32,210,
(6)	Deori	NW	Clays, limestone	J-1	100	129,41,251
(7)	Bangoli		Clays, limestone	K-1	100	30,50,396
(8)	Nadiaya		Clays, limestone	K-3	100	86,42,260
(9)	Math		Clays, limestone	K-1	100	110,34,148
(10)	Nakti		Clays, limestone	CH-1	100	110,30,85,165
(11)	Bharwadi kalan		Clays, limestone	J-2	100	44,31,260
(12)	Gairkeda		Clays, limestone	J-2	100	115,31,175
(13)	Gaitra		Clays, limestone	CH-1	100	110,50,125
(14)	Siliyari		Clays, limestone	K-2	100	110,26,155
(15)	Bharawadi khurd		Clays, limestone	J-2	100	37,84,140
(16)	Bhimbhori		Clays, limestone	J-1	100	115,31,235

DETAILS OF WASTEWATER TREATMENT

Effluent from various area CPU regeneration, PSF backwash, SSF backwash etc. is collected in the equalization tank where it is pumped to reaction tank for clarification. Then the effluent from RT goes to HRSCC for the further treatment and then clarified water from HRSCC is stored in clarified water storage tank.

Since the plant adopts zero discharge philosophy there is no discharge of waste water outside plant premises after its treatment. The storm water in the plant area will be collected through storm water drains.

An effluent management scheme is implemented to optimize various water systems so as to reduce intake water requirement as well as effluent discharge. The scheme will essentially involve collection, treatment and recirculation/ disposal of various effluents.

The STP is available in the plant area.

The proposed measures to minimize the impacts and conservation of fresh water are:

- ✚ Recycling of total wastewater generated in cooling tower to process and ash disposal;
- ✚ Adequate treatment of wastewater prior to recycling / reuse to maximum extent;
- ✚ Availability of Sewage Treatment Plant to treat domestic sewage generated from plant.
- ✚ Provision for utilization of treated domestic wastewater in greenbelt development;
- ✚ Lining of guard pond suitably to prevent any seepage into ground to avoid any Groundwater contamination;
- ✚ Construction of suitable rainwater harvesting structures.

8. RAIN WATER HARVESTING:

THE PRINCIPLE OF RAIN WATER HARVESTING:

Rain water falling on the ground and absorbed by the earth consisting of the loose soil (permeable) and weathered rocks beneath the earth's surface, just as sponge, stores water is called aquifer. All this can happen only if the rain water is allowed to touch the loose earth called aquifer. Similarly deficit of ground water, in that aquifer has to be studied; otherwise potential in the rich ground water potential recharging will cause flooding and water logging of shallow overburden.

In the last three decades an exponential growth in number of ground water structures has been observed. This has led to enormous withdrawal of groundwater for various uses of agricultural, industrial and other domestic needs. This resource has become an important source of drinking water and food security for teeming millions of the state.

RECHARGING UNDERGROUND AQUIFER:

When the impervious layer is at shallow depth i.e. 20.00 Mts to 22.00 Mts, the top aquifer is subsurface aquifer which normally gets recharged during the rainy season without any effort. Hence water in the open well (dug well) is not generally ground water in true sense.

Water in the bore well or tube well generally 50.00 Mts 55.00mts deep is actually the ground water which contains minerals in it, which is of almost importance from ecological point of view.

Due to urbanization, population growth, industrial growth & irrigation purpose millions of bore wells/tube wells are drilled & ground water is continuously being pumped out, leaving thereby a permanent decline in underground water potential. Therefore rain water harvesting in real sense is that branch of

engineering which studies and finds the suitable solutions in the vicinity of targeted area, for recharging to carry roof top rain water up-to ground water.

TECHNIQUES OF RAIN WATER HARVESTING:

There are two main techniques of rain water harvestings.

- A Storage of rainwater on surface for future use.
- B Recharge to ground water.

The storage of rain water on surface is a traditional techniques and structures used were underground tanks, ponds, check dams, weirs etc. Recharge to ground water is a new concept of rain water harvesting and the structures generally used are:-

Pits: - Recharge pits are constructed for recharging the shallow aquifer. These are constructed 1 to 2 m, wide and to 3 m. deep which are back filled with boulders, gravels, coarse sand, which forms a filter screen

Trenches: - These are constructed when the permeable strata is available at shallow depth. Trench may be 0.5 to 1 m. wide, 1 to 1.5m. Deep and 10 to 20 m. long depending upon availability of water. These are back filled with filter materials.

Dug wells: - Existing dug wells may be utilized as recharge structure and water should pass through filter media before putting into dug well.

Recharge wells/bore: - Recharge wells of 100 to 300 mm. diameter are generally constructed for recharging the deeper aquifers and water is passed through filter media to avoid choking of recharge wells.

Recharge Shafts: - For recharging the shallow aquifer which is located below clayey surface, recharge shafts of 0.5 to 3 m. diameter and 10 to 15 m. deep are constructed and back filled with boulders, gravels & coarse sand.

Lateral shafts with bore wells: - For recharging the upper as well as deeper aquifers lateral shafts of 1.5 to 2 m wide & 10 to 30 m. long depending upon availability of water with one or two bore wells is constructed. The lateral shaft is back filled with boulders, gravels & coarse sand.

Spreading techniques: - When permeable strata start from top then this technique is used. Spread the water in streams/Nalas by making check dams, nala bunds, cement plugs, gabion structures or a percolation pond may be constructed.

DIVERSION OF RUN-OFF INTO EXISTING SURFACE WATER BODIES:

Construction activity in and around the city is resulting in the drying up of water bodies and reclamation of these tanks for conversion into plots for houses. Free flow of storm runoff into these tanks and water bodies must be ensured. The storm runoff may be diverted into the nearest tanks or depression, which will create additional recharge. Urbanization effects on Groundwater Hydrology

- ✚ Increase in water demand
- ✚ More dependence on ground water use.
- ✚ Over exploitation of ground water
- ✚ Increase in run-off, decline in well yields and fall in water levels
- ✚ Reduction in open soil surface area
- ✚ Reduction in infiltration and deterioration in water quality
- ✚ Methods of artificial recharge in urban areas:
 - ✚ Water spreading.
 - ✚ Recharge through pits, trenches, wells, shafts.
 - ✚ Rooftop collection of rainwater.
 - ✚ Induced recharge from surface water bodies.

Computation of artificial recharge from Roof top rainwater collection:

Factors taken for computation:

- ✚ Roof top area in sq.mt. for individual house and for multi-storied building.
- ✚ Average annual monsoon rainfall – as per data in mm.
- ✚ Effective annual rainfall contributing to recharge 90% of Average annual rainfall.

Benefits of Artificial Recharge in Urban Areas:

- ✚ Improvement in infiltration and reduction in run-off.

- ✚ Improvement in groundwater levels and yields.
- ✚ Reduces strain on Special Village Panchayats/ Municipal / Municipal Corporation water supply
- ✚ Improvement in groundwater quality
- ✚ Methods and techniques for ground water recharge

Roof Top Rain Water / run off harvesting through

- ✚ Recharge Pit
- ✚ Recharge Trench
- ✚ Tube-well/Bore wells
- ✚ Recharge Well

Rain Water Harvesting through

- ✚ Contour Bund
- ✚ Percolation tank
- ✚ Check Dam/ Cement Plug/ Nala Bund
- ✚ Recharge shaft
- ✚ Dug well Recharge

Rainwater harvesting from the factory area will have to be consider for recharge factor. They are roof-water harvesting and surface water harvesting.

1 ROOF WATER HARVESTING

2 The ground water system is maintained and replenished to its maximum extent during the rainy season. Rain water harvesting has assumed significance as it artificially augments the recharging to the depleted aquifers and facilitates them to restore over period of time. The surplus runoff generated during monsoon is to be conserved and recharge to augment ground water resources.

3 Out of the various techniques of rain water harvesting, Roof top rain water harvesting through direct injection into bore well has although good intake capacity, yet it is found to be the most suitable under the prevailing hydro

geological condition. The other surface water recharging schemes are not technically feasible inside the township area. The selection of suitable location of recharging two tube wells no.01 and 02 has been considered to achieve desired results. Roof top rain water harvesting is the direct collection of rain water from roof top which is to be channelized through gutters and then transport the water from the roof, through down pipes, to the existing two tube well. In addition, there will be a first flush system to divert the dirty water which contains roof debris collected on the roof during non-rainy periods and a filter unit to remove debris and contaminants before water enters the tube well. The roof water is directly connected to ground water systems, precautionary measures need to be taken to ensure that recharging water is free of contaminant before get diverted for recharging into the subsurface. The various components to be used for installation of Roof top rain water harvesting system are as described below;

- 4 **Gutters:** Gutters are channels fixed to the edges of roof all around to collect and transport the rainwater from the roof. They can be in semi-circular or rectangular in shapes.
- 5 **Downpipe:** Down pipe is the pipe, which carries the rainwater from the gutters to the bore well. Down pipe is joined with the gutters at one end, and the other end is connected to the filter unit. Each PVC pipes of 100 mm to 150 mm (4 inch to 6 inch) diameter as down-pipe is to be used for every 50sq.m. of roof area.
- 6 **First Flush Pipe:** A first flush system is incorporated to dispose off the water from 'first rain' so that debris, dirt and dust collected on the roofs during non-rainy periods is washed out through first flush rain water pipe. After the first rain is washed out through first flush pipe, the valve is closed to allow the water to enter the down pipe and reach the filter unit.

7 **Filter Unit:** The filter unit is a container or chamber filled with filter media such as coarse sand, gravels, and pebbles separated by fine mesh wire to remove the debris and dirt from water that enters the tank. The container is provided with an outlet pipe to allow the passage of water into bore well. The filter unit is placed between the down pipes and bore well. The horizontal slope of inlet and outlet pipe at the filter is 1:1.

Roof water recharge is the direct method to recharge the aquifer. Actually 90% of rainfall could be recharged from roof.

2 SURFACE WATER HARVESTING

The surface water recharge tabulate with roof water as per the area mentioned below. The surface water may also be recharge through a copal of bore well up to the depth of 60mts with proper filtration method. Where the runoff goes from the plant premises?

The surface water is being drained through piped drainage systematically; ultimately it goes to a natural drain or nala. But this surface water should be checked by constructing bandharas across the nala bed. It has been constructed with the guidance of irrigation engineer. There is no possibility of actual recuperation due to clay formation. Hence the flowing nala which have a bandhara like structure should be deepened into its bed and widened to a considerable length so that there may be a lateral spreading. This structure should be widened up to its maximum width. This may help to increase the average static water levels of the watershed in which the project area falls. These bandharas will also increase the storage of nala basin, thus increasing the irrigation to the surrounding area and thus will save the crops in draught period.

The drain water which will flow into the existing surface body and which will have a Bundara will increase the static water levels of that watershed where the

Project is standing. Hence this watershed will be treated as developed. This project area falls under the water shed no. K-1

The artificial recharge is tabulated as be

A ESTIMATION OF ANNUAL RUNOFF POTENTIAL						
S. No.	Land Use / Type of Area	Area (Sq. meters)	Average Annual Rainfall (mili meter)	Average Annual Rainfall (meter)	Runoff Coefficient	Total Annual Runoff Potential Created (cu. m /year)
1	Roof Top Area	1719975	1118	1.118	0.85	1634492.24
2	Paved Area	242820	1118	1.118	0.65	176457.29
3	Open Area	343995	1118	1.118	0.20	76917.28
4	Green Belt Area	1133160	1118	1.118	0.10	126687.28
Total		3439950				2014554.09
B ESTIMATION OF PEAK RAINFALL RUNOFF						
S. No.	Land Use / Type of Area	Area (Sq. meters)	Runoff Coefficient	Intensity of Rainfall (m/hr)	Runoff for hourly peak intensity (cu. m/hour)	Runoff for 15 minutes peak intensity (cu. m)
1	Roof Top Area	1719975	0.85	0.035	51169.25	12792.31
2	Paved Area	242820	0.65	0.035	5524.15	1381.03
3	Open Area	343995	0.20	0.035	2407.96	601.99
4	Green Belt Area	1133160	0.10	0.035	3966.06	991.51
Total		3439950			63067.42	15766.84

3 IMPACT ASSESMENT

i. Out of four watersheds two watersheds were underdeveloped. Only K-I have water balance and the watershed K-II will have a water balance after the recharge schemes are developed as mentioned earlier.

ii. K-II watershed will be developed, where the project is standing, when the roof water and surface water harvesting projects as mentioned are undertaken.

iii. The remaining two watersheds in general are not affecting the water regime of the project area as the complete drainage systems of these watersheds runs away from our project watershed. These watersheds should be developed as a social obligation so that there will not be a problem on water regime.

Hence there will not be an adverse impact on the water regime of the project area.

