

Letter No. OCPL/900

Date: 26/11/2020



**Odisha
Coal and
Power
Limited**

Odisha Coal and Power Limited
(A Government of Odisha Company)
CIN U10100OR2015SGC018623
Website: www.ocpl.org.in

To,

The Joint Director(s)
Regional Office, Eastern Region (ERO)
Ministry of Environment, Forest & Climate Change
A-3, Chandrasekharpur, Bhubaneswar-751023

Sub: Submission of Half Yearly Compliance Report of the Environmental Clearance conditions of Manoharpur Open Cast Coal Mine Project (8.00 MTPA) of Odisha Coal & Power Limited located in IB valley, Dist. Sundargarh, Odisha.

Ref: (i) EC letter No. J-11015/139/2008-IA.II (M) dated 21.02.2014
(ii) EC transfer order vide letter no. J-11015/139/2008-IA.II (M)Pt. file dt. 30.12.2015
(iii) Amendment in EC vide letter no. J-11015/139/2008-IA.II (M)Pt. dt. 06.11.2019

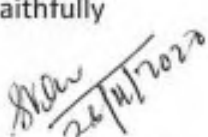
Dear Sir,

In reference to the notification issued by MoEF&CC vide letter S.O. 5845 (E) dated 26.11.2018 and Environmental Clearance as referred above in respect of Manoharpur Open Cast Coal Mine (8.00 MTPA) of Odisha Coal & Power Limited located in IB valley, Dist. Sundargarh, Odisha, please find enclosed herewith Half Yearly Compliance Report in soft copy (CD) as well as hard copy for the period of April 2020 to September 2020.

As per MoEF&CC (ERO) letter dated 11.05.2020, the scanned copy of report is being submitted to their good office at the given email address (roez.bsr-mef@nic.in).

This is for your kind information and needful action at your end.

Yours Faithfully


Authorized Signatory
(AGM- Mechanical)

Copy to:

1. The Scientist ('E' & Regional Directorate), Central Pollution Control Board, South end Conclave, Block 502, 5th & 6th Floors, 1582 Razidanga Main Road, Kolkata-700107.
2. The Member Secretary, State Pollution Control Board, Odisha, Paribesh Bhawan, A/118, Nilkanthnagar, Unit VIII, Bhubaneswar 751012

HALF YEARLY COMPLIANCE REPORT

For

Environmental Conditions

April 2020 – September 2020

MANOHARPUR OPENCAST COAL MINE



Odisha Coal & Power Limited,
Zone-A, Ground Floor,
Fortune Tower, Bhubaneswar-751023, Odisha
Web: www.ocpl.org.in



ENVIRONMENTAL CLEARANCE(EC) COMPLIANCE REPORT

PROJECT NAME - MANOHARPUR OPENCAST COAL MINE PROJECT

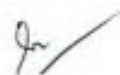
EC letter No. J-11015/139/2008-IA.II (M) dated 21.02.2014 and

EC Transfer Order - EC-No. J-11015 / 139/2008-IA.II (M) Pt. file Dated 30TH December 2015

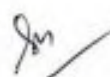
Period of Compliance Report – April 2020 to September 2020

Sr. No.	EC Letter Condition	Compliance
A. SPECIFIC CONDITIONS		
i.	The maximum production from the mine at any given time shall not exceed the limit as prescribed in the EC.	The rated maximum production capacity of the mine is 8.00MTPA as per the approved Mining Plan (Rev II). Hence, the limit shall not exceed as prescribed in EC. Mine development work were started w.e.f. 01.11.2018 and coal production started from 10.10.2019. Thereafter, due to evacuation constraints, coal dispatch started w.e.f. 14.12.2019 from mine end to Kanika Railway Siding of MCL. Till March 2020, OCPL has produced 1.002 MT of coal in the FY 2019-20.
ii.	Environmental clearance to the proposal is subject to obtaining clearance under the wildlife (Protection) Act, 1972 from the Standing Committee of National Board for Wildlife, as applicable	Not Applicable. The proposed Manoharpur coal mine project does not fall within 10km of National park/sanctuary and as such clearance from National Board of Wildlife is not required for the said project. However, the Site Specific Wildlife Conservation Plan of this project has been approved by Principal Chief Conservator of Forests (PCCF-WL) & Chief Wildlife Warden (CWW), Odisha which is being implemented.
iii.	The OB should be kept in ML area and there should be no OB dumps at the end of mining.	As per the approved Mine Plan & Mine Closure Plan (Revision – II), total 3 nos. of OB dumps will be acquired in non-coal bearing area by OCPL. Major portion of the overburden (86%) will be utilized in back filling and there will be no external dump at the end of mining. Currently, the generated OB from the mining operation is being stored at External OB dump as per approved Mining Plan.
iv.	The land for OB dumping should be made ready for original use after mine closure.	Noted

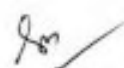
v.	All the sandstone taken out during mining should be utilized for house construction and given free of cost to locals.	Efforts will be made to comply with the conditions.
vi.	Since the mining area is total forest land, the sandstones should not be dumped as OB.	Maximum care will be taken for compliance of the same.
vii.	Fly ash dumping is not permitted in mine void.	Fly ash will not be dumped. If any situation arises which requires fly ash dumping then proper scientific studies will be done and permissions will be obtained from competent authorities prior to dumping.
viii.	The leachability study may be carried out for chromium, arsenic and mercury that may be present in fly ash.	The required leachability study shall be carried out by concerned authority and the test result of same will be submitted to MOEF & CC for obtaining necessary permission before commencement of fly ash disposal, if required, in Manoharpur Coal Mine Project.
ix.	The CSR amount should be Rs.4 crores in initial 3 years, and thereafter it should be Rs 5/T of coal/annum till the end of the life of project with the escalation factor every year coal production.	This is being complied. CSR activities already carried out in the vicinity of the project area. Total expenditure incurred on CSR activities till September 2020 is Rs. 4.67 Cr. The year wise expenditure carried out on CSR activities is attached as Annexure 1 for your kind reference.
x.	The CSR activity, which had already been carried out by proponent, be audited by a 3 rd Party. The audit should be carried out by a reputed agency.	Noted. The audit has been carried out by reputed agency M/s GEOENVITECH (Research and Consultancy Services Pvt. Ltd.) which is empaneled with Govt. of Odisha.
xi.	The proponent shall come back to the Committee for its washery proposal for further consideration.	Will be complied, if applicable.
xii.	Coal transportation from mine to railway siding by conveyor belt and from siding to TPP by MGR through SILO loading of the wagons	Coal transportation from mine to railway siding will be done by conveyor belt and from siding to TPP by MGR through SILO loading of the wagons (Rapid Loading System). OCPL would like to mention that initially commissioning of MGR system was getting delayed due to land acquisition issue in MCL command area which has been resolved now but due to pandemic disease COVID-19,



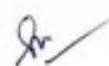
		the construction work of MGR system is expected to be completed by 30th June 2021. However, currently OCPL transporting the coal from mine end to Kanika siding through road as an interim arrangement and the same is being utilized under the provisions of Allotment Agreement (Clause – 8). An approval/amendment in the EC letter for transporting the coal by road from mine end to Kanika siding has been obtained from MoEF&CC vide letter no. J-11015/139/2008-IA-II(M) Pt. dated 06th November 2019. The copy of same has already been submitted to your good office vide letter no. OCPL/16 dated 06.01.2020 (Refer Annexure 2).
xiii.	The embankment constructed along the river boundary shall be of suitable dimensions and critical patches shall be strengthened by stone pitching on the river front side and stabilized with plantation so as to withstand the peak water flow and prevent mine inundation.	There is no river in and around the project area. One seasonal nalla passes through the coal block which will be diverted outside the coal block. Strong embankment, stone pitching will be provided along the nalla to withstand the peak water flow and prevent mine inundation.
xiv.	There shall be no overflow of OB into the river and into the agricultural fields and massive plantation of native species shall be taken up in the area between the river and the project.	OCPL will make their best efforts by engaging the technical staff for the monitoring of dumping of OB as per the approved Mining Plan (Rev II) so that no overflow of OB will get into the river / nalla and into agricultural fields. Plantation of approx. 4737 nos. comprises local native species i.e. Mango, Amla, Neem, Jamun etc. has been carried out by protecting the existing trees inside the project area. The area covered under plantation is about 16.735 Hac. The list of plantation done during the FY 2019-20 and 2020-21 is attached as Annexure 2 for your kind consideration. In addition to above also, approx. 18008 nos. of native plant species have been planted in surrounding areas i.e. R&R Colony (Phase 1



		& 2) developed by OCPL covering an area of about 4 Hac.
xv.	OB shall be stacked at two earmarked external OB dumpsite(s) only. The ultimate slope of the dump shall not exceed 28°. Monitoring & management of existing reclaimed dumpsites shall continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the Ministry of Environment & Forests and its Regional office located at Bhopal on yearly basis.	The overburden from the mine is being stored at their earmarked location and also dump design is in line with approved Mining Plan (Revision II).
xvi.	Catch drains and siltation ponds of appropriate size shall be constructed to arrest silt and sediment flows from soil, OB and mineral dumps. The water so collected shall be utilized for watering the mine area, roads, green belt development, etc. The drains shall be regularly de-silted and maintained properly. Garland drains (size, gradient and length) and sump capacity shall be designed keeping 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine site. Sump capacity shall also provide adequate retention period to allow proper settling of silt material.	Siltation pond followed by garland / catch drain around the External OB dump 1 and coal stock yard has been provided to arrest the flows from OB dump / coal stock yard. The drains are being regularly de-silted during the pre and post monsoon season and maintained properly. One sump of sufficient capacity has been provided within the mine to cater the peak sudden rainfall and discharge/seepage from adjoining areas. The water so collected in sump is being utilized for watering the mine area, roads, green belt development, etc.
xvii.	Dimension of the retaining wall at the toe of the dumps and OB benches within the mine to check run-off and siltation shall be based on the rainfall data.	Presently, OB dumps are in the active stage. The provision of retaining wall will be complied once the OB dumps reach to its final stage.
xviii.	Crushers at the CHP of adequate capacity for the expansion project shall be operated with high efficiency bag filters, water sprinkling system shall be provided to check fugitive emissions from crushing operations, conveyor system, haulage roads, transfer points, etc.	Currently, the construction of CHP is also on full swing. Hence, the compliance will be done when CHP becomes operational.
xix.	Drills shall be wet operated.	is being complied.
xx.	The project authorities shall undertake regular repairing and tarring of roads used for mineral transportation. A 3-tier green belt	Continuous efforts are being made on regular basis to comply with the conditions.



	comprising of a mix of native species shall be developed all along the major approach roads.	
xxi.	Controlled blasting shall be practiced with use of delay detonators and only during daytime. The mitigative measures for control of ground vibrations and to arrest the fly rocks and boulders shall be implemented.	Services of CSIR-CIMFR has been taken for scientific design of Blast parameter to reduce ground vibration. The recommendations of competent authority are being implemented during blasting.
xxii.	A progressive afforestation plan shall be implemented covering an area of 512.584 ha at the end of mining, which includes reclaimed external OB dump (193.478 ha), internal dump (257.11 ha), and green belt (61.996 ha) and in township located outside the lease by planting native species in consultation with the local DFO/Agriculture Department. The density of the trees shall be around 2500 plants per ha. Massive plantation shall be carried out in open spaces in and around the mine and a 3-tier avenue plantation along the main approach roads to the mine.	Areas will be afforested including reclaimed areas etc. and native species of plantation will be decided in consultation with DFO/Agriculture department. Technical and Biological reclamation plan as per approved Mine Plan (Rev II) has already been submitted to your good office. The plantation has been carried out on vacant spaces within the project area i.e. Safety zone, bank of Garia nalla, CHP area etc. The planation comprises of local / native species i.e. Mango, Neem, Amla, Jamun, Jack Fruit, Ashok etc. The list comprises details of plantation done during the FY 2019-20 and 2020-21 is attached as Annexure 2.
xxiii.	An estimated 61.73 M Cum of OB will be generated during the entire life of the mine. Out of which 29.23 Mm ³ of OB will be dumped in four external OB dump in non-coal bearing area. The maximum height of external OB dump for hard OB will not exceed 30 m each. The maximum slope of the dump shall not exceed 28°. Monitoring and management of reclaimed dump sites shall continue till the vegetation becomes self-sustaining and compliance status shall be submitted to MOEF and its Regional Office on yearly basis.	As per the approved Mine Plan & Mine Closure Plan (Revision – II), total 3 nos. of OB dumps will be acquired in non-coal bearing area by OCPL. Complied Compliance & Status report will be submitted to MoEF &CC and its Regional office on yearly basis along with the six monthly post EC compliance report. Also, kindly refer the point no. xv as mentioned above.
xxiv.	Of the total quarry area of ha, the backfilled quarry area of 489 ha shall be reclaimed with plantation and a void of 162 ha which is proposed to be converted into a water body, shall be gently sloped and the upper benches	Back filled area will be reclaimed with plantation. Density of trees will be 2500/ha. Water body (reservoir) will be gently sloped. Plantation of native species will be done