ANNEXURE-I

WELL INVENTORY DATA

K-1

Sr. no.	Name of Village	Total no. of well / b-w	No. of wells o-e & e-m	SWL		Fluctuation
				Summer	Winter	
(1)	Bartori	27	24	5.45	4.54	0.91
(2)	Saragaon	65	57	9.09	4.54	4.55
(3)	Kurra	17	13	6.96	3.03	3.93
(4)	Dansuli	09	07	6.96	3.03	3.93
(5)	Dahegaon	15	12	10.60	4.54	6.06
(6)	Khapri	11	07	6.06	3.03	3.03
(7)	Raikheda	29	26	6.96	4.54	2.42
(8)	Murra	35	32	6.06	3.03	3.03
(9)	Bangoli	08	07	6.96	4.54	2.42
(10)	Pikardin	13	10	12.12	4.54	7.58
(11)	Ganayatri	64	60	4.54	1.51	3.03
(12)	Asounda	32	30	12.72	6.06	6.66
(13)	Math	08	06	14.54	9.09	5.45
(14)	Nilja	05	05	nil	nil	Nil

K-2

Sr. No.	name of village	No. of Wells & b/w	Total no. of well with o/e & e /m	SWL		Fluct
				Summer	Winter	
1	Janjaira	50	47	7.57	3.03	4.54
2	Mauhagaon	34	31	14.54	9.09	5.54
3	Kodwa	19	15	6.96	4.54	2.42
4	Malaud	40	40	nil	nil	Nil
		143	134	7.26	4.16	3.01

K-3

Sr. No.	name of village	No. of Wells & b/w	Total no. of well with o/e & e /m	SWL		Fluct
				Summer	Winter	
1	Karrora	82	75	12.12	4.54	7.58
2	Pathora	41	40	11.51	4.54	6.97
3	Bithiya	03	02	13.33	6.06	7.27
4	Nahardiya	09	07	12.12	4.54	7.58
5	Tildadih	17	14	12.12	7.57	4.55
		152	140	12.20	5.45	6.75

J-1

Sr. No.	Name of village	No. of Wells & b/w	Total no. of well with o/e & e /m	SWL		Fluct
				Summer	Winter	
1	Chicholi	03	03	nil	Nil	Nil
2	Chhataud	07	07	nil	Nil	Nil
3	Bhiburi	44	40	12.12	6.06	6.06
4	Rajiya	04	02	12.12	6.06	6.06
5	Sirwe	25	20	8.48	4.54	3.94
6	Deori	20	20	nil	Nil	Nil
		103	94	5.45	2.77	2.67

J-2

Sr. No.	name of village	No. of Wells & b/w	Total no. of well with o/e & e /m	SWL		Fluct
				Summer	Winter	
1	Gaurkheda	23	22	5.75	4.54	1.21
2	Bharuwadhin ka	45	42	9.09	4.54	4.55

3	Bharuwadhin ku	127	123	9.09	4.54	4.55
4	Paraswani	16	15	9.09	6.06	3.03
5	Kathiya	80	80	nil	Nil	Nil
6	Keotara	60	57	6.06	3.03	3.03
		351	339	6.51	3.79	2.72

CH-1

Sr. No.	name of village	No. of Wells & b/w	Total no. of well with o/e & e /m	SWL		Fluct
				Summer	Winter	
1	Nakkti	17	13	7.57	6.06	1.51
2	Gaitra	19	16	7.57	6.06	1.51
3	Baikhundh	14	11	6.66	2.12	2.12
4	Kondri	29	27	5.75	1.12	1.12
5	Bahesar	12	09	6.66	2.12	2.12
6	Jalso	51	50	8.18	4.55	4.55
7	Kudru	10	07	5.75	1.12	1.12
		152	133	6.87	4.84	2.03







ANNEXURES

RAINFALL FOR THE PAST 30 YEAR (1988-2017) RAIKHEDA, TILDA (C. G.) STATION

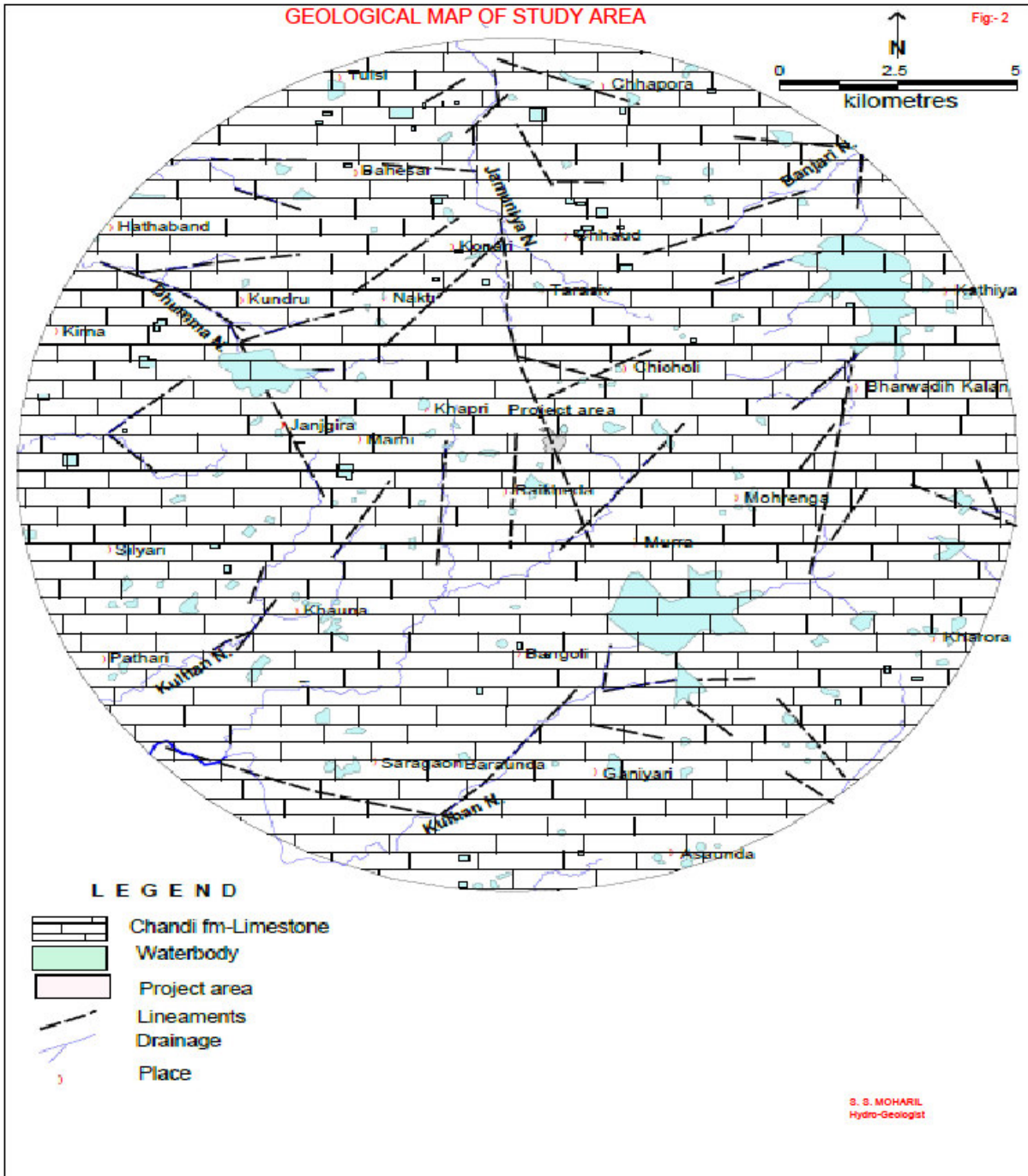
YEAR	ANNUAL RAINFALL (MM)
1988	1120.0
1989	1070.0
1990	1120.0
1991	1105.0
1992	1130.0
1993	1100.0
1994	1100.5
1995	1110.5
1996	1140.0
1997	1160.0
1998	1120.0
1999	1160.0
2000	1135.0
2001	1210.0
2002	1140.0
2003	1130.0
2004	1140.0
2005	1195.0
2006	1090.0
2007	1095.0
2008	1160.0
2009	1140.2
2010	1070.0
2011	1110.0
2012	1205.0
2013	1060.0
2014	1090.2
2015	1070.0
2016	1070.0
2017	1000.0

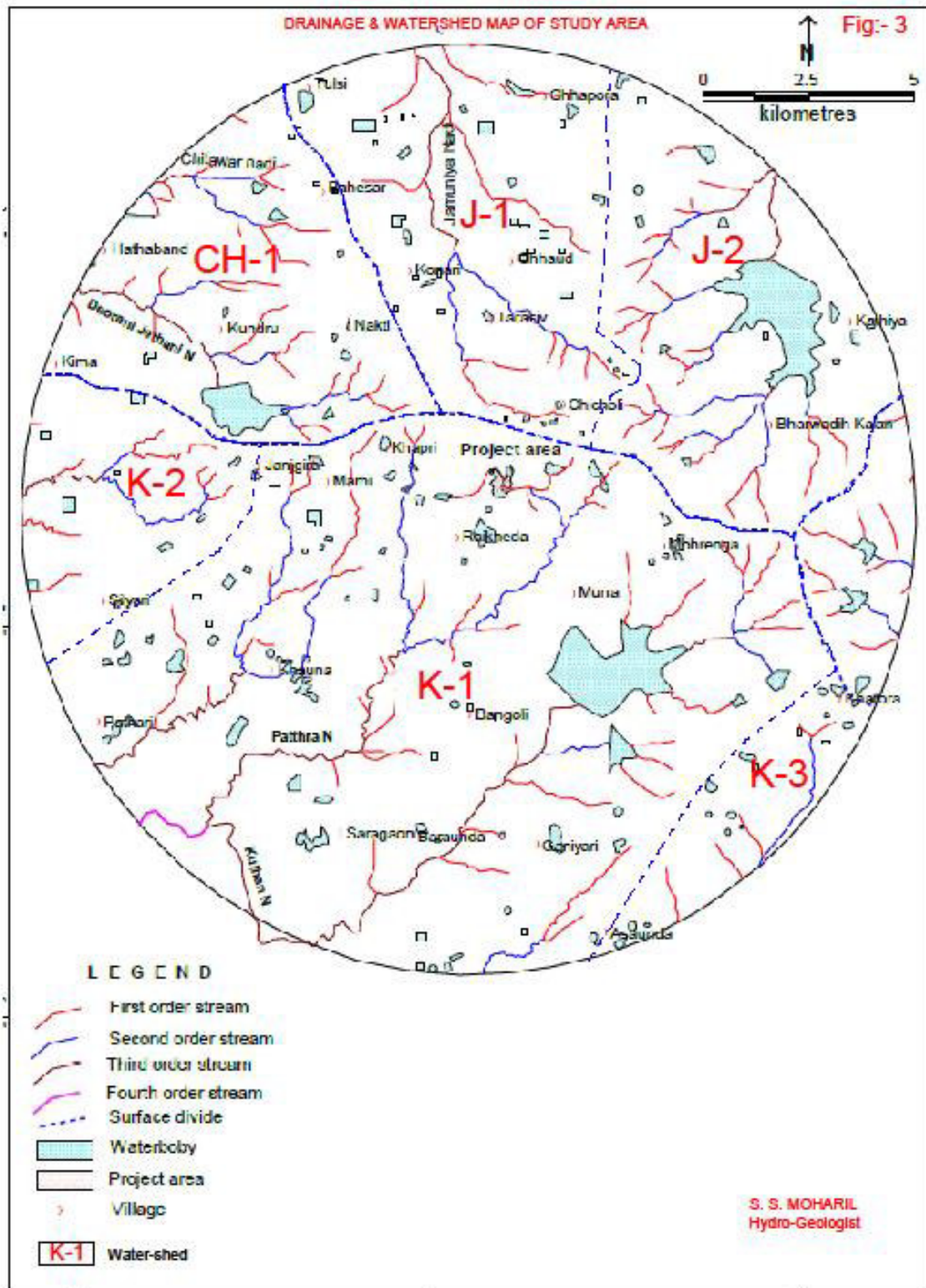
TOTAL AVEREGE ----- 1118.21



GEOLOGICAL MAP OF STUDY AREA

Fig-2





REPORT ON CHEMICAL ANALYSIS

**Environmental Laboratory & EIA Consultant Organization**

(NABL QCI Accredited , MoEF Recognized, NABET QCI Accredited, ISO 9001, ISO 14001 & OHSAS 18001 Certified)

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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com**Test Report
Water Quality**

Report No. : ELPL/QD4/TRD/5.10/GW/July-18/39	Report Date : 09-08-2018
Name & Address of the Customer : GMR Chhattisgarh Energy Ltd. , Unit # 2 x 685 MW, Raikheda, Tilda-Raipur-493114, Chhattisgarh	
Ref. : Our Offer No. ELPL/Q/50/18-19 dtd. 25-06-2018	
Sample Description : Ground Water Sampling Ref Method : IS 3025 (Part 1): 1987 RA 2009 Sample Inward No. :ELPL/July-18/301/66/GW-39	Sampling Location : Z. P. Borewell Gaitara Environment Condition: Cloudy & Sunny (during sampling)
Sampling Date : 31-07-18	Sampled By: Mr. Digambar Kale, ELPL Representative
Period of Analysis: From 01-08-2018 to 09-08-2018	

Results of Analysis

Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
1	pH value	--	6.5 to 8.5	6.89	IS 3025 (Part 11): 1983 RA 2017 (Clause 2.0)
2	Total Dissolved Solids	mg/l	500/2000	204.0	IS 3025 (Part 16): 1984 RA 2017
3	Aluminium (as Al)	mg/l	0.03/0.2	0.01	IS 3025 (Part 2): 2004 RA 2014
4	Barium (as Ba)	mg/l	0.7	0.004	IS 3025 (Part 2): 2004 RA 2014
5	Boron (as B)	mg/l	0.5/1.0	<0.02	IS 3025 (Part 2): 2004 RA 2014
6	Calcium (as Ca)	mg/l	75/200	40.0	IS 3025 (Part 40): 1991 RA 2014 (Clause 5.0)
7	Chloride (as Cl)	mg/l	250/1000	22.9	IS 3025 (Part 32): 1988 RA 2014 (Clause 2.0)
8	Copper (as Cu)	mg/l	0.05/1.5	0.016	IS 3025 (Part 2): 2004 RA 2014
9	Fluoride (as F)	mg/l	1.0/1.5	0.25	IS 3025 (Part 60): 2008 RA 2013 (Clause 6.0)
10	Iron (as Fe)	mg/l	1.0	0.30	IS 3025 (Part 2): 2004 RA 2014
11	Magnesium (as Mg)	mg/l	30/100	5.84	IS 3025 (Part 46): 1994 RA 2014 (Clause 6.0)
12	Manganese (as Mn)	mg/l	0.1/0.13	0.02	IS 3025 (Part 2): 2004 RA 2014
13	Nitrate (as NO ₃)	mg/l	45	12.1	APHA -22 nd Ed. -4500 (NO ₃ ⁻) (B)
14	Selenium (as Se)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
15	Silver (as Ag)	mg/l	0.1	<0.005	IS 3025 (Part 2): 2004 RA 2014
16	Sulphate (as SO ₄)	mg/l	200/400	20.1	APHA 22 nd Ed - 4500 SO ₄ ²⁻ (E)
17	Total Alkalinity (as CaCO ₃)	mg/l	200/600	70.0	IS 3025 (Part 23): 1986 RA 2014
18	Total Hardness(as CaCO ₃)	mg/l	200/600	124.0	IS 3025 (Part 21): 2009 RA 2014 (Clause 5.0)
19	Zinc (as Zn)	mg/l	5/15	0.38	IS 3025 (Part 2): 2004 RA 2014



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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com

Report No. : ELPL/QD4/TRD/5.10/GW/July-18/39				Report Date : 09-08-2018	
Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
20	Cadmium (as Cd)	mg/l	0.003	<0.003	IS 3025 (Part 2): 2004 RA 2014
21	Lead (as Pb)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
22	Mercury (as Hg)	mg/l	0.001	<0.001	IS 3025 (Part 2): 2004 RA 2014
23	Molybdenum (as Mo)	mg/l	0.07	<0.02	IS 3025 (Part 2): 2004 RA 2014
24	Nickel (as Ni)	mg/l	0.02	<0.02	IS 3025 (Part 2): 2004 RA 2014
25	Total Arsenic (as As)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
26	Total Chromium (as Cr)	mg/l	0.05	<0.005	IS 3025 (Part 2): 2004 RA 2014
Norms : IS 10500: 2012 (Second Revision)					
Note : Test results relates to sample collected & tested. It shall not be reproduced partially or fully without prior approval of ELPL.					
Remarks: Water is meeting the norms for above parameters					
For Earthcare Labs Pvt. Ltd.					
(K.L. Jadhav) Authorized Signatory & CEO					

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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com**Test Report
Water Quality**

Report No. : ELPL/QD4/TRD/5.10/W/July-18/40A	Report Date : 09-08-2018
Name & Address of the Customer : GMR Chhattisgarh Energy Ltd. , Unit # 2 x 685 MW, Raikheda, Tilda-Raipur-493114, Chhattisgarh	
Ref. : Our Offer No. ELPL/Q/50/18-19 dtd. 25-06-2018	
Sample Description : Surface Water Sampling Ref Method : IS 3025 (Part 1): 1987 RA 2009 Sample Inward No. :ELPL/July-18/301/66/W-40A	Sampling Location : Surface Water from Bengali Dam Ghansoli Road Environment Condition: Sunny (during sampling)
Sampling Date : 31-07-18	Sampled By: Mr. Digambar Kale, ELPL Representative
Period of Analysis: From 01-08-2018 to 09-08-2018	

Results of Analysis

Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
1	pH value	--	6.5 to 8.5	8.75	IS 3025 (Part 11): 1983 RA 2017 (Clause 2.0)
2	Total Dissolved Solids	mg/l	500/2000	132.0	IS 3025 (Part 16): 1984 RA 2017
3	Aluminium (as Al)	mg/l	0.03/0.2	<0.006	IS 3025 (Part 2): 2004 RA 2014
4	Barium (as Ba)	mg/l	0.7	0.008	IS 3025 (Part 2): 2004 RA 2014
5	Boron (as B)	mg/l	0.5/1.0	<0.02	IS 3025 (Part 2): 2004 RA 2014
6	Calcium (as Ca)	mg/l	75/200	25.6	IS 3025 (Part 40): 1991 RA 2014 (Clause 5.0))
7	Chloride (as Cl)	mg/l	250/1000	7.99	IS 3025 (Part 32): 1988 RA 2014 (Clause 2.0)
8	Copper (as Cu)	mg/l	0.05/1.5	<0.006	IS 3025 (Part 2): 2004 RA 2014
9	Fluoride (as F)	mg/l	1.0/1.5	0.23	IS 3025 (Part 60): 2008 RA 2013 (Clause 6.0)
10	Iron (as Fe)	mg/l	1.0	<0.02	IS 3025 (Part 2): 2004 RA 2014
11	Magnesium (as Mg)	mg/l	30/100	5.35	IS 3025 (Part 46): 1994 RA 2014 (Clause 6.0)
12	Manganese (as Mn)	mg/l	0.1/0.13	0.005	IS 3025 (Part 2): 2004 RA 2014
13	Nitrate (as NO ₃)	mg/l	45	<0.02	APHA -22 nd Ed. -4500 (NO ₃ ⁻) (B)
14	Selenium (as Se)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
15	Silver (as Ag)	mg/l	0.1	<0.005	IS 3025 (Part 2): 2004 RA 2014
16	Sulphate (as SO ₄)	mg/l	200/400	11.0	APHA 22 nd Ed - 4500 SO ₄ ²⁻ (E)
17	Total Alkalinity (as CaCO ₃)	mg/l	200/600	50.0	IS 3025 (Part 23): 1986 RA 2014
18	Total Hardness(as CaCO ₃)	mg/l	200/600	86.0	IS 3025 (Part 21): 2009 RA 2014 (Clause 5.0)
19	Zinc (as Zn)	mg/l	5/15	<0.004	IS 3025 (Part 2): 2004 RA 2014



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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com

Report No. : ELPL/QD4/TRD/5.10/W/July-18/40A				Report Date : 09-08-2018	
Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
20	Cadmium (as Cd)	mg/l	0.003	<0.003	IS 3025 (Part 2): 2004 RA 2014
21	Lead (as Pb)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
22	Mercury (as Hg)	mg/l	0.001	<0.001	IS 3025 (Part 2): 2004 RA 2014
23	Molybdenum (as Mo)	mg/l	0.07	<0.02	IS 3025 (Part 2): 2004 RA 2014
24	Nickel (as Ni)	mg/l	0.02	<0.02	IS 3025 (Part 2): 2004 RA 2014
25	Total Arsenic (as As)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
26	Total Chromium (as Cr)	mg/l	0.05	<0.005	IS 3025 (Part 2): 2004 RA 2014
Norms : IS 10500: 2012 (Second Revision)					
Note : Test results relates to sample collected & tested. It shall not be reproduced partially or fully without prior approval of ELPL.					
Remarks: Water is meeting the norms for above parameters					
For Earthcare Labs Pvt. Ltd.					
(K.L. Jadhav) Authorized Signatory & CEO					

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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com**Test Report
Water Quality**

Report No. : ELPL/QD4/TRD/5.10/W/July-18/41A	Report Date : 09-08-2018
Name & Address of the Customer : GMR Chhattisgarh Energy Ltd. , Unit # 2 x 685 MW, Raikheda, Tilda-Raipur-493114, Chhattisgarh	
Ref. : Our Offer No. ELPL/Q/50/18-19 dtd. 25-06-2018	
Sample Description : Surface Water Sampling Ref Method : IS 3025 (Part 1): 1987 RA 2009 Sample Inward No. :ELPL/July-18/301/66/W-41A	Sampling Location : Surface Water from Murra Village Lake Environment Condition: Sunny (during sampling)
Sampling Date : 31-07-18	Sampled By: Mr. Digambar Kale, ELPL Representative
Period of Analysis: From 01-08-2018 to 09-08-2018	

Results of Analysis

Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
1	pH value	--	6.5 to 8.5	7.46	IS 3025 (Part 11): 1983 RA 2017 (Clause 2.0)
2	Total Dissolved Solids	mg/l	500/2000	775.6	IS 3025 (Part 16): 1984 RA 2017
3	Aluminium (as Al)	mg/l	0.03/0.2	0.01	IS 3025 (Part 2): 2004 RA 2014
4	Barium (as Ba)	mg/l	0.7	0.008	IS 3025 (Part 2): 2004 RA 2014
5	Boron (as B)	mg/l	0.5/1.0	0.03	IS 3025 (Part 2): 2004 RA 2014
6	Calcium (as Ca)	mg/l	75/200	42.4	IS 3025 (Part 40): 1991 RA 2014 (Clause 5.0))
7	Chloride (as Cl)	mg/l	250/1000	209.9	IS 3025 (Part 32): 1988 RA 2014 (Clause 2.0)
8	Copper (as Cu)	mg/l	0.05/1.5	<0.006	IS 3025 (Part 2): 2004 RA 2014
9	Fluoride (as F)	mg/l	1.0/1.5	0.626	IS 3025 (Part 60): 2008 RA 2013 (Clause 6.0)
10	Iron (as Fe)	mg/l	1.0	0.02	IS 3025 (Part 2): 2004 RA 2014
11	Magnesium (as Mg)	mg/l	30/100	14.6	IS 3025 (Part 46): 1994 RA 2014 (Clause 6.0)
12	Manganese (as Mn)	mg/l	0.1/0.13	0.01	IS 3025 (Part 2): 2004 RA 2014
13	Nitrate (as NO ₃)	mg/l	45	0.73	APHA -22 nd Ed. -4500 (NO ₃ ⁻) (B)
14	Selenium (as Se)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
15	Silver (as Ag)	mg/l	0.1	<0.005	IS 3025 (Part 2): 2004 RA 2014
16	Sulphate (as SO ₄)	mg/l	200/400	54.7	APHA 22 nd Ed - 4500 SO ₄ ²⁻ (E)
17	Total Alkalinity (as CaCO ₃)	mg/l	200/600	100.0	IS 3025 (Part 23): 1986 RA 2014
18	Total Hardness(as CaCO ₃)	mg/l	200/600	166.0	IS 3025 (Part 21): 2009 RA 2014 (Clause 5.0)
19	Zinc (as Zn)	mg/l	5/15	0.08	IS 3025 (Part 2): 2004 RA 2014



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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com

Report No. : ELPL/QD4/TRD/5.10/W/July-18/41A				Report Date : 09-08-2018	
Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
20	Cadmium (as Cd)	mg/l	0.003	<0.003	IS 3025 (Part 2): 2004 RA 2014
21	Lead (as Pb)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
22	Mercury (as Hg)	mg/l	0.001	<0.001	IS 3025 (Part 2): 2004 RA 2014
23	Molybdenum (as Mo)	mg/l	0.07	<0.02	IS 3025 (Part 2): 2004 RA 2014
24	Nickel (as Ni)	mg/l	0.02	<0.02	IS 3025 (Part 2): 2004 RA 2014
25	Total Arsenic (as As)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
26	Total Chromium (as Cr)	mg/l	0.05	<0.005	IS 3025 (Part 2): 2004 RA 2014
Norms : IS 10500: 2012 (Second Revision)					
Note : Test results relates to sample collected & tested. It shall not be reproduced partially or fully without prior approval of ELPL.					
Remarks: Water is meeting the norms for above parameters					
For Earthcare Labs Pvt. Ltd.					
(K.L. Jadhav) Authorized Signatory & CEO					

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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com**Test Report
Water Quality**

Report No. : ELPL/QD4/TRD/5.10/GW/July-18/42	Report Date : 09-08-2018
Name & Address of the Customer : GMR Chhattisgarh Energy Ltd. , Unit # 2 x 685 MW, Raikheda, Tilda-Raipur-493114, Chhattisgarh	
Ref. : Our Offer No. ELPL/Q/50/18-19 dtd. 25-06-2018	
Sample Description : Ground Water Sampling Ref Method : IS 3025 (Part 1): 1987 RA 2009 Sample Inward No. :ELPL/July-18/301/66/GW-42	Sampling Location : Z. P. Borewell at C. P. School Raikheda Environment Condition: Sunny (during sampling)
Sampling Date : 31-07-18	Sampled By: Mr. Digambar Kale, ELPL Representative
Period of Analysis: From 01-08-2018 to 09-08-2018	