	shall be terraced and stabilized with plantation/afforestation by planting native plant species in consultation with the local DFO/Agriculture Department. The density of the trees shall be around 2500 plants per ha	with consultation of DFO/Agriculture department.
xxv.	The proponent should prepare restoration and reclamation plan for the degraded area. The land be used in a productive and sustainable manner.	Will be complied as specified in approved Mining Plan (Rev II).
xxvi.	Compensatory Ecological & Restoration of waste land, other degraded land and OB dumps in lieu of breaking open the land be carried out	Will be complied as specified in approved Mining Plan (Rev II). Year wise plan for progressive reclamation and afforestation as per approved Mine Plan has already been submitted to your good office.
xxvii.	The mining should be phased out in sustainable manner. No extra over burden dumps are permitted.	Noted and being complied as per approved Mining Plan (Rev II).
xxviii.	No groundwater shall be used for mining operations	Noted and is being complied.
xxix.	Regular monitoring of groundwater level and quality shall be carried out by establishing a network of existing wells and construction of new piezometers. The monitoring for quantity shall be done four times a year in pre-monsoon (May), monsoon (August), post-monsoon (November) and winter (January) seasons and for quality in May. Data thus collected shall be submitted to the Ministry of Environment & Forests and to the Central Pollution Control Board quarterly within one month of monitoring.	Monitoring of groundwater level and quality has been carried out by establishing a network of existing dug wells and construction of new piezometers. The monitoring of ground water level and quality analysis were carried out during the year 2019-20 for the core zone and buffer zone of the project area. The monitoring analysis reports in this regard has already been submitted to your good office (in quarterly compliance) vide letter no. MCMP/Env/2020/716 dated 10.09.2020. The copy of same is again attached herewith as Annexure 3 for your ready reference.
xxx.	The Company shall put up artificial groundwater recharge measures for augmentation of groundwater resource in case monitoring indicates a decline in water table. The project authorities shall meet water requirement of nearby village(s) in case the village wells go dry due to dewatering of mine	Sump of sufficient capacity has been provided as artificial ground water recharge measures within the mine to recharge the ground water table of the adjoining areas. The siltation pond followed by Garland drains will also help in retaining the rain water and recharge of ground water table.

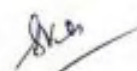
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xxxi.	Sewage treatment plant shall be installed in the existing colony. ETP shall also be provided for workshop and CHP wastewater.	Sewage Treatment Plant (STP) will be installed to treat the generated domestic waste water at required places i.e. mine colony and the STP treated water will be reused in horticulture development within the colony. ETP shall also be installed as specified.
xxxii.	Besides carried out regular periodic health checkup of their workers, 10% of the workers identified from workforce engaged in active mining operations shall be subjected to health checkup for occupational diseases and hearing impairment, if any, through an specialized agency/institution within the District/State and the results reported to this Ministry and to DGMS	Being complied with as per applicable guidelines of Coal Mine Rules, 1955.
xxxiii.	There are 370 PDFs and 385 PAFs. Land oustees shall be compensated as per the norms laid out R&R Policy of CIL or the National R&R Policy or R&R Policy of the State Government whichever is higher	Complied as per the provisions of Odisha R&R Policy, 2006.
xxxiv.	For monitoring land use pattern and for post mining land use, a time series of land use maps, based on satellite imagery (on scale of 1:5000) of the core zone and buffer zone, from the start of the project until end of mine life shall be prepared once in 3 years (for any one particular season which is consistent in the time series), and the report submitted to MOEF and its concerned Regional Office.	The land use / land cover study for core zone & buffer zone of Manoharpur Coal Mine Project has been carried out during the year 2018 and the report has also been prepared by M/s Geosys Enterprise Solutions Private Limited, Hyderabad, Telangana. The copy of report showing the detailed land use / land cover study using the Remote Sensing Technique and GIS is attached as Annexure 4 .
xxxv.	A detail final Mine Closure Plan along with details of Corpus Fund shall be submitted to the Ministry of Environment & Forests within 6 months of grant of Environmental Clearance	The approved Mine Plan and Mine Closure Plan (Rev II) has been submitted to MoEF&CC on dated 08.05.2018. Further, the Mining Plan & Mine Closure Plan (Rev-III), has been approved on 26-09-2019 by MoC for 16 MTPA which includes the expansion of Manoharpur Coal Mine towards its Dipside. The environmental clearance (EC) application for the proposed expansion from 8 to 16 MTPA has already been submitted to MoEF&CC as per the approved Mining Plan

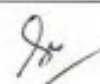


		(Rev-III). Also, MoEF&CC has approved the Terms of Reference (ToR) vide letter dt. 29.04.2020 for further EIA/EMP study.
xxxvi.	The project authorities shall in consultation with the Panchayats of the local villages and administration identify socio-economic and welfare measures under CSR to be carried out over the balance life of the mine	As mentioned above in Point no. (ix), CSR activities is being carried out in consultation with concerned Panchayat / local administration.
xxxvii.	The proponent should implement the assurances given during the Public Hearing	Assurance given during the Public Hearing is being implemented in the vicinity of project area.
xxxviii.	Corporate Environment Responsibility: a) The Company shall have a well laid down Environment Policy approved by the Board of Directors. b) The Environment Policy shall prescribe for standard operating process/procedures to bring into focus any infringements/deviation/violation of the environmental or forest norms/conditions c) The hierarchical system or Administrative Order of the company to deal with environmental issues and for ensuring compliance with the environmental clearance conditions shall be furnished d) To have proper checks and balances, the company shall have a well laid down system of reporting of non-compliances/violations of environmental norms to the Board of Directors of the company and/or shareholders or stakeholders at large	a) Environment policy has been approved by Board and it is in place. b) Will be complied with. c) There is an environment management cell comprises of technical qualified persons who is taking care of all environmental compliances of clearances and monitoring. The cell is headed by Head of Company through Head of Mines. d) Organizational Structure for Environmental Management & System of Reporting of Non-compliance - The Environmental Management Cell (EMC) has important role for coordination of the actions required for environmental management, mitigation, and for monitoring the progress of the proposed management plans and actions to be taken. The cell is responsible for monitoring of the implementation of the environment issues.

B. GENERAL CONDITIONS



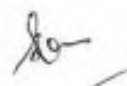
i.	No change in mining technology and scope of working shall be made without prior approval of the Ministry of Environment and Forests.	Prior approval will be obtained, if applicable.
ii.	No change in calendar plan of production for quantum of mineral coal shall be made.	Agreed and if there is any change in calendar plan of production of coal, due permission/approval shall be obtained from competent authority complying the MoEF&CC guidelines in this regard.
iii.	Four ambient air quality monitoring stations shall be established in the core zone as well as in the buffer zone for PM ₁₀ , PM _{2.5} , SO ₂ and NO _x monitoring. Location of the stations shall be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board. Monitoring of heavy metals such as Hg, As, Ni, Cd, Cr, etc carried out at least once in six months.	The monthly environmental monitoring including ambient air quality is being carried out regularly in the core zone (4 locations) as well as in the buffer zone (4 locations) by MoEF&CC/NABL/OSCPB accredited laboratory M/s Visiontek Consultancy Services Pvt. Ltd. for PM₁₀, PM_{2.5}, SO_x, and NO_x and the copy of same is being submitted regularly to Odisha State Pollution Control Board (OSPCB). Also, the monitoring of heavy metals such as Hg, As, Ni, Cd, Cr etc. has been carried out on six monthly basis in July month 2020 for core zone and buffer zone. The test results show that parameters are within the permissible limits as prescribed by MoEF&CC and test report in this regard is attached as Annexure 5. Due to Pandemic disease COVID 19, the environmental monitoring has not been carried during the April & May 2020 (2nd quarter). The monitoring report showing the results of pollutants (PM₁₀, PM_{2.5}, SO_x, and NO_x) for the 3rd quarter of 2020 (July to September 2020) is attached as Annexure 6 for ready reference.
iv.	Data on ambient air quality (PM ₁₀ , PM _{2.5} , SO ₂ and NO _x) and heavy metals such as Hg, As, Ni, Cd, Cr and other monitoring data shall be regularly submitted to the Ministry including its concerned Regional Office and to the State Pollution Control Board and the Central Pollution Control Board once in six months. Random verification of samples through analysis from independent	Kindly refer the Point no. iii (General Condition) as mentioned above.



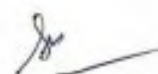
	laboratories recognized under the EPA rules, 1986 shall be furnished as part of compliance report.	
v.	Adequate measures shall be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in blasting and drilling operations, operation of HEMM, etc shall be provided with ear plugs/muffs	Complied
vi.	Industrial Wastewater (workshop and wastewater from the mine) shall be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19th May 1993 and 31st December 1993 or as amended from time to time before discharge. Oil and grease trap shall be installed before discharge of workshop effluents	Will be complied with.
vii.	Vehicular emissions shall be kept under control and regularly monitored. Vehicles used for transporting the mineral shall be covered with tarpaulins and optimally loaded	Complied
viii.	Monitoring of environmental quality parameters shall be carried out through a laboratory recognized under EPA Rules, 1986	The environmental monitoring is being carried out as mentioned above in Point no. iii (General Condition).
ix.	Personnel working in dusty areas shall wear protective respiratory devices and they shall also be provided with adequate training and information on safety and health aspects.	Agreed and is being complied with.
x.	Occupational health surveillance programme of the workers shall be undertaken periodically to observe any contractions due to exposure to dust and to take corrective measures, if needed and records maintained thereof. The quality of environment due to outsourcing and the health and safety issues of the outsourced manpower should be addressed by company while outsourcing.	Noted and will be complied with as per applicable norms of Coal Mine Rules.
xi.	A separate environmental management cell with suitable qualified personnel shall be set up under the control of a Senior Executive, who will report directly to the Head of the company.	An environment management cell comprising of technical qualified personnel has been working in the organization who is directly reporting to the Head of Company through Head of Mines.



xii.	The funds earmarked for environmental protection measures shall be kept in separate account and shall not be diverted for other purpose. Year-wise expenditure shall be reported to this Ministry and its concerned Regional Office.	Will be complied as advised. Year-wise expenditure incurred on environmental protection measures is attached as Annexure 7 .
xiii.	The Project authorities shall advertise at least in two local newspapers widely circulated around the project, one of which shall be in the vernacular language of the locality concerned within seven days of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution Control Board and may also be seen at the website of the Ministry of Environment & Forests at http://envfor.nic.in	Complied.
xiv.	A copy of the environmental clearance letter shall be marked to concern Panchayat/Zila Parishad, Municipal Corporation or Urban local body and local NGO, if any, from whom any suggestion/representation has been received while processing the proposal. A copy of the clearance letter shall also be displayed on company's website	Complied.
xv.	A copy of environmental clearance letter shall also be displayed on the website of the concerned State Pollution Control Board. The EC letter shall also be displayed at the Regional Office, District Industry Sector and Collector's Office/Tehsildar's Office for 30 days	Complied
xvi.	The clearance letter, shall be uploaded on the company's website. The compliance status of the stipulated environmental clearance conditions shall also be uploaded by the project authorities on their website and updated at least once every six months so as to bring the same in public domain. The monitoring data of environmental quality parameter (air, water, noise and soil) and	The environmental clearance letter along with compliance status of stipulated conditions has been uploaded on company website which can be seen at the following link: http://ocpl.org.in/Environment.asp



	critical pollutant such as PM10, PM2.5, SO2 and Nox (ambient) and critical sectoral parameters shall also be displayed at the entrance of project premises and mine office and in corporate office and on company's website	
xvii.	The project proponent shall submit six monthly compliance reports on status of compliance of the stipulated environmental clearance conditions (both in hard copy and in e-mail) to the respective Regional Office of the Ministry, respective Zonal Offices of CPCB and the SPCB.	Being Complied in confirmation to notification issued by MOEF&CC vide letter no. S.O. 5845 (E) dated 26.11.2018 and MoEF&CC (ERO) vide letter no. File No : 106-12/EPE.
xviii.	The Regional Office of this Ministry located in the Region shall monitor compliance of the stipulated conditions. The Project authorities shall extend full cooperation to the office(s) of the Regional Office by furnishing the requisite data/information/monitoring reports.	Project authorities will extend full cooperation to the Ministry Regional Office.
xix.	The environmental statement for each financial year ending 31 March in Form V is mandated to be submitted by the project proponent for the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be uploaded on the company's website along with the status of compliance of EC conditions and shall be sent to the respective Regional Offices of the MoEF by e-mail.	Being Complied.



ENVIRONMENTAL CLEARANCE(EC) COMPLIANCE REPORT

MANOHARPUR OPENCAST COAL MINE PROJECT

(Amendment vide letter No. EC-No. J-11015 / 139/2008-IA.II (M) Pt. file Dated 06TH November 2019)

Sr. No.	EC Letter Condition	Compliance
C. CONDITIONS		
i.	High rated tippers i.e. 25 to 30 tonne capacity coal carrying tippers for same quantity shall be used to reduce number of trips.	complied.
ii.	Accordingly, 9200 TPD of coal from Manoharpur Coal Mine to Kanika siding / ACB siding / any other Indian railway siding in the near vicinity of mine (23 km) by road and from there to Ib TPP of OPGC by Indian rail.	Coal is being transported from mine end to Kanika siding of MCL by road as an interim arrangement and the same is being utilized under the provisions of Allotment Agreement (Clause – 8). The quantity of daily dispatch is well within the approved limit.
iii.	Further, 3000 TPD of coal from Manoharpur Coal Mine to Ib TPP directly by road (i.e. 117 km road) only if Route 1 is not available. The stretch of 1.2 km having width of ~ 5.5 mts (single lane) shall be widened to 7mts width and made double lane before commencement of transportation.	No coal is presently being transported by OCPL through this Route.
iv.	All necessary environment mitigation such as tree plantation, mechanized road sweeping should be taken to prevent increase in air pollution level in villages/settlements lying within 100 m (23 km till Kanika Railway siding) along the Route 1 and villages/settlements (117 km road) lying along the Route 2.	Necessary mitigation measures i.e. water sprinkling, tree planation, proper covering of coal carrying tippers etc. are being carried out at site to prevent increase in air pollution level in nearby villages.
v.	The state pollution control board, while considering consent to operate for project, shall ensure that with the proposed coal transportation by road, air quality would remain within the national ambient air quality standards.	Noted & agreed. An intimation letter has already been submitted to Odisha State Pollution Control Board (OSPCB) regarding the obtaining of EC from MoEF&CC for transportation of coal from Manoharpur coal mine to Kanika siding of MCL through road.
vi.	Implementation of MGR shall be expedited.	Construction work of MGR is on full swing which is expected to be completed by June 2021.

vii.	All the recommendations given in study on Traffic Impact Assessment Report shall be complied.	Is being complied.
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A handwritten signature in black ink, consisting of a stylized 'J' followed by a checkmark-like flourish.

Manoharpur Coal Mine Project, Tehsil Hemgir, Dist. Sundergarh, Odisha

ANNEXURE 1

Year wise Expenditure Detail on CSR

Sl.No	Sectors	OPGC	OCPL					2020-21 (Till September 2020)	Total Expenditure on CSR
		2008-2015	2015-2016	2016-2017	2017-2018	2018-19	2019-20		
1	Health	16922646	95000	225900	414000	412309	243562	218140	
2	Education		1290000	1244300	1326500	912000	300000	0	
3	Skill Development			2151263	1854000	1925170	2143354	954000	
4	Socio-Culture		168000	100560	305000	565000	150000	0	
5	Sports		226000		117800	140000	95000	0	
6	Rural Infrastructure			3114404	3791751	2340609	1969011	0	
7	Livelihood		0	0	0		0	0	
8	Water Sanitation		0	0	330000	440000	169000	0	
9	Public Relation		0	0	0	64000	0	0	
	Total	1,69,22,646	17,79,000	68,36,427	81,39,051	67,99,088	50,69,927	11,72,140	4,67,18,279

Note: Rs. 16922646 expenditure submitted by OPGC to OCPL

Manoharpur Coal Mine Project of Odisha Coal and Power Limited (Annexure 2)

Details of Green Area / Plantation Development

The tree species planted under the green area development within ML & project area are as follows:

Tree Species	Plantation during (FY 2019-20)	Plantation during (FY 2020-21)	Total
Mango	518	85	603
Amla	502	154	656
Neem	504	421	925
Jackfruit	2	2	4
Guava	1	6	7
Ashok	22	10	32
Bakula	-	5	5
Jamun	503	-	503
Astelia	2	-	2
Monterey cypress	2	-	2
Norfolk island pine	2	-	2
Acalypha	4	-	4
Sago palm	2	-	2
Bahude	500	-	500
Harida	500	-	500
Seena Tora	-	5	5
Pongame Oil Tree	-	10	10
Drumstick Tree	-	8	8
Custard Apple Tree	-	3	3
Cassia	-	5	5
Sitafal	-	300	300
Debadaru	-	85	85
Karanj	-	441	441
Papaya	-	18	18
Sajana	-	15	15
Teak	-	100	100
Total	3064	1673	4737

Area covered under planation = 15.926 Hac + 0.809 Hac = 16.735 Hac

Plantation Details of Surrounding Area Developed by OCPL

Apart from the above, Approx. 18008 nos. of native plant species have been planted in surrounding areas i.e. R&R colony (Phase 1 & 2). Area covered under plantation is about 4.0 Hac.

Letter No. – MCMP/Env/2020/416

Date - 10/09/2020

To,

The Joint Director(s)
Regional Office, Eastern Region
Ministry of Environment, Forest & Climate Change
A-3, Chandrasekharpur, Bhubaneswar-751023



**Odisha
Coal and
Power
Limited**

Odisha Coal and Power Limited
(A Government of Odisha Company)
CIN U10100OR2015SGC018623
Website: www.ocpl.org.in

Sub: Submission of Compliance Documents of Ground Water Level & Quality Monitoring Report in respect of Manoharpur Coal Mine Project of Odisha Coal and Power Limited.

Ref: (i) EC letter No. J-11015/139/2008-IA.II (M) dated 21.02.2014
(ii) EC transfer order vide letter no. J-11015/139/2008-IA.II (M)Pt. file dt. 30.12.2015
(iii) CTO letter dt. 28.02.2018 (Consent Order No. 2851)

Dear Sir,

In reference to the letters cited above in respect of Manoharpur Open Cast Coal Mine (8.00 MTPA) of Odisha Coal & Power Limited located in IB valley, Dist. Sundargarh, Odisha, we hereby submit the report of Ground Water level monitoring & Quality analysis report (Refer **Annexure 1**) carried out during the year 2019-20 for the core zone and buffer zone of the project area in compliance to point no. xxix of EC letter (Point no. 3, Part A, Specific Conditions) and point no. 23 of CTO letter (Part E, Special Condition).

Apart from the above, OCPL would like to mention that ground water quality monitoring has been carried out during the August 2020 (Monsoon Season) by MoEF&CC/NABL/OSPCB approved laboratory M/s Visiontek Consultancy Services Pvt. Ltd. for 2 locations in core zone as well as buffer zone. The analysis report obtained from the above mentioned lab shows that all monitored quality parameters are well within the permissible limits as prescribed by the competent authority. The copy of analysis report is attached also herewith as **Annexure 2**.

This is for your kind perusal.

Thanking You

Yours Faithfully,

For Odisha Coal and Power Limited

Signature
10/9/2020

Authorized Signatory

(AGM - Mechanical)

Manoharpur Coal Mine Project

Encl: as above

CC: 1. The Scientist ('E' & Regional Directorate), Central Pollution Control Board, South end Conclave, Block 502, 5th & 6th Floors, 1582 Razidanga Main Road, Kolkata-700107.
2. The Member Secretary, State Pollution Control Board (SPCB), Paribesh Bhawan, A/118, Nilkantha Nagar, Unit-VIII Bhubaneswar-751012, Odisha

Manoharpur Coal Mine Project of Odisha Coal and Power Limited (OCPL)

ANNEXURE 1

1.0 MONITORING OF GROUND WATER REGIME

1.1 Piezometers

- During the hydrogeological investigation carried out in 2017, a set of 04 main wells or Pumping Wells (PW) with larger diameter (6 inch) have been constructed named HD01PW, HD02PW, HD03PW and HD04PW within the Dip side Manoharpur Coal Block (adjacent to Manoharpur coal mine). These have been constructed for pumping purpose during pumping test as well as in future.
- Another four sets of Observation Wells (OW) (smaller diameter- 2 inch) with name HD01OW, HD02OW, HD03OW and HD04OW have also been constructed just near the PWs. The OWs have been constructed at a distance of 10 to 20 m away from corresponding PWs. The observation wells have been constructed for monitoring purpose during pumping test.
- Currently, all these Bore Wells (08 nos) have been preserved presently as “Piezometers” for ground water level monitoring. Also in future, the 04 OWs will be maintained as “Piezometers” in long run till the end of mining activity in Manoharpur Coal Block (present project area) with their respective names as P01, P02, P03 and P04.
- The depth to water level has been monitored manually during the Months of August, November, January and May during the year 2019-20 for these Bore Wells by M/s Geoenvitech Research & Consultancy Services Pvt. Ltd.
- The locations of these Piezometers have been marked on the map given in Fig. 1 and the monitoring data of water level has been given in Table 1.

Table 1: Piezometers Monitoring

S. No.	Code of well	Depth/Dia	Location	Depth (meters below ground level)			
				Year : 2019 - 2020			
				August 2019	November 2019	January 2020	May 2020
1	HD 01 PW	186m/150mm	21.93948° N, 83.76012° E	15.2	15.5	15.8	16.9
2	HD 01 OW P01	218m/50mm	21.93950° N, 83.76030° E	17.7	17.6	17.8	18.6
3	HD 02 PW	198m/150mm	21.95678° N, 83.73626° E	17.9	18.1	18.8	19.4
4	HD 02 OW P02	198m/50mm	21.95674° N, 83.74595° E	18.9	18.8	18.9	19.55
5	HD 03 PW	192m/150mm	21.96019° N, 83.76357° E	16.1	16.5	16.8	17.5
6	HD 03 OW P03	220m/50mm	21.96027° N, 83.76343° E	15.7	17.2	16.6	17.5
7	HD 04 PW	205m/150mm	21.94017° N, 83.77429° E	6.2	6.14	6.25	6.6
8	HD 04 OW P04	192m/50mm	21.94038° N, 83.77423° E	5.9	6.05	6.2	6.9

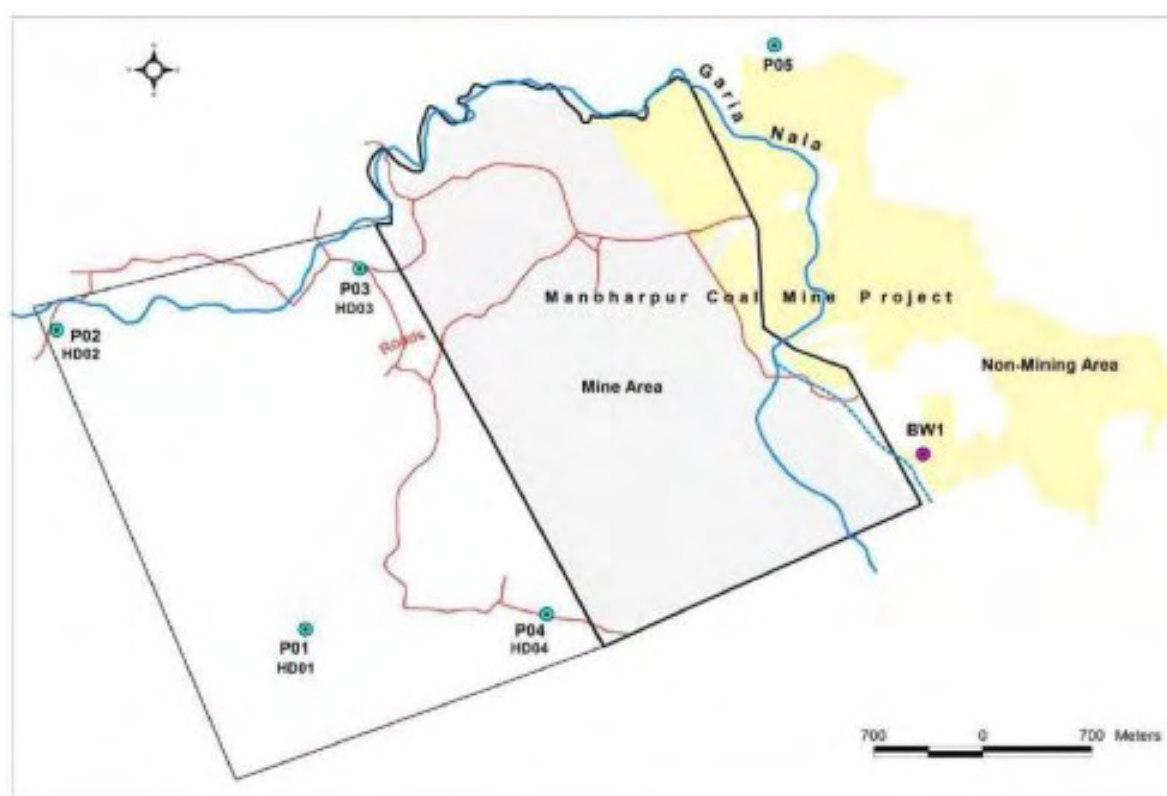


Fig. 1: Map Showing Location of Piezometers (Manoharpur and Dip-side Manoharpur Coal Block)



Fig. 2: Piezometers Monitoring During May 2020

1.2 Ground Water Level Monitoring of Key Dug Wells within Buffer Zone

In the Buffer Zone of project area, around 31 numbers of Key Wells have been inventorized and monitored periodically. The details of same is provided below in Table no. 2.