Results of Analysis

Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
1	pH value	--	6.5 to 8.5	7.22	IS 3025 (Part 11): 1983 RA 2017 (Clause 2.0)
2	Total Dissolved Solids	mg/l	500/2000	324.0	IS 3025 (Part 16): 1984 RA 2017
3	Aluminium (as Al)	mg/l	0.03/0.2	0.008	IS 3025 (Part 2): 2004 RA 2014
4	Barium (as Ba)	mg/l	0.7	0.008	IS 3025 (Part 2): 2004 RA 2014
5	Boron (as B)	mg/l	0.5/1.0	<0.02	IS 3025 (Part 2): 2004 RA 2014
6	Calcium (as Ca)	mg/l	75/200	78.4	IS 3025 (Part 40): 1991 RA 2014 (Clause 5.0))
7	Chloride (as Cl)	mg/l	250/1000	15.9	IS 3025 (Part 32): 1988 RA 2014 (Clause 2.0)
8	Copper (as Cu)	mg/l	0.05/1.5	0.021	IS 3025 (Part 2): 2004 RA 2014
9	Fluoride (as F)	mg/l	1.0/1.5	0.43	IS 3025 (Part 60): 2008 RA 2013 (Clause 6.0)
10	Iron (as Fe)	mg/l	1.0	0.34	IS 3025 (Part 2): 2004 RA 2014
11	Magnesium (as Mg)	mg/l	30/100	11.7	IS 3025 (Part 46): 1994 RA 2014 (Clause 6.0)
12	Manganese (as Mn)	mg/l	0.1/0.13	0.0031	IS 3025 (Part 2): 2004 RA 2014
13	Nitrate (as NO ₃)	mg/l	45	1.50	APHA -22 nd Ed. -4500 (NO ₃ ⁻) (B)
14	Selenium (as Se)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
15	Silver (as Ag)	mg/l	0.1	<0.005	IS 3025 (Part 2): 2004 RA 2014
16	Sulphate (as SO ₄)	mg/l	200/400	23.2	APHA 22 nd Ed - 4500 SO ₄ ²⁻ (E)
17	Total Alkalinity (as CaCO ₃)	mg/l	200/600	220.0	IS 3025 (Part 23): 1986 RA 2014
18	Total Hardness(as CaCO ₃)	mg/l	200/600	244.0	IS 3025 (Part 21): 2009 RA 2014 (Clause 5.0)
19	Zinc (as Zn)	mg/l	5/15	0.075	IS 3025 (Part 2): 2004 RA 2014



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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com

Report No. : ELPL/QD4/TRD/5.10/GW/July-18/42				Report Date : 09-08-2018	
Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
20	Cadmium (as Cd)	mg/l	0.003	<0.003	IS 3025 (Part 2): 2004 RA 2014
21	Lead (as Pb)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
22	Mercury (as Hg)	mg/l	0.001	<0.001	IS 3025 (Part 2): 2004 RA 2014
23	Molybdenum (as Mo)	mg/l	0.07	<0.02	IS 3025 (Part 2): 2004 RA 2014
24	Nickel (as Ni)	mg/l	0.02	<0.02	IS 3025 (Part 2): 2004 RA 2014
25	Total Arsenic (as As)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
26	Total Chromium (as Cr)	mg/l	0.05	<0.005	IS 3025 (Part 2): 2004 RA 2014
Norms : IS 10500: 2012 (Second Revision)					
Note : Test results relates to sample collected & tested. It shall not be reproduced partially or fully without prior approval of ELPL.					
Remarks: Water is meeting the norms for above parameters					
For Earthcare Labs Pvt. Ltd.					
(K.L. Jadhav) Authorized Signatory & CEO					

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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com**Test Report
Water Quality**

Report No. : ELPL/QD4/TRD/5.10/W/July-18/43A	Report Date : 09-08-2018
Name & Address of the Customer : GMR Chhattisgarh Energy Ltd. , Unit # 2 x 685 MW, Raikheda, Tilda-Raipur-493114, Chhattisgarh	
Ref. : Our Offer No. ELPL/Q/50/18-19 dtd. 25-06-2018	
Sample Description : Surface Water Sampling Ref Method : IS 3025 (Part 1): 1987 RA 2009 Sample Inward No. :ELPL/July-18/301/66/W-43A	Sampling Location : Surface Water from Raikheda Village Lake Environment Condition: Sunny (during sampling)
Sampling Date : 31-07-18	Sampled By: Mr. Digambar Kale, ELPL Representative
Period of Analysis: From 01-08-2018 to 09-08-2018	

Results of Analysis

Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
1	pH value	--	6.5 to 8.5	8.98	IS 3025 (Part 11): 1983 RA 2017 (Clause 2.0)
2	Total Dissolved Solids	mg/l	500/2000	167.0	IS 3025 (Part 16): 1984 RA 2017
3	Aluminium (as Al)	mg/l	0.03/0.2	<0.006	IS 3025 (Part 2): 2004 RA 2014
4	Barium (as Ba)	mg/l	0.7	0.006	IS 3025 (Part 2): 2004 RA 2014
5	Boron (as B)	mg/l	0.5/1.0	<0.02	IS 3025 (Part 2): 2004 RA 2014
6	Calcium (as Ca)	mg/l	75/200	19.2	IS 3025 (Part 40): 1991 RA 2014 (Clause 5.0))
7	Chloride (as Cl)	mg/l	250/1000	16.9	IS 3025 (Part 32): 1988 RA 2014 (Clause 2.0)
8	Copper (as Cu)	mg/l	0.05/1.5	0.01	IS 3025 (Part 2): 2004 RA 2014
9	Fluoride (as F)	mg/l	1.0/1.5	0.57	IS 3025 (Part 60): 2008 RA 2013 (Clause 6.0)
10	Iron (as Fe)	mg/l	1.0	<0.02	IS 3025 (Part 2): 2004 RA 2014
11	Magnesium (as Mg)	mg/l	30/100	10.7	IS 3025 (Part 46): 1994 RA 2014 (Clause 6.0)
12	Manganese (as Mn)	mg/l	0.1/0.13	0.005	IS 3025 (Part 2): 2004 RA 2014
13	Nitrate (as NO ₃)	mg/l	45	<0.2	APHA -22 nd Ed. -4500 (NO ₃ ⁻) (B)
14	Selenium (as Se)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
15	Silver (as Ag)	mg/l	0.1	<0.005	IS 3025 (Part 2): 2004 RA 2014
16	Sulphate (as SO ₄)	mg/l	200/400	22.7	APHA 22 nd Ed - 4500 SO ₄ ²⁻ (E)
17	Total Alkalinity (as CaCO ₃)	mg/l	200/600	55.0	IS 3025 (Part 23): 1986 RA 2014
18	Total Hardness(as CaCO ₃)	mg/l	200/600	92.0	IS 3025 (Part 21): 2009 RA 2014 (Clause 5.0)



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19	Zinc (as Zn)	mg/l	5/15	0.04	IS 3025 (Part 2): 2004 RA 2014
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Report No. : ELPL/QD4/TRD/5.10/W/July-18/43A Report Date : 09-08-2018 Page 1 of 2

Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
20	Cadmium (as Cd)	mg/l	0.003	<0.003	IS 3025 (Part 2): 2004 RA 2014
21	Lead (as Pb)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
22	Mercury (as Hg)	mg/l	0.001	<0.001	IS 3025 (Part 2): 2004 RA 2014
23	Molybdenum (as Mo)	mg/l	0.07	<0.02	IS 3025 (Part 2): 2004 RA 2014
24	Nickel (as Ni)	mg/l	0.02	<0.02	IS 3025 (Part 2): 2004 RA 2014
25	Total Arsenic (as As)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
26	Total Chromium (as Cr)	mg/l	0.05	<0.005	IS 3025 (Part 2): 2004 RA 2014

Norms : IS 10500: 2012 (Second Revision)

Note : Test results relates to sample collected & tested. It shall not be reproduced partially or fully without prior approval of ELPL.

Remarks: Water is meeting the norms for above parameters

For Earthcare Labs Pvt. Ltd.

(K.L. Jadhav)

Authorized Signatory & CEO

**Environmental Laboratory & EIA Consultant Organization**

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C-11, Amar Enclave Commercial Wing, Jog Layout, Prashant Nagar, Near Ajni Square, Nagpur – 440 015 ,Tel & Fax:(0712) 2251470, Cell: 9766616862
Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com**Test Report
Water Quality**

Report No. : ELPL/QD4/TRD/5.10/W/July-18/44A	Report Date : 09-08-2018
Name & Address of the Customer : GMR Chhattisgarh Energy Ltd. , Unit # 2 x 685 MW, Raikheda, Tilda-Raipur-493114, Chhattisgarh	
Ref. : Our Offer No. ELPL/Q/50/18-19 dtd. 25-06-2018	
Sample Description : Surface Water Sampling Ref Method : IS 3025 (Part 1): 1987 RA 2009 Sample Inward No. :ELPL/July-18/301/66/W-44A	Sampling Location : Surface Water from Bhatapara Village Lake Environment Condition: Sunny (during sampling)
Sampling Date : 31-07-18	Sampled By: Mr. Digambar Kale, ELPL Representative
Period of Analysis: From 01-08-2018 to 09-08-2018	

Results of Analysis

Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
1	pH value	--	6.5 to 8.5	7.59	IS 3025 (Part 11): 1983 RA 2017 (Clause 2.0)
2	Total Dissolved Solids	mg/l	500/2000	533.0	IS 3025 (Part 16): 1984 RA 2017
3	Aluminium (as Al)	mg/l	0.03/0.2	0.01	IS 3025 (Part 2): 2004 RA 2014
4	Barium (as Ba)	mg/l	0.7	0.01	IS 3025 (Part 2): 2004 RA 2014
5	Boron (as B)	mg/l	0.5/1.0	0.02	IS 3025 (Part 2): 2004 RA 2014
6	Calcium (as Ca)	mg/l	75/200	41.6	IS 3025 (Part 40): 1991 RA 2014 (Clause 5.0))
7	Chloride (as Cl)	mg/l	250/1000	134.9	IS 3025 (Part 32): 1988 RA 2014 (Clause 2.0)
8	Copper (as Cu)	mg/l	0.05/1.5	0.01	IS 3025 (Part 2): 2004 RA 2014
9	Fluoride (as F)	mg/l	1.0/1.5	<0.2	IS 3025 (Part 60): 2008 RA 2013 (Clause 6.0)
10	Iron (as Fe)	mg/l	1.0	<0.02	IS 3025 (Part 2): 2004 RA 2014
11	Magnesium (as Mg)	mg/l	30/100	13.1	IS 3025 (Part 46): 1994 RA 2014 (Clause 6.0)
12	Manganese (as Mn)	mg/l	0.1/0.13	0.01	IS 3025 (Part 2): 2004 RA 2014
13	Nitrate (as NO ₃)	mg/l	45	<0.2	APHA -22 nd Ed. -4500 (NO ₃ ⁻) (B)
14	Selenium (as Se)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
15	Silver (as Ag)	mg/l	0.1	0.01	IS 3025 (Part 2): 2004 RA 2014
16	Sulphate (as SO ₄)	mg/l	200/400	90.9	APHA 22 nd Ed - 4500 SO ₄ ²⁻ (E)
17	Total Alkalinity (as CaCO ₃)	mg/l	200/600	40.4	IS 3025 (Part 23): 1986 RA 2014
18	Total Hardness(as CaCO ₃)	mg/l	200/600	158.0	IS 3025 (Part 21): 2009 RA 2014 (Clause 5.0)
19	Zinc (as Zn)	mg/l	5/15	0.05	IS 3025 (Part 2): 2004 RA 2014



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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com

Report No. : ELPL/QD4/TRD/5.10/W/July-18/44A				Report Date : 09-08-2018	
Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
20	Cadmium (as Cd)	mg/l	0.003	<0.003	IS 3025 (Part 2): 2004 RA 2014
21	Lead (as Pb)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
22	Mercury (as Hg)	mg/l	0.001	<0.001	IS 3025 (Part 2): 2004 RA 2014
23	Molybdenum (as Mo)	mg/l	0.07	<0.02	IS 3025 (Part 2): 2004 RA 2014
24	Nickel (as Ni)	mg/l	0.02	<0.02	IS 3025 (Part 2): 2004 RA 2014
25	Total Arsenic (as As)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
26	Total Chromium (as Cr)	mg/l	0.05	<0.008	IS 3025 (Part 2): 2004 RA 2014
Norms : IS 10500: 2012 (Second Revision)					
Note : Test results relates to sample collected & tested. It shall not be reproduced partially or fully without prior approval of ELPL.					
Remarks: Water is meeting the norms for above parameters					
For Earthcare Labs Pvt. Ltd.					
(K.L. Jadhav) Authorized Signatory & CEO					

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Square, Nagpur – 440 015 ,Tel & Fax:(0712) 2251470, Cell: 9766616862

Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com**Test Report
Water Quality**

Report No. : ELPL/QD4/TRD/5.10/W/July-18/45A	Report Date : 09-08-2018
Name & Address of the Customer : GMR Chhattisgarh Energy Ltd. , Unit # 2 x 685 MW, Raikheda, Tilda-Raipur-493114, Chhattisgarh	
Ref. : Our Offer No. ELPL/Q/50/18-19 dtd. 25-06-2018	
Sample Description : Surface Water Sampling Ref Method : IS 3025 (Part 1): 1987 RA 2009 Sample Inward No. :ELPL/July-18/301/66/W-45A	Sampling Location : Surface Water from Back Side of Switch Yard lake Environment Condition: Sunny (during sampling)
Sampling Date : 31-07-18	Sampled By: Mr. Digambar Kale, ELPL Representative
Period of Analysis: From 01-08-2018 to 09-08-2018	