Table 2: Water Level Monitoring of Key Dug Wells within Vicinity of Project Area

S. No.	Village	Location	Depth (meters below ground level)			
			Year : 2019 - 2020			
			August 2019	November 2019	January 2020	May 2020
1	Kaudar	21.85564° N, 83.76815° E	6.15	6.8	7.9	8.8
2	Kanika	21.87693° N, 83.74692° E	5.6	6.05	6.3	6.8
3	Grindola	21.84835° N, 83.79787° E	2.8	3.6	4.2	6.4
4	Garjanbahal	22.01041° N, 83.76459° E	5.9	6.7	7.1	7.5
5	Duduka	22.02686° N, 83.80135° E	2.5	4.1	4.4	5.4
6	Barpali	22.02969° N, 83.78037° E	5.1	5.6	5.8	6.15
7	Durubaga	21.96901° N, 83.76006° E	0.6	1.1	1.3	1.5
8	Parmanandapur	21.95503° N, 83.76579° E	2.5	3.3	3.6	4.5
9	Hemgir	21.95229° N, 83.70478° E	0.8	1.5	1.7	5.4
10	Dulinga	21.94575° N, 83.79857° E	3.9	4.7	5.9	6.8
11	Bihajore	21.93712° N, 83.87183° E	1.9	4.3	4.5	5.9
12	Kanaktora	21.93558° N, 83.88054° E	1.7	3.7	4.1	5.8
13	Brahmani	21.90261° N, 83.71673° E	3.2	5.5	5.9	6.4
14	Bhelwantikra	21.88888° N, 83.78434° E	6.6	9.8	10.1	11.9
15	Kamlag	21.94344° N, 83.84005° E	3.2	3.9	4.2	4.5
16	Tangirdihi	21.89127° N, 83.79614° E	3.6	5.2	5.8	6.4
17	Majhapada	21.93424° N, 83.8125° E	2.9	6.3	6.6	6.95
18	San Gumuda	21.96123° N, 83.7938° E	1.8	4.1	4.65	5.3
19	Chhapaldihi	21.88583° N, 83.84688° E	3.3	4.9	5.3	5.9
20	Aluajharan (Anlajharan)	21.91948° N, 83.83447° E	3.5	5.4	6.1	8.8
21	Kalamegha	21.94856° N, 83.84308° E	3.1	4.45	4.8	5.4
22	Mesna	21.97977° N, 83.83843° E	2.6	4.1	4.4	6.2
23	Nangalkata	21.97518° N, 83.86542° E	0.7	1.6	2.1	3.0
24	Anlabahal	22.03595° N, 83.85995° E	2.4	3.5	4.7	7.6

25	Laikera	21.99352° N, 83.84095° E	3.3	4.5	4.9	5.95
26	Budajharia	21.96348° N, 83.73026° E	3.2	4.1	4.4	5.6
27	Sarabahal	21.97233° N, 83.81041° E	4.5	5.4	5.8	6.7
28	Kutabaga	21.99129° N, 83.74433° E	2.2	4.8	5.2	6.1
29	Gadwar	22.0091° N, 83.71652° E	2.4	4.15	4.8	5.9
30	Tumlia	22.01886° N, 83.71861° E	3.1	5.8	6.4	8.4
31	Kathapali	21.94082° N, 83.76913° E	3.6	4.8	5.4	6.95



Fig. 2: Water Level Monitoring of Key Dug Wells



Barpali



Tumlia



Laikera



Majhapada



Sanghumuda



Sarbahal

Fig. 2: Water Level Monitoring of Key Dug Wells

1.3 Ground Water Quality

Ground water samples collected from existing Piezometers and sample key dugwells have been analyzed by M/s Geoenvitech Research & Consultancy Services Pvt. Ltd. The result is shown in the Table 3 & 4 provided below.

Table 3: Ground Water Quality of Piezometers within project area

Sl. No .	Parameter	Unit	Max. Tolerance Limit as per IS 2296: Class C	AUGUST 2019				NOVEMBER 2019				JANUARY 2020				MAY 2020			
				HD 01 PW	HD 02 PW	HD 03 PW	HD 04 PW	HD 01 PW	HD 02 PW	HD 03 PW	HD 04 PW	HD 01 PW	HD 02 PW	HD 03 PW	HD 04 PW	HD 01 PW	HD 02 PW	HD 03 PW	HD 04 PW
1	pH Value @ 25°C	--	6.5 to 8.5	5.43	8.62	6.03	7.15	5.77	9.12	6.16	7.68	5.88	9.2	6.35	6.13	5.67	8.76	5.91	6.35
2	Turbidity	NTU	1	4.5	<1	53.4	5.2	63.45	<1	59.35	34.5	59.6	<1	<1	45.5	83.2	22.1	112.2	92.2
3	Total Dissolved Solids	mg/l	500	151.5	243.4	186.2	60.4	93.5	287.3	193.5	35.2	98.3	266.1	167.2	48.9	135.4	406.2	166.1	90.8
4	Chloride (as Cl ⁻)	mg/l	250	19.5	32.6	7.3	4.8	5.9	35.6	5.9	3.9	7.95	37.6	3.95	7.91	9.55	40.4	11.42	9.53
5	Total Hardness (as CaCO ₃)	mg/l	200	40.8	104	43.6	36.5	32.5	81	57	15	39	58	45	27	81	110	86	46
6	Calcium (as Ca)	mg/l	75	8.1	3.2	12.1	8.1	9.6	1.5	11.2	3.15	9.58	16.3	8.8	5.3	12.7	4.75	14.3	6.5
7	Magnesium (as Mg)	mg/l	30	5.1	23.2	3.3	3.8	1.9	18.3	6.5	1.8	3.8	4.6	4.9	3.8	11.6	24.1	12.3	6.4
8	Total Alkalinity (as CaCO ₃)	mg/l	200	41.2	140	57	42	54.5	142.6	75.4	16.6	57.4	154.2	68.4	39.4	80.1	179.6	101	19.95
9	Iron (as Fe)	mg/l	0.3	0.12	0.14	0.12	0.07	0.13	<0.05	0.14	<0.05	0.18	0.16	0.22	0.21	<0.05	<0.05	<0.05	<0.05
10	Sulphate (as SO ₄ ⁻)	mg/l	200	5.3	7.6	5.2	<5	<5	12.1	5.3	<5	<5	12.3	<5	<5	<5	8.2	5.4	<5
11	Nitrate (NO ₃ ⁻)	mg/l	45	1.04	1.15	1.05	0.69	0.29	0.84	0.25	0.22	0.2	0.37	0.27	<0.2	1.3	2.5	0.85	0.5
12	Fluoride (as F ⁻)	mg/l	1	0.07	0.08	0.08	0.06	<0.05	0.08	0.04	<0.05	<0.05	0.05	<0.05	<0.05	0.07	0.12	0.08	0.06

Table 4: Ground Water Quality of Key Dug Wells around the project area

Sl. No	Parameter	Unit	Max. Toleranc e Limit as per IS 2296: Class C	AUGUST 2019						NOVEMBER 2019						JANUARY 2020						MAY 2020								
				KAUDAR	KANIKA	DURUBAGA	KANAKTORA	KAMALAG	LAIKERA	KAUDAR	KANIKA	DURUBAGA	KANAKTORA	KAMALAG	TANGIRIDIHI	LAIKERA	KAUDAR	KANIKA	DURUBAGA	KANAKTORA	KAMALAG	TANGIRIDIHI	LAIKERA	KAUDAR	KANIKA	DURUBAGA	KANAKTORA	KAMALAG	TANGIRIDIHI	LAIKERA
1	pH Value @ 25°C	--	6.5 to 8.5	6.69	6.24	6.03	7.32	6.84	7.18	7.03	6.71	5.31	6.47	7.25	6.64	6.65	6.56	7.02	7.12	5.44	7.66	7.42	7.35	6.52	6.82	5.37	7.52	7.33	6.35	6.92
2	Turbidity	NTU	1	<1	6.2	23	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	1
3	Total Dissolved Solids	mg/l	500	344.1	579.1	55.5	953.2	475.3	627.2	236.2	135.5	40.1	772.6	438.5	902.1	612.1	299.3	158.5	996.3	36.5	771.3	874.4	436.3	534.5	204.4	52.6	766.6	788.1	904.3	894.7
4	Chloride (as Cl ⁻)	mg/l	250	39.2	66.6	11.6	121.2	48.8	82.1	29.5	13.6	5.8	81.1	59.5	232.1	117.2	25.6	11.9	282.8	7.92	104.1	84.36	65.4	49.78	13.5	10.44	84.24	86.12	185.2	120.2
5	Total Hardness (as CaCO ₃)	mg/l	200	112.4	204.5	25.3	445.5	184.5	261.3	117.5	66.5	28.5	322.4	174.2	506.8	302.3	100.2	55.8	50.6	10.4	182.4	268.5	148.3	132.5	92.3	32.1	126.2	135.7	275	166
6	Calcium (as Ca)	mg/l	75	26.6	69.7	5.1	81.8	49.5	50.6	30.6	18.6	5.5	96.1	47.5	114.1	75.6	23.4	15.1	80.1	2.5	75.5	86.5	38.7	22.5	9.64	4.2	21.8	16.3	38.4	33.6
7	Magnesium (as Mg)	mg/l	30	11.3	7.44	3.2	58.4	14.7	32.3	9.7	1.9	3.52	19.7	13.6	53.5	27.5	10.3	4.35	73.8	0.95	32.03	12.66	12.6	18.5	16.4	5.47	11.7	35.3	43.4	20.3
8	Total Alkalinity (as CaCO ₃)	mg/l	200	53	155	19	295	140	165	71.5	42.5	31	184.5	154.5	212.3	180.5	75	50.5	237.2	17.3	215	402.5	167.5	78	81	21	242	182	158	176
9	Iron (as Fe)	mg/l	0.3	0.11	0.22	0.13	0.08	0.11	0.09	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.12	<0.05	<0.05	0.11	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
10	Sulphate (as SO ₄)	mg/l	200	11.2	21.3	<5	46.5	13.3	23.5	12.4	<5	<5	52.5	17.8	82.1	35.5	13.4	<5	83.3	<5	50.3	72.1	48.2	0.95	0.62	<0.2	1.2	1.4	1.1	0.91
11	Nitrate (NO ₃ ⁻)	mg/l	45	1.31	1.62	4.3	2.6	1.4	1.6	0.33	0.23	<0.2	0.72	0.3	1.41	0.92	0.44	0.22	1.55	<0.2	0.72	1.22	0.43	23.5	5.6	<5	32.42	34.2	61.6	52.5
12	Fluoride (as F ⁻)	mg/l	1	0.12	0.12	0.12	0.18	0.09	0.15	0.05	<0.05	<0.05	0.15	0.06	0.17	0.13	0.06	<0.05	0.22	<0.05	0.14	0.15	0.06	0.12	0.05	<0.05	0.11	0.12	0.16	0.15



Ref:Envlab/20/R-3741

Date: 03.09.2020

GROUND WATER QUALITY REPORT AUGUST-2020

(CORE ZONE)

1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Name of the Location : **Ground Water -1(Borehole at Vocational Training Centre)**
4. Location Co-ordinates : **21° 57' 46.1592" N, 83° 46' 32.9664" E**
5. Date of Sampling : **04.08.2020**
6. Date of Receiving : **05.08.2020**
7. Date of Analysis : **05.08.2020 to 12.08.2020**
8. Sample Collected By : **VCSPL Representative in presence of OCPL representative**