Results of Analysis

Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
1	pH value	--	6.5 to 8.5	7.46	IS 3025 (Part 11): 1983 RA 2017 (Clause 2.0)
2	Total Dissolved Solids	mg/l	500/2000	346.0	IS 3025 (Part 16): 1984 RA 2017
3	Aluminium (as Al)	mg/l	0.03/0.2	0.01	IS 3025 (Part 2): 2004 RA 2014
4	Barium (as Ba)	mg/l	0.7	0.03	IS 3025 (Part 2): 2004 RA 2014
5	Boron (as B)	mg/l	0.5/1.0	<0.02	IS 3025 (Part 2): 2004 RA 2014
6	Calcium (as Ca)	mg/l	75/200	53.6	IS 3025 (Part 40): 1991 RA 2014 (Clause 5.0))
7	Chloride (as Cl)	mg/l	250/1000	33.9	IS 3025 (Part 32): 1988 RA 2014 (Clause 2.0)
8	Copper (as Cu)	mg/l	0.05/1.5	0.01	IS 3025 (Part 2): 2004 RA 2014
9	Fluoride (as F)	mg/l	1.0/1.5	0.86	IS 3025 (Part 60): 2008 RA 2013 (Clause 6.0)
10	Iron (as Fe)	mg/l	1.0	<0.02	IS 3025 (Part 2): 2004 RA 2014
11	Magnesium (as Mg)	mg/l	30/100	8.27	IS 3025 (Part 46): 1994 RA 2014 (Clause 6.0)
12	Manganese (as Mn)	mg/l	0.1/0.13	0.008	IS 3025 (Part 2): 2004 RA 2014
13	Nitrate (as NO ₃)	mg/l	45	<0.2	APHA -22 nd Ed. -4500 (NO ₃ ⁻) (B)
14	Selenium (as Se)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
15	Silver (as Ag)	mg/l	0.1	0.008	IS 3025 (Part 2): 2004 RA 2014
16	Sulphate (as SO ₄)	mg/l	200/400	100.6	APHA 22 nd Ed - 4500 SO ₄ ²⁻ (E)
17	Total Alkalinity (as CaCO ₃)	mg/l	200/600	45.0	IS 3025 (Part 23): 1986 RA 2014
18	Total Hardness(as CaCO ₃)	mg/l	200/600	168.0	IS 3025 (Part 21): 2009 RA 2014 (Clause 5.0)
19	Zinc (as Zn)	mg/l	5/15	0.05	IS 3025 (Part 2): 2004 RA 2014

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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com

Report No. : ELPL/QD4/TRD/5.10/W/July-18/45A				Report Date : 09-08-2018	
Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
20	Cadmium (as Cd)	mg/l	0.003	<0.003	IS 3025 (Part 2): 2004 RA 2014
21	Lead (as Pb)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
22	Mercury (as Hg)	mg/l	0.001	<0.001	IS 3025 (Part 2): 2004 RA 2014
23	Molybdenum (as Mo)	mg/l	0.07	<0.02	IS 3025 (Part 2): 2004 RA 2014
24	Nickel (as Ni)	mg/l	0.02	<0.02	IS 3025 (Part 2): 2004 RA 2014
25	Total Arsenic (as As)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
26	Total Chromium (as Cr)	mg/l	0.05	0.006	IS 3025 (Part 2): 2004 RA 2014
Norms : IS 10500: 2012 (Second Revision)					
Note : Test results relates to sample collected & tested. It shall not be reproduced partially or fully without prior approval of ELPL.					
Remarks: Water is meeting the norms for above parameters					
For Earthcare Labs Pvt. Ltd.					
(K.L. Jadhav) Authorized Signatory & CEO					

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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com**Test Report
Water Quality**

Report No. : ELPL/QD4/TRD/5.10/W/July-18/46A	Report Date : 09-08-2018
Name & Address of the Customer : GMR Chhattisgarh Energy Ltd. , Unit # 2 x 685 MW, Raikheda, Tilda-Raipur-493114, Chhattisgarh	
Ref. : Our Offer No. ELPL/Q/50/18-19 dtd. 25-06-2018	
Sample Description : Ground Water Sampling Ref Method : IS 3025 (Part 1): 1987 RA 2009 Sample Inward No. :ELPL/July-18/301/66/W-46A	Sampling Location : Ground Water from Pizometer Well No. 4 Environment Condition: Sunny (during sampling)
Sampling Date : 31-07-18	Sampled By: Mr. Digambar Kale, ELPL Representative
Period of Analysis: From 01-08-2018 to 09-08-2018	

Results of Analysis

Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
1	pH value	--	6.5 to 8.5	7.26	IS 3025 (Part 11): 1983 RA 2017 (Clause 2.0)
2	Total Dissolved Solids	mg/l	500/2000	556.0	IS 3025 (Part 16): 1984 RA 2017
3	Aluminium (as Al)	mg/l	0.03/0.2	0.01	IS 3025 (Part 2): 2004 RA 2014
4	Barium (as Ba)	mg/l	0.7	0.005	IS 3025 (Part 2): 2004 RA 2014
5	Boron (as B)	mg/l	0.5/1.0	<0.02	IS 3025 (Part 2): 2004 RA 2014
6	Calcium (as Ca)	mg/l	75/200	60.0	IS 3025 (Part 40): 1991 RA 2014 (Clause 5.0))
7	Chloride (as Cl)	mg/l	250/1000	40.4	IS 3025 (Part 32): 1988 RA 2014 (Clause 2.0)
8	Copper (as Cu)	mg/l	0.05/1.5	0.008	IS 3025 (Part 2): 2004 RA 2014
9	Fluoride (as F)	mg/l	1.0/1.5	0.52	IS 3025 (Part 60): 2008 RA 2013 (Clause 6.0)
10	Iron (as Fe)	mg/l	1.0	0.23	IS 3025 (Part 2): 2004 RA 2014
11	Magnesium (as Mg)	mg/l	30/100	4.87	IS 3025 (Part 46): 1994 RA 2014 (Clause 6.0)
12	Manganese (as Mn)	mg/l	0.1/0.13	0.01	IS 3025 (Part 2): 2004 RA 2014
13	Nitrate (as NO ₃)	mg/l	45	<0.2	APHA -22 nd Ed. -4500 (NO ₃ ⁻) (B)
14	Selenium (as Se)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
15	Silver (as Ag)	mg/l	0.1	<0.005	IS 3025 (Part 2): 2004 RA 2014
16	Sulphate (as SO ₄)	mg/l	200/400	73.6	APHA 22 nd Ed - 4500 SO ₄ ²⁻ (E)
17	Total Alkalinity (as CaCO ₃)	mg/l	200/600	185.0	IS 3025 (Part 23): 1986 RA 2014
18	Total Hardness(as CaCO ₃)	mg/l	200/600	172.0	IS 3025 (Part 21): 2009 RA 2014 (Clause 5.0)
19	Zinc (as Zn)	mg/l	5/15	0.09	IS 3025 (Part 2): 2004 RA 2014

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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com

Report No. : ELPL/QD4/TRD/5.10/W/July-18/46A				Report Date : 09-08-2018	
Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
20	Cadmium (as Cd)	mg/l	0.003	<0.003	IS 3025 (Part 2): 2004 RA 2014
21	Lead (as Pb)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
22	Mercury (as Hg)	mg/l	0.001	<0.001	IS 3025 (Part 2): 2004 RA 2014
23	Molybdenum (as Mo)	mg/l	0.07	<0.02	IS 3025 (Part 2): 2004 RA 2014
24	Nickel (as Ni)	mg/l	0.02	<0.02	IS 3025 (Part 2): 2004 RA 2014
25	Total Arsenic (as As)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
26	Total Chromium (as Cr)	mg/l	0.05	<0.005	IS 3025 (Part 2): 2004 RA 2014
Norms : IS 10500: 2012 (Second Revision)					
Note : Test results relates to sample collected & tested. It shall not be reproduced partially or fully without prior approval of ELPL.					
Remarks: Water is meeting the norms for above parameters					
For Earthcare Labs Pvt. Ltd.					
(K.L. Jadhav) Authorized Signatory & CEO					

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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com**Test Report
Water Quality**

Report No. : ELPL/QD4/TRD/5.10/W/July-18/47A	Report Date : 09-08-2018
Name & Address of the Customer : GMR Chhattisgarh Energy Ltd. , Unit # 2 x 685 MW, Raikheda, Tilda-Raipur-493114, Chhattisgarh	
Ref. : Our Offer No. ELPL/Q/50/18-19 dtd. 25-06-2018	
Sample Description : Ground Water Sampling Ref Method : IS 3025 (Part 1): 1987 RA 2009 Sample Inward No. :ELPL/July-18/301/66/W-47A	Sampling Location : Ground Water from Pizometer Well No. 5 Environment Condition: Sunny (during sampling)
Sampling Date : 31-07-18	Sampled By: Mr. Digambar Kale, ELPL Representative
Period of Analysis: From 01-08-2018 to 09-08-2018	

Results of Analysis

Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
1	pH value	--	6.5 to 8.5	7.42	IS 3025 (Part 11): 1983 RA 2017 (Clause 2.0)
2	Total Dissolved Solids	mg/l	500/2000	520.0	IS 3025 (Part 16): 1984 RA 2017
3	Aluminium (as Al)	mg/l	0.03/0.2	0.01	IS 3025 (Part 2): 2004 RA 2014
4	Barium (as Ba)	mg/l	0.7	0.004	IS 3025 (Part 2): 2004 RA 2014
5	Boron (as B)	mg/l	0.5/1.0	<0.02	IS 3025 (Part 2): 2004 RA 2014
6	Calcium (as Ca)	mg/l	75/200	89.6	IS 3025 (Part 40): 1991 RA 2014 (Clause 5.0))
7	Chloride (as Cl)	mg/l	250/1000	10.9	IS 3025 (Part 32): 1988 RA 2014 (Clause 2.0)
8	Copper (as Cu)	mg/l	0.05/1.5	<0.006	IS 3025 (Part 2): 2004 RA 2014
9	Fluoride (as F)	mg/l	1.0/1.5	0.770	IS 3025 (Part 60): 2008 RA 2013 (Clause 6.0)
10	Iron (as Fe)	mg/l	1.0	0.18	IS 3025 (Part 2): 2004 RA 2014
11	Magnesium (as Mg)	mg/l	30/100	3.89	IS 3025 (Part 46): 1994 RA 2014 (Clause 6.0)
12	Manganese (as Mn)	mg/l	0.1/0.13	0.02	IS 3025 (Part 2): 2004 RA 2014
13	Nitrate (as NO ₃)	mg/l	45	<0.2	APHA -22 nd Ed. -4500 (NO ₃ ⁻) (B)
14	Selenium (as Se)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
15	Silver (as Ag)	mg/l	0.1	<0.005	IS 3025 (Part 2): 2004 RA 2014
16	Sulphate (as SO ₄)	mg/l	200/400	73.1	APHA 22 nd Ed - 4500 SO ₄ ²⁻ (E)
17	Total Alkalinity (as CaCO ₃)	mg/l	200/600	205.0	IS 3025 (Part 23): 1986 RA 2014
18	Total Hardness(as CaCO ₃)	mg/l	200/600	240.0	IS 3025 (Part 21): 2009 RA 2014 (Clause 5.0)
19	Zinc (as Zn)	mg/l	5/15	0.28	IS 3025 (Part 2): 2004 RA 2014



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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com

Report No. : ELPL/QD4/TRD/5.10/W/July-18/47A				Report Date : 09-08-2018	
Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
20	Cadmium (as Cd)	mg/l	0.003	<0.003	IS 3025 (Part 2): 2004 RA 2014
21	Lead (as Pb)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
22	Mercury (as Hg)	mg/l	0.001	<0.001	IS 3025 (Part 2): 2004 RA 2014
23	Molybdenum (as Mo)	mg/l	0.07	<0.02	IS 3025 (Part 2): 2004 RA 2014
24	Nickel (as Ni)	mg/l	0.02	<0.02	IS 3025 (Part 2): 2004 RA 2014
25	Total Arsenic (as As)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
26	Total Chromium (as Cr)	mg/l	0.05	<0.005	IS 3025 (Part 2): 2004 RA 2014
Norms : IS 10500: 2012 (Second Revision)					
Note : Test results relates to sample collected & tested. It shall not be reproduced partially or fully without prior approval of ELPL.					
Remarks: Water is meeting the norms for above parameters					
For Earthcare Labs Pvt. Ltd.					
(K.L. Jadhav) Authorized Signatory & CEO					

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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com**Test Report
Water Quality**

Report No. : ELPL/QD4/TRD/5.10/GW/July-18/48	Report Date : 09-08-2018
Name & Address of the Customer : GMR Chhattisgarh Energy Ltd. , Unit # 2 x 685 MW, Raikheda, Tilda-Raipur-493114, Chhattisgarh	
Ref. : Our Offer No. ELPL/Q/50/18-19 dtd. 25-06-2018	
Sample Description : Ground Water Sampling Ref Method : IS 3025 (Part 1): 1987 RA 2009 Sample Inward No. :ELPL/July-18/301/66/GW-48	Sampling Location : Plazometer Well No. 6, Near Raw Water Pump House Environment Condition: Cloudy & Sunny (during sampling)
Sampling Date : 31-07-18	Sampled By: Mr. Digambar Kale, ELPL Representative
Period of Analysis: From 01-08-2018 to 09-08-2018	