SL. No.	Name of the Parameters	Unit	Testing Method	Standard as per IS 10500:2012, Amnd. 2015 & 2018	Analysis Result
1.	pH (at 25 °C)	---	APHA 4500H ⁺ B	6.5-8.5	6.93
2.	Color	Hazen	APHA 2120 B,C	5.0	<5
3.	Odor	---	APHA 2150 B	Agreeable	Agreeable
4.	Taste	---	APHA 2160 C	Agreeable	Agreeable
5.	Turbidity	NTU	APHA 2130 B	1.0	<1.0
6.	Residual Free Chlorine	mg/l	APHA 4500 Cl ⁻ B	0.2	ND
7.	Total Dissolved Solids	mg/l	APHA 2540 C	500.0	273.0
8.	Electrical Conductivity	μ S/cm	APHA 2510 B	---	418.2
9.	Total Alkalinity as CaCO ₃	mg/l	APHA 2320 B	200	96.0
10.	Total Hardness as CaCO ₃	mg/l	APHA 2340 C	200	122.0
11.	Calcium as Ca	mg/l	APHA 3500 Ca B	75	38.2
12.	Magnesium as Mg	mg/l	APHA 3500Mg B	30	6.5
13.	Chloride as Cl	mg/l	APHA 4500Cl ⁻ B	250	33.5
14.	Fluoride as F	mg/l	APHA 4500 F ⁻ C	1.0	0.43
15.	Sulphide	mg/l	APHA 4500 S ²⁻ D	0.05	ND
16.	Sulphate as SO ₄	mg/l	APHA 4500SO ₄ ²⁻ B	200	21.8
17.	Nitrate as NO ₃	mg/l	APHA 4500NO ₃ ⁻ E	45	1.34
18.	Ammonical Nitrogen as NH ₃ -N	mg/l	APHA 4500 NH ₃ F	0.5	BDL
19.	Hexavalent Chromium as Cr ⁺⁶	mg/l	APHA 3111 B	--	BDL
20.	Phenolic Compounds as C ₆ H ₅ OH	mg/l	APHA5530 B,D	0.001	BDL
21.	Cyanide as CN	mg/l	APHA 4500 CN ⁻ C D	0.05	BDL
22.	Sodium as Na	mg/l	APHA 3500Na B	---	9.7
23.	Potassium as K	mg/l	APHA 3500K B	---	1.6
24.	Copper as Cu	mg/l	APHA 3111 B,C	0.05	BDL
25.	Iron as Fe	mg/l	APHA 3500Fe B	1.0	0.34
26.	Manganese as Mn	mg/l	APHA 3500Mn B	0.1	BDL
27.	Mercury as Hg	mg/l	APHA3500 Hg	0.001	BDL
28.	Cadmium as Cd	mg/l	APHA3111 B,C	0.003	BDL
29.	Selenium as Se	mg/l	APHA3114 B	0.01	BDL
30.	Arsenic as As	mg/l	APHA3114 B	0.01	BDL



31.	Lead as Pb	mg/l	APHA3111 B,C	0.01	BDL
32.	Zinc as Zn	mg/l	APHA3111 B,C	5.0	1.16
33.	Nickel as Ni	mg/l	APHA3500 Ni	0.02	BDL
34.	Total Chromium as Cr	mg/l	APHA 3500 Cr B	0.05	BDL
35.	Boron as B	mg/l	APHA 4500 B C	0.5	BDL
36.	Silver as Ag	mg/l	APHA 3500 Ag	0.1	BDL
37.	Barium as Ba	mg/l	APHA 3500 Ba	0.7	BDL
38.	Aluminium as Al	mg/l	APHA 3500 Al B	0.2	BDL
39.	Anionic detergent as MBAS	mg/l	APHA 5540 C	1.0	ND
40.	Mineral Oil	mg/l	APHA 5220 B	0.5	ND
41.	Total Coliform	MPN/100ml	APHA 9221 B	Shall not be detectable in any 100 ml	<1.1
42.	EColi	MPN/100ml	APHA 9221 E	Shall not be detectable in any 100 ml	Absent
43.	Feacal Coliform	MPN/100ml	APHA 9221 F	---	<1.1
44.	Pesticides	mg/l	APHA 6630 C	---	Absent

BDL Value: Cu <0.02mg/l, Al <1.0mg/l, B <0.1mg/l, Ba <0.5mg/l, Mn<0.05mg/l, Hg<0.002 mg/l, Cd <0.01 mg/l, Se <0.001 mg/l, As <0.004 mg/l, Pb<0.01mg/l, Ni<0.05 mg/l, Cr <0.05mg/l, Cr⁺⁶<0.01mg/l, Phenol <0.05mg/l, CN <0.01mg/l, Ba<0.1mg/l

M. Panda
Reviewed by



Pooja Mohanty
Approved by





Ref: Envlab/20/R-3742

Date: 03.09.2020

GROUND WATER QUALITY REPORT AUGUST-2020

(CORE ZONE)

1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Name of the Location : **Ground Water-2 (Borehole- BGR Camp Site)**
4. Location Co-ordinates : **21° 56' 58.1748" N, 83° 47' 44.5668" E**
5. Date of Sampling : **06.08.2020**
6. Date of Receiving : **07.08.2020**
7. Date of Analysis : **07.08.2020 to 13.08.2020**
8. Sample Collected By : **VCSPS Representative in presence of OCPL representative**

SL. No.	Name of the Parameters	Unit	Testing Method	Standard as per IS 10500:2012, Amnd. 2015 & 2018	Analysis Result
1.	pH (at 25 °C)	---	APHA 4500H ⁺ B	6.5-8.5	7.25
2.	Color	Hazen	APHA 2120 B,C	5.0	<5
3.	Odor	---	APHA 2150 B	Agreeable	Agreeable
4.	Taste	---	APHA 2160 C	Agreeable	Agreeable
5.	Turbidity	NTU	APHA 2130 B	1.0	<1.0
6.	Residual Free Chlorine	mg/l	APHA 4500 Cl ⁻ B	0.2	ND
7.	Total Dissolved Solids	mg/l	APHA 2540 C	500.0	259.0
8.	Electrical Conductivity	μS/cm	APHA 2510 B	---	385.6
9.	Total Alkalinity as CaCO ₃	mg/l	APHA 2320 B	200	88.0
10.	Total Hardness as CaCO ₃	mg/l	APHA 2340 C	200	110.0
11.	Calcium as Ca	mg/l	APHA 3500 Ca B	75	34.4
12.	Magnesium as Mg	mg/l	APHA 3500Mg B	30	5.8
13.	Chloride as Cl	mg/l	APHA 4500Cl ⁻ B	250	29.0
14.	Fluoride as F	mg/l	APHA 4500 F ⁻ C	1.0	0.34
15.	Sulphide	mg/l	APHA 4500 S ²⁻ D	0.05	ND
16.	Sulphate as SO ₄	mg/l	APHA 4500SO ₄ ²⁻ B	200	19.2
17.	Nitrate as NO ₃	mg/l	APHA 4500NO ₃ E	45	1.25
18.	Ammonical Nitrogen as NH ₃ -N	mg/l	APHA 4500 NH ₃ F	0.5	BDL
19.	Hexavalent Chromium as Cr ⁺⁶	mg/l	APHA 3111 B	--	BDL
20.	Phenolic Compounds as C ₆ H ₅ OH	mg/l	APHA5530 B,D	0.001	BDL
21.	Cyanide as CN	mg/l	APHA 4500 CN ⁻ C D	0.05	BDL
22.	Sodium as Na	mg/l	APHA 3500Na B	---	7.4
23.	Potassium as K	mg/l	APHA 3500K B	---	1.8
24.	Copper as Cu	mg/l	APHA 3111 B,C	0.05	BDL
25.	Iron as Fe	mg/l	APHA 3500Fe B	1.0	0.32
26.	Manganese as Mn	mg/l	APHA 3500Mn B	0.1	BDL
27.	Mercury as Hg	mg/l	APHA3500 Hg	0.001	BDL
28.	Cadmium as Cd	mg/l	APHA3111 B,C	0.003	BDL
29.	Selenium as Se	mg/l	APHA3114 B	0.01	BDL
30.	Arsenic as As	mg/l	APHA3114 B	0.01	BDL
31.	Lead as Pb	mg/l	APHA3111 B,C	0.01	BDL



32.	Zinc as Zn	mg/l	APHA3111 B,C	5.0	0.94
33.	Nickel as Ni	mg/l	APHA3500 Ni	0.02	BDL
34.	Total Chromium as Cr	mg/l	APHA 3500 Cr B	0.05	BDL
35.	Boron as B	mg/l	APHA 4500 B C	0.5	BDL
36.	Silver as Ag	mg/l	APHA 3500 Ag	0.1	BDL
37.	Barium as Ba	mg/l	APHA 3500 Ba	0.7	BDL
38.	Aluminium as Al	mg/l	APHA 3500 Al B	0.2	BDL
39.	Anionic detergent as MBAS	mg/l	APHA 5540 C	1.0	ND
40.	Mineral Oil	mg/l	APHA 5220 B	0.5	ND
41.	Total Coliform	MPN/100ml	APHA 9221 B	Shall not be detectable in any 100 ml	<1.1
42.	EColi	MPN/100ml	APHA 9221 E	Shall not be detectable in any 100 ml	Absent
43.	Feacal Coliform	MPN/100ml	APHA 9221 F	---	<1.1
44.	Pesticides	mg/l	APHA 6630 C	---	Absent

BDL Value: Cu <0.02mg/l, Al <1.0mg/l, B <0.1mg/l, Ba <0.5mg/l, Mn<0.05mg/l, Hg<0.002 mg/l, Cd <0.01 mg/l, Se <0.001 mg/l, As <0.004 mg/l, Pb<0.01mg/l, Ni<0.05 mg/l, Cr <0.05mg/l, Cr⁺⁶<0.01mg/l, Phenol <0.05mg/l, CN <0.01mg/l, Ba<0.1mg/l

Mande

Reviewed by



Puja Mohanty

Approved by





Ref:Envlab/20/R-3745

Date: 03.09.2020

GROUND WATER QUALITY REPORT AUGUST-2020 (BUFFER ZONE)

1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Name of the Location : **Ground Water-1: Near Paramanandpur Village**
: **Ground Water-2: Near Dulanga Village**
4. Location Co-ordinates : **GW-1: 21° 57' 15.4476" N, 83° 45' 54.144" E**
: **GW-2: 21° 56' 46.1832" N, 83° 47' 55.3164" E**
5. Date of Sampling : **06.08.2020**
6. Date of Receiving : **07.08.2020**
7. Date of Analysis : **07.08.2020 to 13.08.2020**
8. Sample Collected By : **VCSPL Representative in presence of OCPL representative**

SL. No.	Name of the Parameters	Unit	Testing Method	Standard as per IS 10500:2012, Amnd. 2015 & 2018	Analysis Result	
					GW-1	GW-2
1.	pH (at 25 °C)	---	APHA 4500H ⁺ B	6.5-8.5	7.03	7.27
2.	Color	Hazen	APHA 2120 B,C	5.0	<5	<5
3.	Odor	---	APHA 2150 B	Agreeable	Agreeable	Agreeable
4.	Taste	---	APHA 2160 C	Agreeable	Agreeable	Agreeable
5.	Turbidity	NTU	APHA 2130 B	1.0	<1.0	<1.0
6.	Residual Free Chlorine	mg/l	APHA 4500 Cl ⁻ B	0.2	ND	ND
7.	Total Dissolved Solids	mg/l	APHA 2540 C	500.0	248.0	226.0
8.	Electrical Conductivity	μS/cm	APHA 2510 B	---	380.7	354.3
9.	Total Alkalinity as CaCO ₃	mg/l	APHA 2320 B	200	88.0	82.0
10.	Total Hardness as CaCO ₃	mg/l	APHA 2340 C	200	114.0	94.0
11.	Calcium as Ca	mg/l	APHA 3500 Ca B	75	35.2	30.6
12.	Magnesium as Mg	mg/l	APHA 3500Mg B	30	6.3	4.3
13.	Chloride as Cl	mg/l	APHA 4500Cl ⁻ B	250	35.5	29.0
14.	Fluoride as F	mg/l	APHA 4500 F ⁻ C	1.0	0.37	0.28
15.	Sulphide	mg/l	APHA 4500 S ²⁻ D	0.05	ND	ND
16.	Sulphate as SO ₄	mg/l	APHA 4500SO ₄ ²⁻ B	200	19.8	17.3
17.	Nitrate as NO ₃	mg/l	APHA 4500NO ₃ ⁻ E	45	1.5	1.34
18.	Ammonical Nitrogen as NH ₃ -N	mg/l	APHA 4500 NH ₃ F	0.5	BDL	BDL
19.	Hexavalent Chromium as Cr ⁶⁺	mg/l	APHA 3111 B	--	BDL	BDL
20.	Phenolic Compounds as C ₆ H ₅ OH	mg/l	APHA5530 B,D	0.001	BDL	BDL
21.	Cyanide as CN	mg/l	APHA 4500 CN ⁻ C D	0.05	BDL	BDL
22.	Sodium as Na	mg/l	APHA 3500Na B	---	9.5	8.7
23.	Potassium as K	mg/l	APHA 3500K B	---	2.2	1.9
24.	Copper as Cu	mg/l	APHA 3111 B,C	0.05	BDL	BDL
25.	Iron as Fe	mg/l	APHA 3500Fe B	1.0	0.28	0.33