Results of Analysis

Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Method
1	pH value	--	6.5 to 8.5	7.52	IS 3025 (Part 11): 1983 RA 2017 (Clause 2.0)
2	Total Dissolved Solids	mg/l	500/2000	343.0	IS 3025 (Part 16): 1984 RA 2017
3	Aluminium (as Al)	mg/l	0.03/0.2	0.008	IS 3025 (Part 2): 2004 RA 2014
4	Barium (as Ba)	mg/l	0.7	0.002	IS 3025 (Part 2): 2004 RA 2014
5	Boron (as B)	mg/l	0.5/1.0	<0.02	IS 3025 (Part 2): 2004 RA 2014
6	Calcium (as Ca)	mg/l	75/200	76.0	IS 3025 (Part 40): 1991 RA 2014 (Clause 5.0))
7	Chloride (as Cl)	mg/l	250/1000	34.9	IS 3025 (Part 32): 1988 RA 2014 (Clause 2.0)
8	Copper (as Cu)	mg/l	0.05/1.5	0.006	IS 3025 (Part 2): 2004 RA 2014
9	Fluoride (as F)	mg/l	1.0/1.5	0.51	IS 3025 (Part 60): 2008 RA 2013 (Clause 6.0)
10	Iron (as Fe)	mg/l	1.0	0.34	IS 3025 (Part 2): 2004 RA 2014
11	Magnesium (as Mg)	mg/l	30/100	9.74	IS 3025 (Part 46): 1994 RA 2014 (Clause 6.0)
12	Manganese (as Mn)	mg/l	0.1/0.13	0.011	IS 3025 (Part 2): 2004 RA 2014
13	Nitrate (as NO ₃)	mg/l	45	0.22	APHA -22 nd Ed. -4500 (NO ₃ ⁻) (B)
14	Selenium (as Se)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
15	Silver (as Ag)	mg/l	0.1	<0.005	IS 3025 (Part 2): 2004 RA 2014
16	Sulphate (as SO ₄)	mg/l	200/400	60.1	APHA 22 nd Ed - 4500 SO ₄ ²⁻ (E)
17	Total Alkalinity (as CaCO ₃)	mg/l	200/600	180.0	IS 3025 (Part 23): 1986 RA 2014
18	Total Hardness(as CaCO ₃)	mg/l	200/600	230.0	IS 3025 (Part 21): 2009 RA 2014 (Clause 5.0)
19	Zinc (as Zn)	mg/l	5/15	0.12	IS 3025 (Part 2): 2004 RA 2014



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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com

Report No. : ELPL/QD4/TRD/5.10/GW/July-18/48				Report Date : 09-08-2018	
Sr. No.	Test Parameters	Unit	Acceptable/ Permissible Limit	Result	Test Met Page 1 of 2
20	Cadmium (as Cd)	mg/l	0.003	<0.003	IS 3025 (Part 2): 2004 RA 2014
21	Lead (as Pb)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
22	Mercury (as Hg)	mg/l	0.001	<0.001	IS 3025 (Part 2): 2004 RA 2014
23	Molybdenum (as Mo)	mg/l	0.07	<0.02	IS 3025 (Part 2): 2004 RA 2014
24	Nickel (as Ni)	mg/l	0.02	<0.02	IS 3025 (Part 2): 2004 RA 2014
25	Total Arsenic (as As)	mg/l	0.01	<0.01	IS 3025 (Part 2): 2004 RA 2014
26	Total Chromium (as Cr)	mg/l	0.05	<0.005	IS 3025 (Part 2): 2004 RA 2014
Norms : IS 10500: 2012 (Second Revision)					
Note : Test results relates to sample collected & tested. It shall not be reproduced partially or fully without prior approval of ELPL.					
Remarks: Water is meeting the norms for above parameters					
For Earthcare Labs Pvt. Ltd.					
(K.L. Jadhav) Authorized Signatory & CEO					

**Environmental Laboratory & EIA Consultant Organization**

(NABL QCI Accredited , MoEF Recognized, NABET QCI Accredited, ISO 9001, ISO 14001 & OHSAS 18001 Certified)

C-11, Amar Enclave Commercial Wing, Jog Layout, Prashant Nagar, Near Ajni

Square, Nagpur – 440 015 ,Tel & Fax:(0712) 2251470, Cell: 9766616862

Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com**Test Report
Soil Quality**

Report No. : ELPL/QD4/TRD/5.10/SO/July-18/04	Report Date : 09-08-2018
Name & Address of the Customer : GMR Chhattisgarh Energy Ltd. , Unit # 2 x 685 MW, Raikheda, Tilda-Raipur-493114, Chhattisgarh	
Ref. : Our Offer No. ELPL/Q/50/18-19 dtd. 25-06-2018	
Sample Description : Soil Sample	Sampling Location : Soil Taken from South Direction Ash Pond
Sampling Ref Method : Soil Chemical Analysis M. L. Jackson	Environment Condition: Cloudy & Sunny (during sampling)
Sample Inward No. :ELPL/July-18/301/66/SO-04	
Sample Collected Date : 31-07-2018	Sampled By: Mr. Digambar Kale, ELPL Representative
Period of Analysis: From 01-08-2018 to 09-08-2018	

Results of Analysis

Sr. No.	Parameters	Unit	Concentration	Method
1	pH	--	8.32	Electrometric Method, IS:2720 (Part 26) -1987 RA 2002
2	Electrical Conductivity	dS/m	0.22	Conductivity Meter Method, IS:14767 - 2000
3	Aluminum (as Al),	mg/kg	32.2	AES Method, USEPA 3050 B, 1996
4	Barium (as Ba)	mg/kg	375.6	AES Method, USEPA 3050 B, 1996
5	Boron (as B)	mg/kg	1.36	AES Method, USEPA 3050 B, 1996
6	Copper (as Cu)	mg/kg	16.1	AES Method, USEPA 3050 B, 1996
7	Iron (as Fe)	mg/kg	16055.0	AES Method, USEPA 3050 B, 1996
8	Manganese (as Mn)	mg/kg	571.1	AES Method, USEPA 3050 B, 1996
9	Cadmium (as Cd)	mg/kg	<0.2	AES Method, USEPA 3050 B, 1996
10	Nickel (as Ni)	mg/kg	<1.0	AES Method, USEPA 3050 B, 1996
11	Zinc (as Zn)	mg/kg	83.5	AES Method, USEPA 3050 B, 1996
12	Lead (as Pb)	mg/kg	<0.5	AES Method, USEPA 3050 B, 1996
13	Chromium (as Cr)	mg/kg	57.6	AES Method, USEPA 3050 B, 1996
14	Silver (as Ag)	mg/kg	0.83	AES Method, USEPA 3050 B, 1996
15	Molybdenum (as Mo)	mg/kg	<1.0	AES Method, USEPA 3050 B, 1996

For Earthcare Labs Pvt. Ltd.(K. L. Jadhav)
Authorized Signatory & CEO

**Test Report
Soil Quality**

Report No. : ELPL/QD4/TRD/5.10/SO/July-18/05	Report Date : 09-08-2018
Name & Address of the Customer : GMR Chhattisgarh Energy Ltd. , Unit # 2 x 685 MW, Raikheda, Tilda-Raipur-493114, Chhattisgarh	
Ref. : Our Offer No. ELPL/Q/50/18-19 dtd. 25-06-2018	
Sample Description : Soil Sample	Sampling Location : Soil Taken from North Direction Ash Pond
Sampling Ref Method : Soil Chemical Analysis M. L. Jackson	Environment Condition: Cloudy & Sunny (during sampling)
Sample Inward No. :ELPL/July-18/301/66/SO-05	
Sample Collected Date : 31-07-2018	Sampled By: Mr. Digambar Kale, ELPL Representative
Period of Analysis: From 01-08-2018 to 09-08-2018	

Results of Analysis

Sr. No.	Parameters	Unit	Concentration	Method
1	pH	--	8.52	Electrometric Method, IS:2720 (Part 26) -1987 RA 2002
2	Electrical Conductivity	dS/m	0.259	Conductivity Meter Method, IS:14767 - 2000
3	Aluminum (as Al),	mg/kg	33.1	AES Method, USEPA 3050 B, 1996
4	Barium (as Ba)	mg/kg	488.3	AES Method, USEPA 3050 B, 1996
5	Boron (as B)	mg/kg	3.54	AES Method, USEPA 3050 B, 1996
6	Copper (as Cu)	mg/kg	13.3	AES Method, USEPA 3050 B, 1996
7	Iron (as Fe)	mg/kg	13755.0	AES Method, USEPA 3050 B, 1996
8	Manganese (as Mn)	mg/kg	784.9	AES Method, USEPA 3050 B, 1996
9	Cadmium (as Cd)	mg/kg	<0.2	AES Method, USEPA 3050 B, 1996
10	Nickel (as Ni)	mg/kg	<1.0	AES Method, USEPA 3050 B, 1996
11	Zinc (as Zn)	mg/kg	62.6	AES Method, USEPA 3050 B, 1996
12	Lead (as Pb)	mg/kg	<0.5	AES Method, USEPA 3050 B, 1996
13	Chromium (as Cr)	mg/kg	33.1	AES Method, USEPA 3050 B, 1996
14	Silver (as Ag)	mg/kg	2.81	AES Method, USEPA 3050 B, 1996
15	Molybdenum (as Mo)	mg/kg	<1.0	AES Method, USEPA 3050 B, 1996

For Earthcare Labs Pvt. Ltd.(K. L. Jadhav)
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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com**Test Report
Soil Quality**

Report No. : ELPL/QD4/TRD/5.10/SO/July-18/06	Report Date : 09-08-2018
Name & Address of the Customer : GMR Chhattisgarh Energy Ltd. , Unit # 2 x 685 MW, Raikheda, Tilda-Raipur-493114, Chhattisgarh	
Ref. : Our Offer No. ELPL/Q/50/18-19 dtd. 25-06-2018	
Sample Description : Soil Sample	Sampling Location : Soil Taken from West Direction Ash Pond
Sampling Ref Method : Soil Chemical Analysis M. L. Jackson	Environment Condition: Sunny (during sampling)
Sample Inward No. :ELPL/July-18/301/66/SO-06	
Sample Collected Date : 31-07-2018	Sampled By: Mr. Digambar Kale, ELPL Representative
Period of Analysis: From 01-08-2018 to 09-08-2018	

Results of Analysis

Sr. No.	Parameters	Unit	Concentration	Method
1	pH	--	8.31	Electrometric Method, IS:2720 (Part 26) -1987 RA 2002
2	Electrical Conductivity	dS/m	0.237	Conductivity Meter Method, IS:14767 - 2000
3	Aluminum (as Al),	mg/kg	28.4	AES Method, USEPA 3050 B, 1996
4	Barium (as Ba)	mg/kg	252.32	AES Method, USEPA 3050 B, 1996
5	Boron (as B)	mg/kg	2.815	AES Method, USEPA 3050 B, 1996
6	Copper (as Cu)	mg/kg	11.625	AES Method, USEPA 3050 B, 1996
7	Iron (as Fe)	mg/kg	7850.0	AES Method, USEPA 3050 B, 1996
8	Manganese (as Mn)	mg/kg	454.45	AES Method, USEPA 3050 B, 1996
9	Cadmium (as Cd)	mg/kg	0.33	AES Method, USEPA 3050 B, 1996
10	Nickel (as Ni)	mg/kg	<1.0	AES Method, USEPA 3050 B, 1996
11	Zinc (as Zn)	mg/kg	33.34	AES Method, USEPA 3050 B, 1996
12	Lead (as Pb)	mg/kg	<0.5	AES Method, USEPA 3050 B, 1996
13	Chromium (as Cr)	mg/kg	33.125	AES Method, USEPA 3050 B, 1996
14	Silver (as Ag)	mg/kg	0.505	AES Method, USEPA 3050 B, 1996
15	Molybdenum (as Mo)	mg/kg	<1.0	AES Method, USEPA 3050 B, 1996

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Email: earthcare2000@gmail.com, **Website:** www.earthcarenagpur.com**Test Report
Soil Quality**

Report No. : ELPL/QD4/TRD/5.10/SO/July-18/07	Report Date : 09-08-2018
Name & Address of the Customer : GMR Chhattisgarh Energy Ltd. , Unit # 2 x 685 MW, Raikheda, Tilda-Raipur-493114, Chhattisgarh	
Ref. : Our Offer No. ELPL/Q/50/18-19 dtd. 25-06-2018	
Sample Description : Soil Sample	Sampling Location : Soil Taken from East Direction Ash Pond
Sampling Ref Method : Soil Chemical Analysis M. L. Jackson	Environment Condition: Sunny (during sampling)
Sample Inward No. :ELPL/July-18/301/66/SO-07	
Sample Collected Date : 31-07-2018	Sampled By: Mr. Digambar Kale, ELPL Representative
Period of Analysis: From 01-08-2018 to 09-08-2018	

Results of Analysis

Sr. No.	Parameters	Unit	Concentration	Method
1	pH	--	8.42	Electrometric Method, IS:2720 (Part 26) -1987 RA 2002
2	Electrical Conductivity	dS/m	0.224	Conductivity Meter Method, IS:14767 - 2000
3	Aluminum (as Al),	mg/kg	30.6	AES Method, USEPA 3050 B, 1996
4	Barium (as Ba)	mg/kg	288.1	AES Method, USEPA 3050 B, 1996
5	Boron (as B)	mg/kg	3.98	AES Method, USEPA 3050 B, 1996
6	Copper (as Cu)	mg/kg	16.7	AES Method, USEPA 3050 B, 1996
7	Iron (as Fe)	mg/kg	15985.0	AES Method, USEPA 3050 B, 1996
8	Manganese (as Mn)	mg/kg	394.3	AES Method, USEPA 3050 B, 1996
9	Cadmium (as Cd)	mg/kg	0.49	AES Method, USEPA 3050 B, 1996
10	Nickel (as Ni)	mg/kg	<1.0	AES Method, USEPA 3050 B, 1996
11	Zinc (as Zn)	mg/kg	39.6	AES Method, USEPA 3050 B, 1996
12	Lead (as Pb)	mg/kg	<0.5	AES Method, USEPA 3050 B, 1996
13	Chromium (as Cr)	mg/kg	79.8	AES Method, USEPA 3050 B, 1996
14	Silver (as Ag)	mg/kg	0.455	AES Method, USEPA 3050 B, 1996
15	Molybdenum (as Mo)	mg/kg	<1.0	AES Method, USEPA 3050 B, 1996

For Earthcare Labs Pvt. Ltd.(K. L. Jadhav)
Authorized Signatory & CEO

Annexure III



ANNUAL REPORT

APRIL 2018- MARCH 2019



GMR Varalakshmi Foundation
GMR Chhattisgarh Energy Limited, Tilda

HIGHLIGHTS OF CSR ACTIVITIES

Education

- Supported 50% salary of 10 teachers at Raikheda Higher Sec. School that benefitted 125 students.
- 3 students benefitted from the Saksham Scholarship Scheme.
- Provided coaching for 53 students of Navodaya Entrance Examination
- Running Kid Smart Early Learning Centers at Raikheda, Chicholi and Gaitra benefiting 149 children.
- Provided transportation facility for 87 girls from the project affected villages to attend college in Tilda.
- 5 library centers in 5 villages are operational. 32867 people used library facility.
- Through library, Books support to College & D-Led students.