26.	Manganese as Mn	mg/l	APHA 3500Mn B	0.1	BDL	BDL
27.	Mercury as Hg	mg/l	APHA3500 Hg	0.001	BDL	BDL
28.	Cadmium as Cd	mg/l	APHA3111 B,C	0.003	BDL	BDL
29.	Selenium as Se	mg/l	APHA3114 B	0.01	BDL	BDL
30.	Arsenic as As	mg/l	APHA3114 B	0.01	BDL	BDL
31.	Lead as Pb	mg/l	APHA3111 B,C	0.01	BDL	BDL
32.	Zinc as Zn	mg/l	APHA3111 B,C	5.0	0.96	1.12
33.	Nickel as Ni	mg/l	APHA3500 Ni	0.02	BDL	BDL
34.	Total Chromium as Cr	mg/l	APHA 3500 Cr B	0.05	BDL	BDL
35.	Boron as B	mg/l	APHA 4500 B C	0.5	BDL	BDL
36.	Silver as Ag	mg/l	APHA 3500 Ag	0.1	BDL	BDL
37.	Barium as Ba	mg/l	APHA 3500 Ba	0.7	BDL	BDL
38.	Aluminium as Al	mg/l	APHA 3500 Al B	0.2	BDL	BDL
39.	Anionic detergent as MBAS	mg/l	APHA 5540 C	1.0	ND	ND
40.	Mineral Oil	mg/l	APHA 5220 B	0.5	ND	ND
41.	Total Coliform	MPN/100ml	APHA 9221 B	Shall not be detectable in any 100 ml	<1.1	<1.1
42.	EColi	MPN/100ml	APHA 9221 E	Shall not be detectable in any 100 ml	Absent	Absent
43.	Feacal Coliform	MPN/100ml	APHA 9221 F	---	<1.1	<1.1
44.	Pesticides	mg/l	APHA 6630 C	---	Absent	Absent

BDL Value: Cu <0.02mg/l, Al <1.0mg/l, B <0.1mg/l, Ba <0.5mg/l, Mn<0.05mg/l, Hg<0.002 mg/l, Cd <0.01 mg/l, Se <0.001 mg/l, As <0.004 mg/l, Pb<0.01mg/l, Ni<0.05 mg/l, Cr <0.05mg/l, Cr⁺⁶<0.01mg/l, Phenol <0.05mg/l, CN <0.01mg/l, Ba<0.1mg/l

M. Panda
Reviewed by



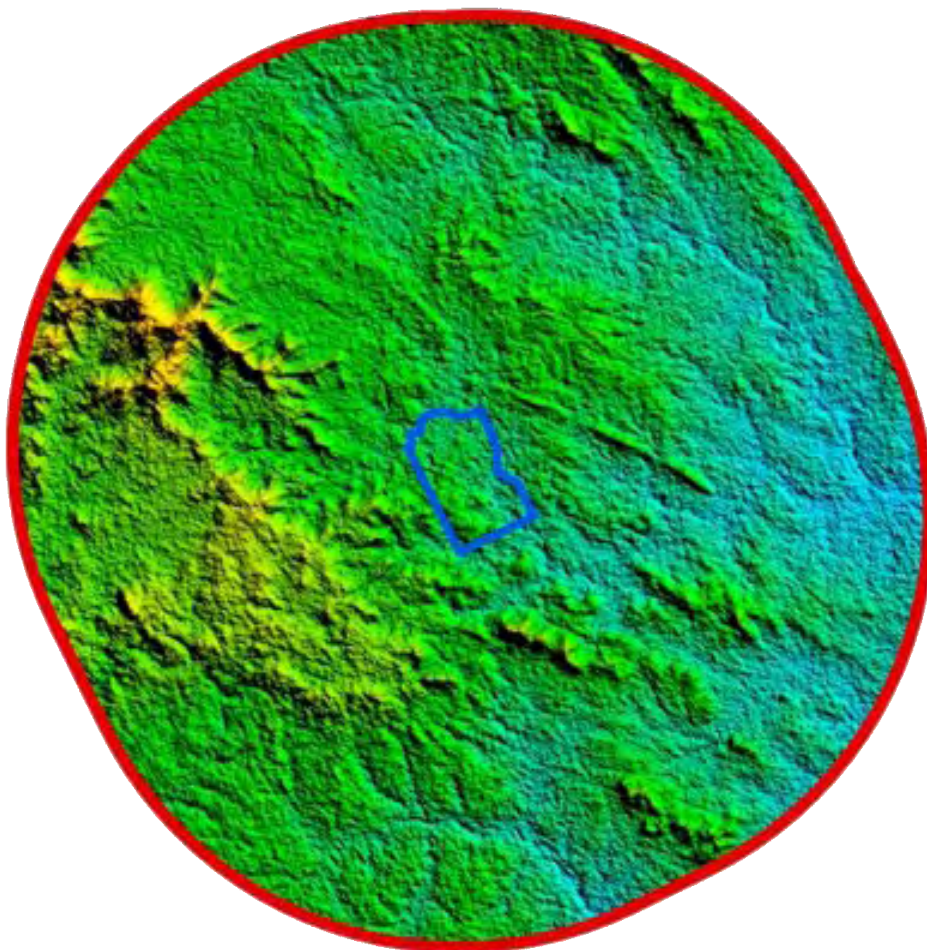
Pooja Mohanty
Approved by



Report on Land Use / Land Cover Study of Core & Buffer Zone of Manoharpur Coal Mine Project

Project Location: Manoharpur, Sundargarh District, Ordisha.

Year of Study: 2018



Prepared for:



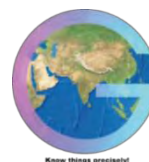
Odisha Coal and Power Ltd,
Zone-A, Ground Floor,
Fortune Towers,
Chandrasekharpur,
Bhubaneswar - 751023
Odisha, India.

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BGR Mining & Infra Ltd,
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Prepared by:



Geosys Enterprise Solutions Private Limited,
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Building, 3rd Floor, Ameerpet,
Hyderabad-500016, Telangana.
(AN ISO 9001:2015 CERTIFIED COMPANY)

REPORT ON

Manoharpur Coal Mine Project

Project Location: Manoharpur, Sundargarh & Jharsuguda District, Odisha State.

1. Introduction

The knowledge of land use and land cover is important for many planning and management activities as it is considered an essential element for modeling and understanding the earth system.

The term land use relates to the human activity or economic function associated with a specific piece of land, while the term land cover relates to the type of feature present on the surface of the earth (Lillesand and Kiefer, 2000).

Land cover maps are presently being developed from local to national to global scales. The use of panchromatic and medium scale aerial photographs to map land use has been an accepted practice since the 1940s. More recently, small scale aerial photographs and satellite images have been utilized for land use and land cover mapping. The satellite remote sensing technology has found its acceptance worldwide for rapid resource assessment and monitoring, particularly in the developing world. National Aeronautical and Space Administration (NASA) of USA has made most significant contributions with satellite based remote sensing techniques. Since 1972, after the Landsat-1 was launched, remote sensing technology and its application has undergone a tremendous change in terms of sensing development, aerial flights with improved sensors, satellite design development and operations including data reception, processing, interpretation, and utilization of satellite images.

All these advancements have widened the applicability of remotely sensed data in various areas, like forest cover, vegetation type mapping, and their changes on a regional scale. If satellite data is judiciously used along with the enough ground data, it is possible to carry out detailed forest inventories, monitoring of land use, and vegetation cover at various scales.

M/s Odisha Coal and Power Ltd, Manoharpur is holding a mining lease of Manoharpur Coal Mine Project with EC No. J-11015/139/2008-IA-II(M) Project for an area of 652.43 Ha at Sundargarh District, Odisha State. Now the Odisha Coal and Power Ltd, is preparing Environmental Impact Assessment Study and Environment Compliance Report to maintain Environmental Clearance for coal mining in the Project area from Ministry of Environment Forest and Climate Change (MOEFCC), Government of India.

M/s BGR Mining & Infra Ltd, is appointed by Odisha Coal and Power Ltd, as mine operator to develop and operate Manoharpur Coal mine project for a period of 10 years wide mining services agreement dated 31.08.2018.

M/s Geosys Enterprise Solutions Private Limited is an Indian company providing world-class Enterprise Geographic Information System (GIS) solutions thereby helping businesses, governments and private organizations to make timely, informed and mission-critical decisions by leveraging the power of geography.

2. Scope of the Study

The objective of the present study is to prepare the Essential (Thematic) Maps to be provided to the Ministry of Environment Forest and Climate Change as part of the EIA/EMP and Environment Compliance Report, for maintaining the Environmental Clearance (EC), as per Environmental Impact Assessment Guidance Manual.

Scope of the Project Includes:

Digital image processing of Core zone (project area) & Buffer zone (10 Km. radius around periphery of the project) for coal mining projects, using Remote Sensing Technique and GIS to study the present land use pattern and prepare land use / land cover maps.

3. Location of the Project

The mine is covered in Manoharpur Village, Hemgir Tehasil, Sundargarh District, Ordisa State. The location of the Mining lease area falls under Survey of India Toposheet No F44R13 the geographical co- ordinates of the lease area as follows:

North-West Corner: 21°58'16.314"N (Latitude), 83°45'52.1"E (Longitude)

South-East Corner: 21°56'48.488"N (Latitude), 83°47'42.485"E (Longitude)

The 10km buffer Zone of the Manoharpur Coal Mine Project is falling in F44L12, F44L16, F44R9 and F44R13 SOI Toposheets. The buffer zone is covered in Sundargarh & Jharsugda District of Ordisa State. Location Map shown in Figure 1

4. Tools and Resources

To meet the project requirements, Geosys has acquired the following satellite data for the study area from National Remote Sensing Centre, Hyderabad.

For 10km Buffer Zone:

Satellite:	IRS Resourcesat2
Sensor:	Liss IV MX
Path:	104
Row:	057
Spatial Resolution:	5.8m
Date of pass:	08-May-2018

For Core Zone Multispectral Data:

Satellite:	IRS Resourcesat2
Sensor:	Liss IV MX
Path:	104
Row:	057
Spatial Resolution:	5.8m
Date of pass:	08-May-2018

High resolution Panchromatic Data:

Satellite:	IRS Cartosat-1
Sensor:	Pan A
Path:	0567
Row:	0295
Spatial Resolution:	2.5m
Date of pass:	04-March-2018

The Resourcesat-2 imageries have been merged with the Cartosat-1 Pan A imageries for the core zone to get the high spatial and spectral information in single image.

The Cartosat-1 Pan A imagery for the core zone is shown in the Fig 6 and the merged data of RS2 Liss IV data and Cartosat-1 Pan A data is shown in Fig 7.

5. Limitations

The limitations of Remote Sensing, Image Processing, Geographical Information Systems, cartography and GPS are applicable in this study.

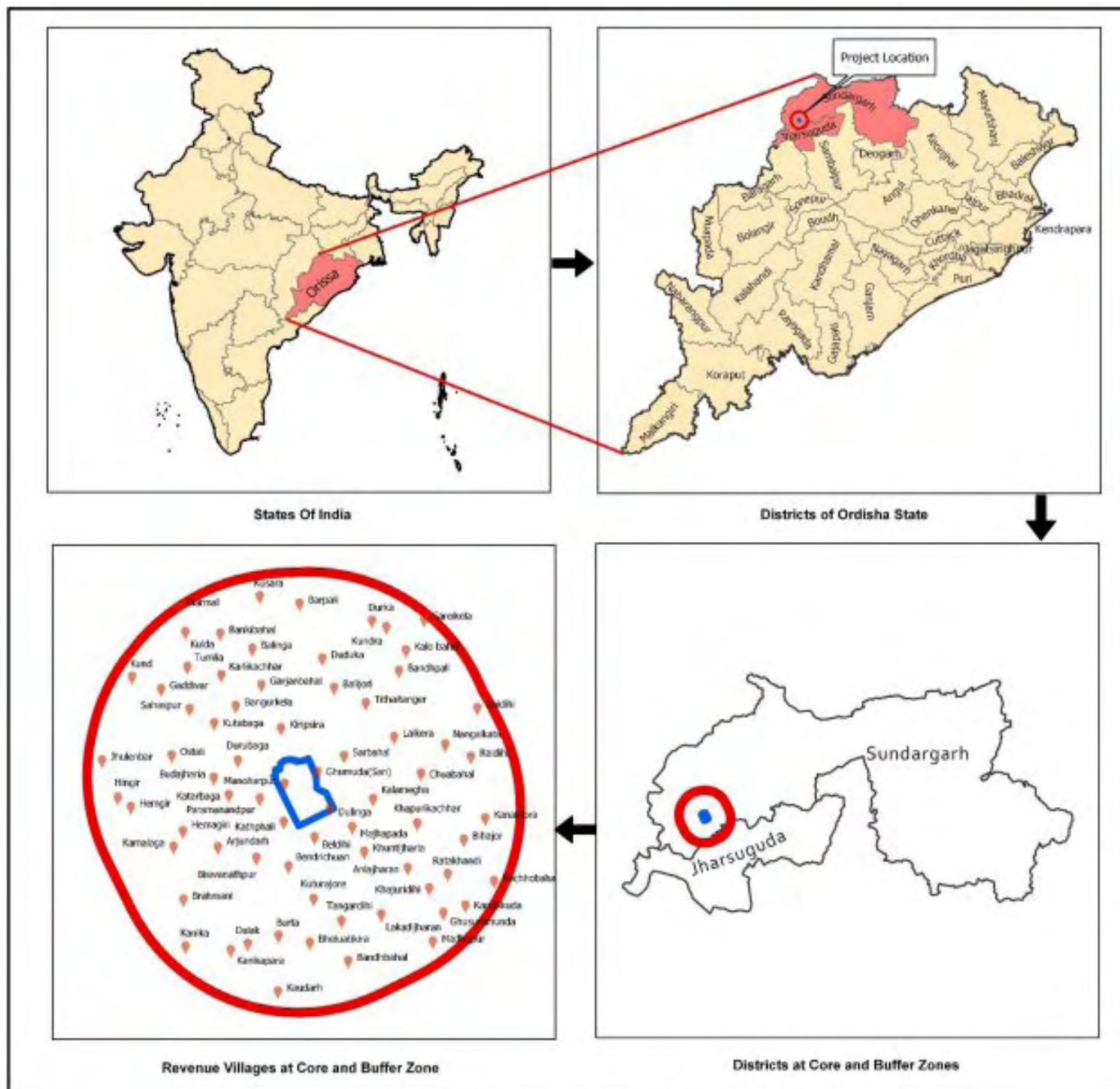


Fig 1: Location Map of the Buffer Zone and Core Zone

Location Map of Manoharpur Coal Mine Project



Legend

- Mine Boundary
- 10 Kms Buffer Boundary

Client:



ODISHA COAL AND POWER LTD

Prepared By:



GEOSYS ENTERPRISE SOLUTIONS PRIVATE LIMITED
(ISO - 9001 - 2015 Certified)

83°40'0"E

83°45'0"E

83°50'0"E

22°0'0"N

21°55'0"N



Resourcesat 02 LISS-IV MX Image Of Core Zone And Buffer Zone Of Manoharpur Coal Mine Project



1:25000

0 1.5 3 6

Kilometers

Satellite Data Details:

Satellite: Resourcesat 02
Sensor: LISS IV MX
Path: 104
Row: 057
Spatial Resolution: 5.8m
Date of Pass: 26th April 2018

Legend

- 10 Kms Buffer Boundary
- Mine Boundary

Client:



Odisha
Coal and
Power
Limited

ODISHA COAL AND POWER LTD

Prepared By:

GEOSYS
ENTERPRISE SOLUTIONS PVT. LTD.

GEOSYS ENTERPRISE SOLUTIONS PRIVATE LIMITED
(ISO - 9001 - 2015 Certified)

Fig 2 : Resourcesat 02 LISS-IV MX Image Of Core Zone And Buffer Zone

83°46'0"E

83°47'0"E

83°48'0"E



Resourcesat 02 LISS-IV MX Image Of Manoharpur Coal Mine Project



1:5000

0 0.23 0.45 0.9
Kilometers

Satellite Data Details:

Satellite: Resourcesat 02
Sensor: LISS IV MX
Path: 104
Row: 057
Spatial Resolution: 5.8m
Date of Pass: 08th May 2018

Legend

 Mine Boundary

Client:



ODISHA COAL AND POWER LTD

Prepared By:

GEOSYS
ENTERPRISE SOLUTIONS PVT. LTD.

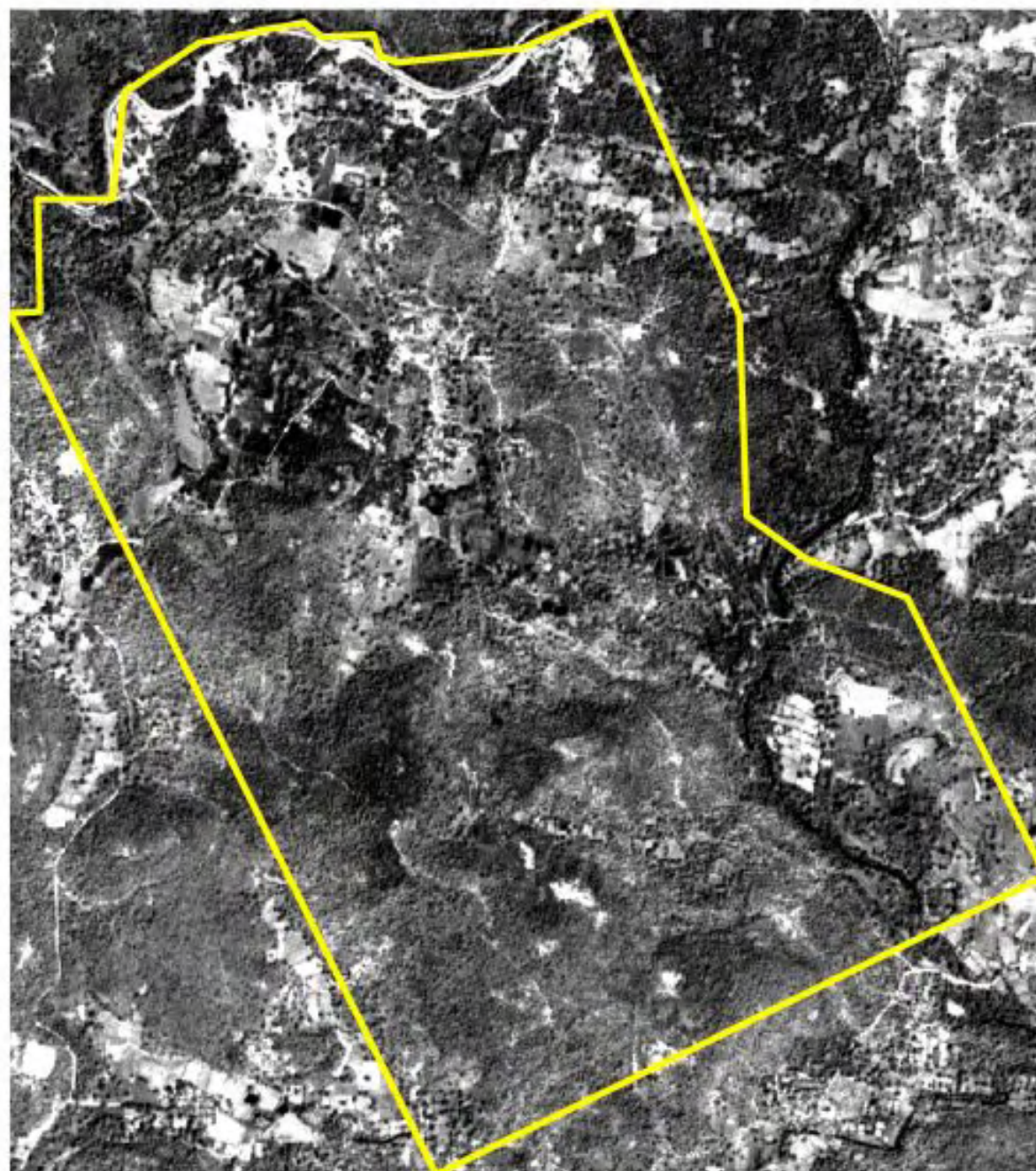
GEOSYS ENTERPRISE SOLUTIONS PRIVATE LIMITED
(ISO - 9001 - 2015 Certified)

Fig 3 : Resourcesat 02 LISS-IV MX Image Of Core Zone

83°46'E

83°47'E

83°48'E



Cartosat 01 PAN Band A Image Of Core Zone Of Manoharpur Coal Mine Project



1:5000

0 0.23 0.45 0.9
Kilometers

Satellite Data Details:

Satellite: Cartosat 01
Sensor: Pan A
Path: 567
Row: 295
Spatial Resolution: 2.5m
Date of pass: 04th March 2018

Legend

 Mine Boundary

Client:



ODISHA COAL AND POWER LTD

Prepared By:

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Fig 4 : Cartosat 01 PAN Band A Image Of Core Zone

83°46'0"E

83°47'0"E

83°48'0"E

21°58'0"N

21°57'0"N



**Merged Data of Resourcesat 02
LISS IV MX and Cartosat 01 PAN
Image of Core Zone of
Manoharpur Coal Mine Project**



1:5000

0 0.25 0.5
Kilometers

Legend

 Mine Boundary

Satellite Data Details:

Satellite: Cartosat - 01
Sensor: Pan A
Path: 0567
Row: 0295
Spatial Resolution: 2.5m
Date of pass: 04th March 2018

Satellite: Resourcesat 02
Sensor: LISS IV MX
Path: 104
Row: 057
Spatial Resolution: 5.8m
Date of pass: 08th May 2018

Client:



ODISHA COAL AND POWER LTD

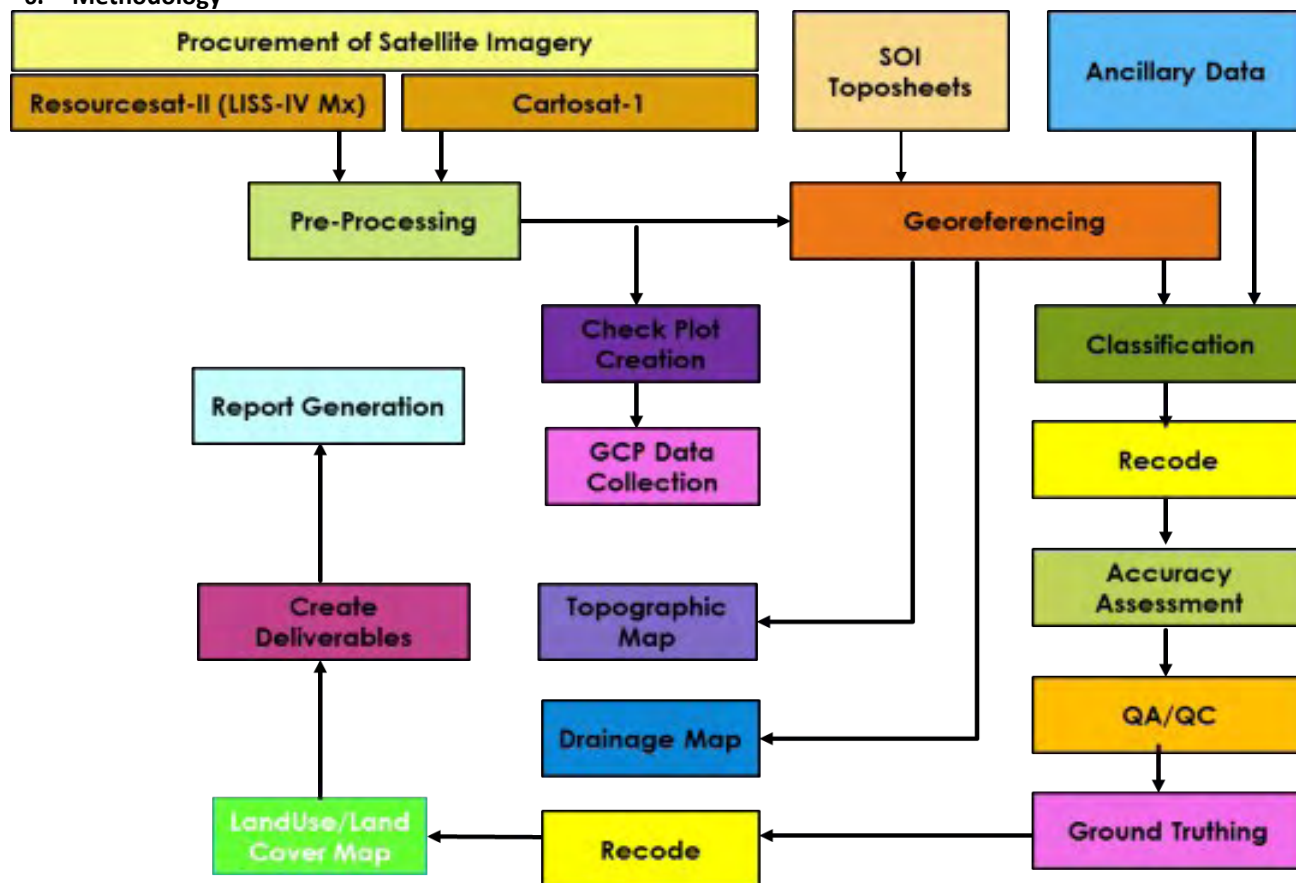
Prepared By:

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ENTERPRISE SOLUTIONS PVT. LTD.