Health, Hygiene and Sanitation

- Four dispensaries are operational catering to an average of 423 patients per month
- Mobile Medical Unit Services reached out to 1016 patients per month from 9 villages
- Provided door to door medical services for 212 elderly people.
- Provided support for 100 pregnant and lactating women through nutrition center in 3 Panchayats
- 48 Health Awareness Programs organized in schools covering 2460 students.
- Public Toilets at Gaitera and Bhatapara benefitted more than 104 families.
- Conducted awareness camps on personal hygiene and sanitation for over 920 women.

Empowerment and Livelihoods

- Trained 50 youth in two courses (Mobile and RAC repairing) at VTC and 07 youth are now self-employed.
- Provided support to 106 youth in computer training at the Computer Literacy Center.
- Trained 87 women on advanced tailoring course. 4th Batch of 27 women & girls are near to be concluded.
- 30 women received bulk order to stitch school bags, pants, shirts and blouses etc.
- 18 students have been achieved success in this session at Pratibha Center.
- 3 youth group, which has 36 members, was supported with Volley Ball kit.
- 18 women of VO- SHG at Raikheda have laid fly ash brick manufacturing plant from Dec 2018.
- Approximately 80 tons fly ash have been delivered to the group from our plant free of cost for the brick.

- Around 60000 bricks have been sold by them so far.

DETAILS OF CSR ACTIVITIES

BACKGROUND OF THE PROJECT

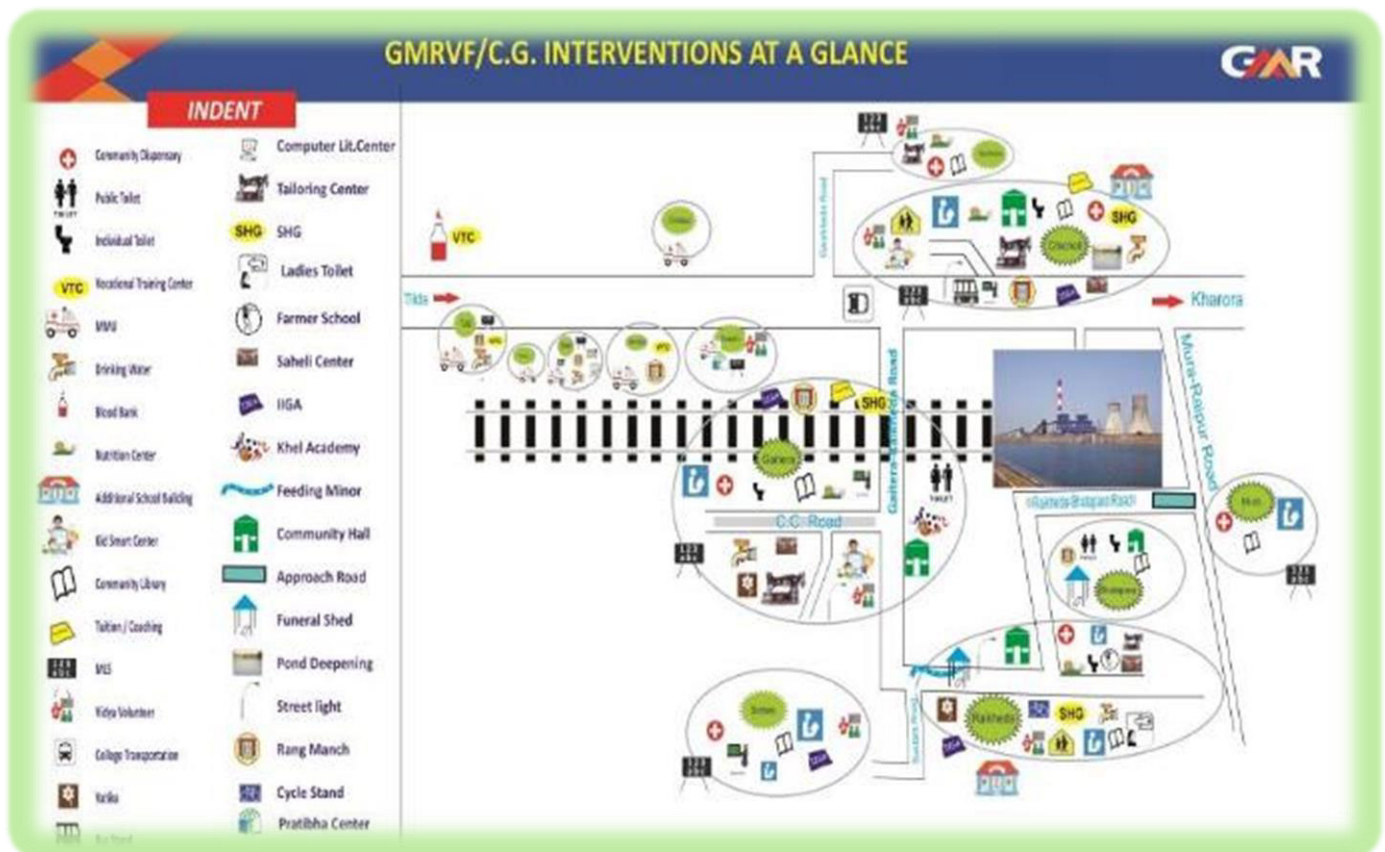
GMR Varalakshmi Foundation (GMR VF) in Chhattisgarh mainly works in 11 Gram Panchayats, namely Raikheda, Chicholi, Gaitra, Gourkheda, Sontara, Murra, Tulsi, Khamharia, Konari, Bartori, Tarashiv Chatod and Samoda in Tilda and Aarang block of Raipur District in Chhattisgarh. Approximately 35,000 individuals are covered in all the villages. Although the rapport building activities in the project area started in March 2009, the actual work began in June 2009. CSR activities in Railway Siding and other nearby villages had started in the year 2015.

The region is heavily dependent on agriculture. Majority of the population belongs to the other Backward Caste and Scheduled Caste community. Around 80% of landowners are marginal farmers with less than 2 acres of agricultural land. They depend on single Kharif crop of Paddy.

As per law, CSR Committee has been set by GCEL. Though there was no mandatory spend during the year, as part of the philosophy of the Group, CSR activities were carried out with the approval of the CSR Committee during the year.

The GMR VF Team at Chhattisgarh comprises of a One Program Executive, three Jr. Assistants, and 22 field volunteers. The various interventions implemented in the project area is depicted below:

GCEL PROGRAM COVERAGE AREA:



DETAILED REPORT

A. EDUCATION

1. Support to Government Schools

- a) **Financial Assistance to Raikheda Higher Secondary School:** For the past 5 years, GMR VF is providing financial assistance to Raikheda Higher Secondary School by sharing 50% salary for 10 teachers. This has helped in the retention of quality teachers.
- b) **Support to Government School:** Despite of many challenges we have supported to 14 govt. schools where approximately 1568 children at our PAV's & RAV's have been benefitted with teacher supports by use of existing volunteers whose are committed to serve on our different activities without any obligations as we have withdrawn Vidya volunteers for the schools support in current Financial year. Simultaneously conducted health awareness camps to each schools and career counseling to higher secondary students by GCEL employees.
- c) **Infrastructure Support by GCEL:** GECL supported the Middle school, Gaitara for the construction of "Toilet".

2. Direct Support to Children

- a) **Saksham Scholarship:** GMR VF had launched the Saksham Scholarship scheme in 2013, with a vision of supporting students from project affected villages pursuing professional courses in government or private institutions by providing 50% of the fees. 3 students from Chicholi and Raikheda villages and are studying engineering and nursing have been benefitted from this scheme yet.
- b) **Navodaya Coaching:** GMRVF started Navodaya entrance coaching in 2011 at one project village and later expanded it to two more villages. Four Navodaya centres are being run in four different villages i.e. Raikheda, Gaitara, Tarashiv and Chicholi and 53 selected students from 4 villages are attending classes at these centres regularly. Regular tests are being conducted at these centres and based on the performance of the children in these tests, special attention would be given to the children who are scoring less marks. Regular parents meetings are being conducted at these centres and children's academic performance is shared with the parents in these meetings. During the reporting period, 7 student from Raikheda Gaitra and Chicholi who attended last year's coaching classes has been selected for Navodaya admission.
- c) **Kid Smart Centers:** Kid Smart Early Learning Centre is the computer-based learning center especially designed for 3-9 year old children. First center was opened in July 2010 at Raikheda with five computer unit. Second Smart center was opened at Primary School, Chicholi in March 2012 with three computer Units and third center established at Gaitara school campus in January 2015. Currently, 149 children are attending these Kid smart centers in 9 batches. Various creativity sessions are running in all the centers.



- d) **Kid smart express** is published by small journalist of Raikheda, Gaitra and Chicholi center. Test and Parents' meeting and Birth Day celebration have organized at the end every month. Drawing & painting and Calligraphy competition are organized very often in different of Occasions. Mothers' meet is organized every month where top scorers of monthly tests are felicitated.
- e) **Transport Facility for College Going Girls:** Students from the Project Affected Villages (PAV) who wants to extend their higher education have to go to college which is about 22 kms far from PAV in Tilda city, Due to the lack of transportation facility, commuting to college is difficult particularly for girls. To address this issue, GMR VF has initiated transportation facility since 2010, exclusively for girls from the PAV, who attend college in Tilda. During the reporting period, a bus has been purchased and maintained with financial support from TIM Delhi Airport Advertising Pvt. Ltd. around 87 girls from 7 villages are getting benefit so far.
- f) **Awareness programs for children including the celebrations of National Days** - World Environment Day, children's Day, Road Safety Week, Yoga Day (900 students participated), was celebrated in the government schools at Chicholi, Tarashiv, Raikheda and Chhatod. Poster & essay competition for school children and Rangoli competition for women was also organized. The winners of various competitions won attractive prizes. More than 342 students and women have participated in the programs.



On the occasion of Independence Day, on August 15, 7 Navodaya students were Felicitated by Mr. Ravishakar S (COO) GCEL & Mr. Sandeep Pachpor (VP) GCEL.

On the occasion of Independence Day, on August 15, 24 meritorious students were Felicitated by Mr. Ravi Shankar S GCEL & Mr. Sandeep Pachpor (VP) GCEL.

On the occasion of Independence Day, on August 15, CSR Team were Felicitated Mr. Ravi Shankar S (COO) GCEL & Mr. Sandeep Pachpor (VP) GCEL.

B. HEALTH, HYGIENE AND SANITATION

GMR VF has signed MOU with Mission Hospital, Tilda to provide preventive and curative health services to people in the Project affected villages. Simultaneously we are also running a Mobile Medical Unit in association with Jan Jagran Sansthan, Tilda for the health services at Railway affected villages.



1. **Community Dispensaries:** GMR Foundation started its first dispensary in October 2009 at Village Development Center (VDC), Raikheda. Later five more dispensaries were started in five other villages. Team of Doctors is visiting the dispensaries fortnightly from Mission Hospital, Tilda. Medicines are provided to all the patients for seasonal ailments free of cost. Average OPD during reporting period was observed 423 patients per month.
2. **Mobile Medical Unit:** The MMU is run by a professional team which includes a doctor, nurse and pharmacist who visits 9 villages fortnightly. The MMU covers 8 villages in Tilda block and 1 village in Aarang block. The MMU is beneficial mainly to the elderly, women and children. About 1,016 people have been benefited from the MMU monthly. The MMU doctor also visited schools on a regular basis and educate children on health and personal hygiene.
 
3. **Nutrition Center:** To provide proper nutrition and ante-natal services to pregnant and lactating women, Nutrition Centers have been initiated in 5 villages. Daily nutrition menu has been worked out and nutrition supplements were provided to 100 beneficiaries regularly at the center. Apart from provision of nutrition supplements and regular health check-ups, the women were also given awareness on the precautions to be taken up during pregnancy and lactating stage.
4. **Health Awareness:** Health awareness classes were organized on a weekly basis for women. Students from the Nursing School of Mission Hospital have facilitated the awareness sessions in the community dispensaries targeting pregnant and lactating women. Sessions focused on personal hygiene, diarrhea, seasonal ailments, pregnancy complications and precautions, cancer and malnourishment. Several programs on screening of breast cancer was also organized in support with the mission hospital. More than 338 women from the villages of Raikheda, Chicholi and Gaitra were participated in the program.
5. **X-Ray Machine at CHC, Kharora and Blood Bank in Tilda:** GCEL had provided an X-Ray unit to the Community Health Centre, Kharora in 2014. 729 patients have got benefit from the X-Ray machine by the reporting period. A blood bank was established by GMR VF five years ago at Mission Hospital, Tilda. The bank had collected 248 units of blood during the reporting period.
6. **School Health Camps:** Total 48 Health Awareness Programs have been organized in schools and have covered 2,460 students during the current FY Year.

Sanitation

7. **Maintenance of Public Toilets:** GMRVF with the support from GMR Chhattisgarh Energy Limited constructed 2 Public Toilet in Bhatapara and Gaitra Village. Presently Public Toilet is being used by 104 poor families in both villages. The use of Public toilet in villages has encouraged that family to use, who cannot afford for individual private toilet. In the current year maintenance of toilet is being done by us and we are providing support of sweeper, cleaning materials and repair and maintenance. The Public Toilet is useful in reducing open defecation in both Villages.

EMPOWERMENT AND LIVELIHOODS

GMR VF also emphasizes on channelizing the skills of youths and women to enhance the income level of all the families in the project affected area through different empowerment and livelihoods programs.

1. Vocational Trainings

GMR VF started village based vocational training (Mobile repairing and RAC repairing course for 90 days) at Kharora in January 2019. Mobile Repair courses were run in the center during the reporting period. These training programs were funded by DDFS and Govt. Mahila Polytechnic College, Raipur.



Name of the course	Number of batches conducted during this period	Number of Youth trained	Number of youth settled.
Mobile repairing	02	34	07
RAC repairing	01	16	00
Total	03	50	07

2. Skill Training in the Villages

a) **Computer Literacy Center:** The crash course on basic computer skill has continued in Computer Center for all students of Std. X to XII. 106 students have been benefited from 2018-19 session so far. 37 students benefited in 4th batch of Computer Literacy Center at nearby villages. Monthly test examination have been organized at the end of month



b) **Tailoring Training cum Production center:** 87 women were trained in tailoring skill during the reporting period. 15 members are regularly visiting in our tailoring cum production centre and learning advance tailoring for their income generation. Various groups have been formed for stitching and specialised training like travel bags making and designing work in blouse etc. This training has given an especial confidence and skills to fashion different types of designer bags to the trainees. So far the women have been earned Rs. 182,000/- from the center.



Chhattisgarh Government has organized "Saras Mela" in Raipur, where various types of stitched bags by our trainees of production center have been displayed on exhibition for selling purpose.



c) **Pratibha Library:** GMR Varalakshmi Foundation has established PRATIBHA library cum counselling center for the youth at village Raikheda. A separate batch for competitive exam has started with 38 students. Free books, newspaper, Rojgar Samachar news periodicals are available at Pratibha Centre for Local youths. 22 students have been successful in "Chhattisgarh Armed Forces" physical



examination, now focused on preparing for the written examination. Out of which 3 students have been selected in Chhattisgarh Force (Physical Examination and written exam). And are awaiting medical test. This year 18 students have been selected in various state level competitions from our center yet. Like 1 has joined in department of C.G. Power Distribution Company limited, Suhela, DC Bhatapara Division and 1 has joined as a Technician in C&I Department in Privet Company. 3 in CAF, 1 in Awas-Mitra, 1 as a assistant fitter in private company, 1 student has joined as a conveyer operator in private company, 2 students cleared written exam in Railway group "D" , 1 student cleared written exam in RPF, and 7 students cleared in railway "ALP" 1st stage.. Considering the usefulness of this activity, GCEL employee Shri Sreekanth Pai (Head - BTG) has committed to give 1 day in a week to conduct classes on "Spoken English ".

d) **Community Libraries:** Currently GMR VF is operating five libraries located at Raikheda, Bhatapara, Gaitera, Gaurkheda & Chicholi. Several programs like painting and rangoli competitions were organized in the libraries. Youth in the village are also using the library to read periodicals to prepare for competitive examinations. 55 people completed their graduate and post graduate courses with the help of the library services.

3. Self Help Group

Forty-one SHGs comprised of 488 members are being supported by foundation are working on women social, economic and political development. Monthly meetings, record keeping, inter-lending are being done by SHGs on regular basis. 42 SHG Members are engaged in income generation activities and earning the income from below activities:



- 8 women are making baby set which is being sold at nearby local hospitals. Earns Rs. 1700/- monthly by each one.
- 10 Members of various groups are engaged in Papad making and earning their livelihood. Earns Rs. 1500/- monthly by each one
- 7 members of SHG are working to make Murra Laddu. Earns Rs. 1000/- monthly by each women
- 6 members of SHG are making "Ready to Eat" meals. Earns Rs. 600/- monthly by each women
- 11 members of Annapurna SHG are making Dona-Pattal. Earns Rs. 9000/- by all women.
- 18 members of Village Organization, Raikheda are making Bricks. Earns Rs. 2400/- by each one.

4. Support to Micro-enterprises and Other Livelihood Activities

a) **Individual IGA Support:** In order to enhance the income levels of poor families, small scale Income Generation Activities are being promoted among project affected families. Till last year, 271 families were supported for the same.



C. Specific initiatives

1. **SWA – DAN by Collage going girls:** The college going girls, who are getting benefit from our School Bus facility, were given the awareness about the "SWA-DAN" program. Under the "SWA-DAN" program, free tuition classes have been introduced in village Gaurkhehda and Raikheda, by our school bus beneficiaries. 48 college going girls have given free tuition to more than 250 students at their home.



2. **SWA - DAN by Trainees of Production Center:** The trainees of tailoring, who are getting benefit from our Training cum Production center, were given the awareness about the "SWA-DAN" program.

Under the "SWA-DAN" program, free Uniform repairing work was introduced in Primary School, at village Bhatpara, Raikheda, Gaitra, Tarashiv & Gaurkhrda by our Training cum Production center beneficiaries

Now Approx. 209 students are getting benefit by our 30 Trainees at Primary School Bhatpara, Raikheda, Gaitra, and Tarashiv & Gaurkhrda.



D. EMPLOYEE ENGAGEMENTS

GCEL have always been very vigorous in volunteering for different community assistance. This year 221 employees participated in 15 community development programs and contributed 4,67 voluntary hours which benefitted more than 7,000 people.

Joy of Giving: This year 4 event were planned under Daan Utasav program in which 118 Employees contributed Rs.72224/- and touched the gut of philanthropic turns. This has made outstanding smiles on the face of 352 Children & Women of our surrounding communities.

The details of employee engagement during the year are given below.

Employee Engagement	Total
No. of Programs	15
No. of beneficiaries	7065
No. of family members and employee volunteers	221
Hours of involvement of employees and family members (person hours).	467

Blood Donation Camp:

- One-day blood donation camp organized by GCEL.
- More than 208 units of blood collected with the help of Raipur Red Cross Society Blood Bank in the eve of 72 Independence Day.
- GMR officials, CSR Team, RAXA Security Services and members of the neighbourhood community and Contract workers donated their blood in the event.



F. SPECIAL ACHIEVEMENTS, CHALLENGES, LEARNINGS & WAY FORWARDS

Special Achievements

- INDIA CSR Leadership Award:** The GCEL and GMRVF has won the prestigious INDIA CSR Leadership accolades in the category of “Innovative Projects in Education”. Chhattisgarh CSR Leadership summit & awards was hosted by India CSR network on Friday, Aug 24, 2018 at Hotel Babylon international Raipur. Over 300 Corporates, CSR leaders, NGO’s & consultants including NABARD and other govt. agencies took part in the summit. The awards was handed over by Hon’ble minister of Water resources & Agriculture Development of Chhattisgarh Shri Brijmohan Agrawal.
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- Navodaya Selection:** 7 Students have been selected in Navodaya examinations and is studying.
 - Pratibha Selection:** 18 candidates have been selected in Government job/privet job through our PRATIBHA center.

Challenges Faced

- High expectations among community members.
- Huge demands from Panchayat Presidents (Sarpanch) despite plant not being in operation.
- Since the activities of Foundation is getting close and reduce at the village level are losing the faith on us and this may lead huge unhappiness too.

Strategic Plan for Coming Year

- Convergence with ongoing government programs and leveraging available resources.
- Marketing linkages for products made by SHG members and Training cum Production center.
- Linking SHG and other programs with other NGO/Govt programs for its sustainability.

Annexure IV

DETAILS OF CSR ACTIVITIES WITH IMPLEMENTATION /EXPENDITURE PLAN (In Lakh Rs)

GMR CHHATTISGARH ENERGY LTD.

#	Line Item	Till March'11	EXPENSES				Exp.	Exp.	Exp.	PLAN	Exp	Total
			2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2018-19	
A	EDUCATION	13.52	31.82	24.35	19.25	39.30	37.99	42.32	24.61	14.10	20.22	247.26
1	Adoption of Govt.Anganwadis for infrastructure & quality improvement		2.15	2.3	1.6	1.65	2	3	0.36	2.10	0.70	15.16
2	Infrastructure supplementation in Govt.Schools of Project Affected Villages		17.67	11.1	5.5	15.4	12.1	4	3.79	2.00	1.38	71.56
3	Village Intensive Education Program for quality improvement in primary education		3	2.46	1.5	6.15	7.46	10	3.29	2.00	2.11	35.86
4	Tuitions for weaker children		3	1.5	1.5	5	5	2	1.85	1.00	2.94	20.85
5	Scholarships for potential youth for higher education		0	0.45	1.45	3	3.23	2.32	1.44	1.00	0.78	12.89
6	Establishing School and running of school		0	0	0	0	0		0.00	4.00	4.80	4.00
7	Support for existing High School		4.5	4.44	5.3	5.5	5.5	5	9.75	1.00	2.77	40.99
8	Transportation support for college going students		1.5	2.1	2.4	2.6	2.7	16	4.13	1.00	4.74	32.43
B	HEALTH	24.86	39.37	28.85	19.10	33.45	48.20	52.85	30.10	18.50	26.09	321.37
1	Community Dispensaries for primary health services		7.2	10.1	12.5	10.3	10.7	9	7.28	1.50	6.08	68.58
2	MMU Unit services for primary health services.			0	0	0	25	15	16.73	2.00	11.00	58.73
3	Strengthening of existing Health Center		2.25	1.75	3.5	1.9	2	3.35	0.00	1.00	0.00	15.75
4	Ambulance service for target villages		0.81	1	1	1.1	1	0.5	0.00	1.00	0.00	6.41
5	Strengthening of existing Veterinary Clinic		0	0	0	0	0	1	0.00	5.00	0.00	6.00
6	Community Plantation		0	0	0	0	0		0.00	3.00	0.25	3.00
7	Individual Toilet support in Villages.			0	0	0	5.6	16	0.00	2.00	0.00	23.60
8	Maintenance of Public Toilets in PAVs		25.11	16	2.1	3.9	3.9	5	2.49	2.00	1.85	60.50
9	Support for elderly people		4	0	0	16.25		3	0.00	1.00	4.71	24.25
10	Nutrition center								3.61		2.20	3.61
C	EMPOWERMENT & LIVELIHOOD	14.12	8.26	16.05	33.50	21.16	23.00	49.65	14.02	11.10	10.02	200.88
1	Sponsoring vocational trainings for drop out youth		1.9	3.85	5.5	9.2	1	10	0.56	4.10	1.53	36.11
2	Establishing Vocational Training Center		0	0	0	0	8	17	6.78	2.00	0.70	33.78
3	Community Based Trainings focussing women empowerment		2.4	3.45	11	6.46	5	2	2.79	1.00	0.60	34.10
4	Farmer's School with demonstration farm		1.2	1.8	2.5	1.3	1	3.25	0.60	1.00	0.00	12.65
5	Micro enterprises through self Help Groups		1.5	3.95	6	3.75	3	2	0.41	1.00	0.86	21.61
6	Computer and training center							11.4	1.58		0.95	12.98
7	livelihood enhancement Individual income Generation		1.26	3	3	0.45	5	4	1.30	1.00	2.49	19.01
8	Establishing Livelihood center		0	0	5.5	0			0.00	1.00	2.89	6.50
D	COMMUNITY DEVELOPMENT	159	382.04	232.55	88.50	82.42	101.90	40.96	18.90	30.00	13.77	1150.04
1	Community drinking water facilities		19.43	2	8	10.63	16.6	2	0.00	6.00	0.00	64.66
2	Drainage facilities in villages		23.74	5	6	0	10		0.00	4.00	0.00	48.74
3	Renovation/construction of village approach roads		295.82	191	9.5	3.77	10	0	7.45	4.00	0.00	521.54
4	Renovation of domestic ponds		16.62	27.55	25	39.6	10.3	4	0.00	4.00	0.00	127.07
5	Developing play grounds		0	0	15	11.75	5		0.00	2.00	0.00	33.75
6	Developing community facilities like community halls, bus shelter, boundary wall, fencing, pond step, market place, maintenance of park in naya raipur		26.43	7	25	16.67	50	34.96	11.45	10.00	13.77	181.51
E	ADMIN & HR	22.36	23.46	24.80	26.70	33.00	29.21	42.65	12.75	5.00	4.09	224.02
1	Staffing, monitoring and program management		22.7	23.6	26.7	33	29.21	29.49	12.75	4.00	1.94	181.45
2	Establishment		0.76	1.2	0	0		13.16	0.00	1.00	2.15	16.12
		233.86	484.95	326.60	187.05	209.33	240.30	228.43	100.38	78.70	74.19	2163.79
Total CSR Expenses Incurred till March 2019												