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(ISO - 9001 - 2015 Certified)

Fig 5 : Merged Data of Resourcesat 02 LISS IV MX and Cartosat 01 PAN A Image of Core Zone

6. Methodology



6.1 Preprocessing of data

The Digital Image Processing has been performed using ArcGIS Desktop and ArcGIS Pro software tools. The IRS Resourcesat2 Liss IV Multispectral imagery have been geometrically corrected with respect to the Survey of India Toposheets. To carry out the geo-referencing, ground control points (GCPs) were identified on the maps and raw satellite data. The coefficients for two co-ordinate transformation equations were computed based on polynomial regression between GCPs on map and satellite data.

This IRS Resourcesat2 Liss IV Multispectral satellite data has been used for the Land Use Land Cover Analysis of Core and Buffer Zone. The satellite imagerys were analyzed digitally by the method of Classification with necessary Ground trothing using the reference map as well as Trimble Catalyst.

The coordinates of the boundary were collected using the Trimble catalyst to demarcate the mine boundary, during GCP collection phase.

Visual image interpretation technique of classification was applied for doing the Land use Landcover map. It is a process of identifying what we see on the images and communicates the information obtained from these images to others for evaluating their significance.

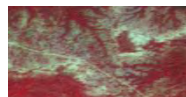
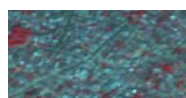
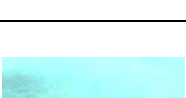
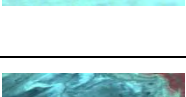
The visual interpretation methodology was used for the study area. This comprises of the following six major steps: -

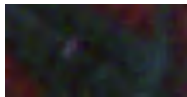
1. Selection and acquisition of data
2. Pre-field Interpretation
3. Ground data collection and verification
4. Post-field Interpretation and Modification
5. Computation of area
6. Final cartographic Map preparation.

Reconnaissance of the area under study is a prerequisite for any kind of attempt in mapping natural resources of the earth. The preliminary survey of the area has assisted in acquainting with the various kinds of classes of LULC types present in the field and subsequently helped in adopting a suitable classification scheme and.

Interpretation key for the final map generation. A classification scheme was developed for the study area following Anderson et al. (1967). A final Interpretation key for the various classes was prepared using spectral characteristics of classes and field knowledge. The interpretation key for LULC classification is given in Table 1.

Table 1: Image Interpretation techniques for Mining of final interpretation key

S.no	LULC Class	Tone	Texture	Shape	Spectral Signature	Description
1	Dense Forest	Dark Red to Light Red	Rough	Irregular		Tree Cover (If Forest Canopy Density>40%)
2	Open Forest	Light Red	Smooth	Irregular		Tree Cover (If Forest Canopy Density is between 10-40%)
3	Scrub	Light Red or Pinkish Red	Coarse	Varying		Bushy Vegetation with shrubs or scattered Trees (If Forest Canopy density<10%)
4	Settlements	Cyan	Rough	Irregular		Urban and Rural Areas
5	Water Bodies	Dark Blue or Light Blue	Smooth	Irregular/Regular		Rivers, Streams and Ponds
6	Plantations	Blackish Red to Dark Red	Medium Smooth/ Medium Coarse	Irregular/Regular/Rectangular		Mature or Young Plants
7	Single Crop	Pinkish or Light Green or Light Blue or Light Cyan	Medium Smooth	Regular		Crops/Current Fallow Lands surrounded by small to Medium Size Settlements
8	Double Crop	Dark Red to Light Red	Medium Smooth	Regular		Crops Lands surrounded by small to Medium Size Settlements
9	Fallow Land	Light Cyan or Whitish	Medium Smooth	Regular		Fields without any Crop surrounded by small to Medium Size Settlements
10	Barren Land	Light Blue or Light Cyan	Smooth	Irregular		Areas are sparse, stunted and contain limited biodiversity
11	Mining area	Light Blue or Light Cyan	Smooth	Irregular		Place where Mining Operations are taken.

12	Coal dump	Dark Grey or Black	Smooth	Irregular		Place where the Coal is Dumped
13	Quarry sump	Dark Blue or Light Blue	Smooth	Irregular		Water slogged in Mining Area
14	Green Belt	Blackish Red to Dark Red	Medium Smooth/ Medium Coarse	Irregular/ Regular		Mature or Young Plants grown in a Mining area

Classification and on-screen digitization were done in ArcGIS Desktop and ArcGIS Pro software. Finally, a polygon map was generated where each polygon represented a distinct class. The classes were then assigned to their respective attributes. Ground truth verification was done by using Trimble Catalyst during field visit. Trimble Catalyst readings included Crop, Fallow Land, Plantation, Forest, Land with / without scrub, Barren Land, Mining area, Built-up land, Water Bodies, Roads and other important and identifiable Landuse/landcover classes of Manoharpur Coal Mine Project, Sundargarh District, Orisha. are recorded and brought into GIS platform. It was found that points were very accurate in the satellite image. Finally, the area statistics of different categories of LULC and color-coded classified map of Manoharpur Opencast Coal Mine Project was generated.

Land use / Land cover Classification for buffer zone

Digital image processing was carried out to delineate various land use/ land cover categories in 10 km buffer Zone viz. built up area, crop lands, forests, scrubs, land with or without scrub, water bodies by assigning necessary training sets, which were identified based on tone, texture, size, shape pattern and location information. Necessary care has been taken to identify proper land use class, where there is conflict between signatures of various classes. The interpreted map was verified on ground at limited points and final land use/land cover map was prepared.

7. Various Land Use Classes considered

The Core and buffer zone are classified into different land use classes. The definitions of various land use classes are given below.

Table 1.1 Core Area Classes

S. No.	Major Land Use	Sub-class	Definition
1	Agriculture	Crop Land	Land devoted to agriculture, the systematic and controlled use of other forms of life—particularly the rearing of livestock and production of crops—to produce food for humans.
		Fallow Land	A piece of land that is normally used for farming but that is left with no crops on it for a season to let it recover its fertility is an example of land that would be described as fallow.
2	Waste Land	Barren Land	Land without any usage and without scrubs and sometimes they are rocky exposed areas.
3	Forest Land	Dense Forest	Forests with canopy coverage between 40%-70%
		Open Forest	Forests with tree canopy coverage between 10%-40%
4	Water Body		The oceans, rivers, streams, lakes, tanks, reservoirs, canals etc. will be identified in this class.
5	Settlements		The habitations are like villages/ colonies/ Industries will be shown in this class.

Table 1.2 Buffer Area Classes

S. No.	Major Land Use	Sub-class	Definition
1	Agriculture	Single Crop	The areas where farmers practice cultivation in a year.
		Fallow Land	The areas not cultivated in current year/ years.
		Plantation	The private areas with horticulture/other plantations
2	Forest cover	Dense Forest	Forests with canopy coverage between 40%-70%
		Open Forest	Forests with tree canopy coverage between 10%-40%
3	Waste Land	Land with / without scrub	Generally waste lands-non-agriculture and non-forest areas covered with or without scrubs.
4	Others	Mining area	The areas, where the mining activity is being carried out/ has been done are shown in this class.
		Industrial Establishments	Means an office building, factory, arena, shop or office, and any land, buildings and structures appertaining thereto
		Built-up land	The habitations are like villages/ colonies/ Industries will be shown in this class.
		Water Bodies	The oceans, rivers, streams, lakes, tanks, reservoirs, canals etc. will be identified in this class.
		Roads	A road is a thoroughfare, route, or way on land between two places that has been paved or otherwise improved to allow travel by foot or some form of conveyance, including a motor vehicle, cart, bicycle, or horse.

8. Land Use Land Cover Details of Buffer Zone

The satellite imagery of the study area around 10 Km from mine site (Core zone boundary) as captured by satellite. The Land use land cover in this study area is given here below.

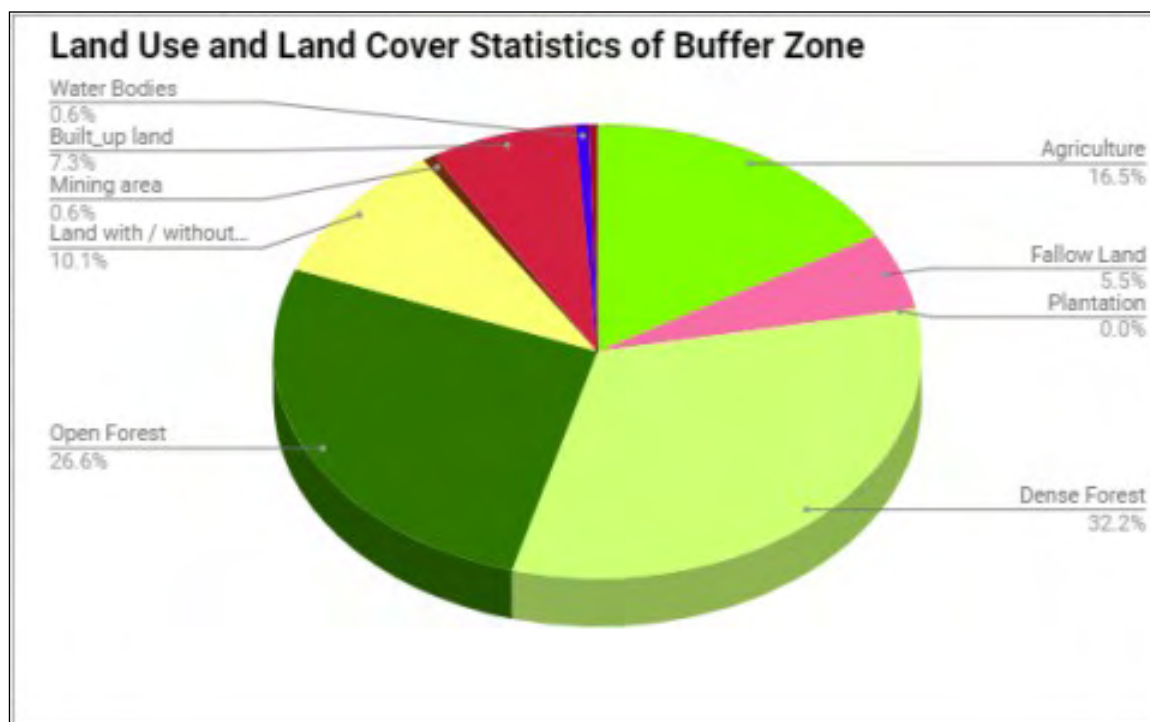
Table 1.3: Land use Land Cover details of 10km Buffer zone

Land Use Land Cover Class	Area of Class	
	Area in Ha	Percentage of Usage
Agriculture	7,266.44	16.46
Fallow Land	2,437.15	5.52
Plantation	13.51	0.03
Dense Forest	14,229.53	32.24
Open Forest	11,760.55	26.64
Land with / without scrub	4,442.63	10.06
Mining area	283.84	0.64
Built-up land	3,233.22	7.32
Water Bodies	273.45	0.619
Roads	200.375	0.45
Total Area	44,140.70	100

Results for Buffer Area

The visual interpretation of the satellite data with the ground truth was used to map different categories of land use/ land cover (LULC) for Buffer Area Fig.8 shows the LULC map of Manoharpur Coal Mine Project for Buffer Area. Area statistics of different categories of Buffer Area of land use/ land cover is also given in Table 1.1.

Ten categories of LULC were classified in Buffer Area are shown in Table 1.2. Agriculture Single crop the major proportion (16.46%) of Manoharpur Opencast-I Coal Mine Project. The forest type of this region belongs to Reserved Forest. Other land use categories included Forest, settlement, water bodies and wasteland. Forest covers 58.87% of the total area. Agriculture is the major source of livelihood economy. Human settlements occupy 7.32% of the total area and are sparsely distributed. Water bodies occupy 0.62% and the main water body is Godavari River which flows across the Buffer zone of Manoharpur Opencast-I Coal Mine Project. Few ponds were also found scattered in and around the villages.



Pie chart of Fig 8: Land use Land Cover details of 10km Buffer zone

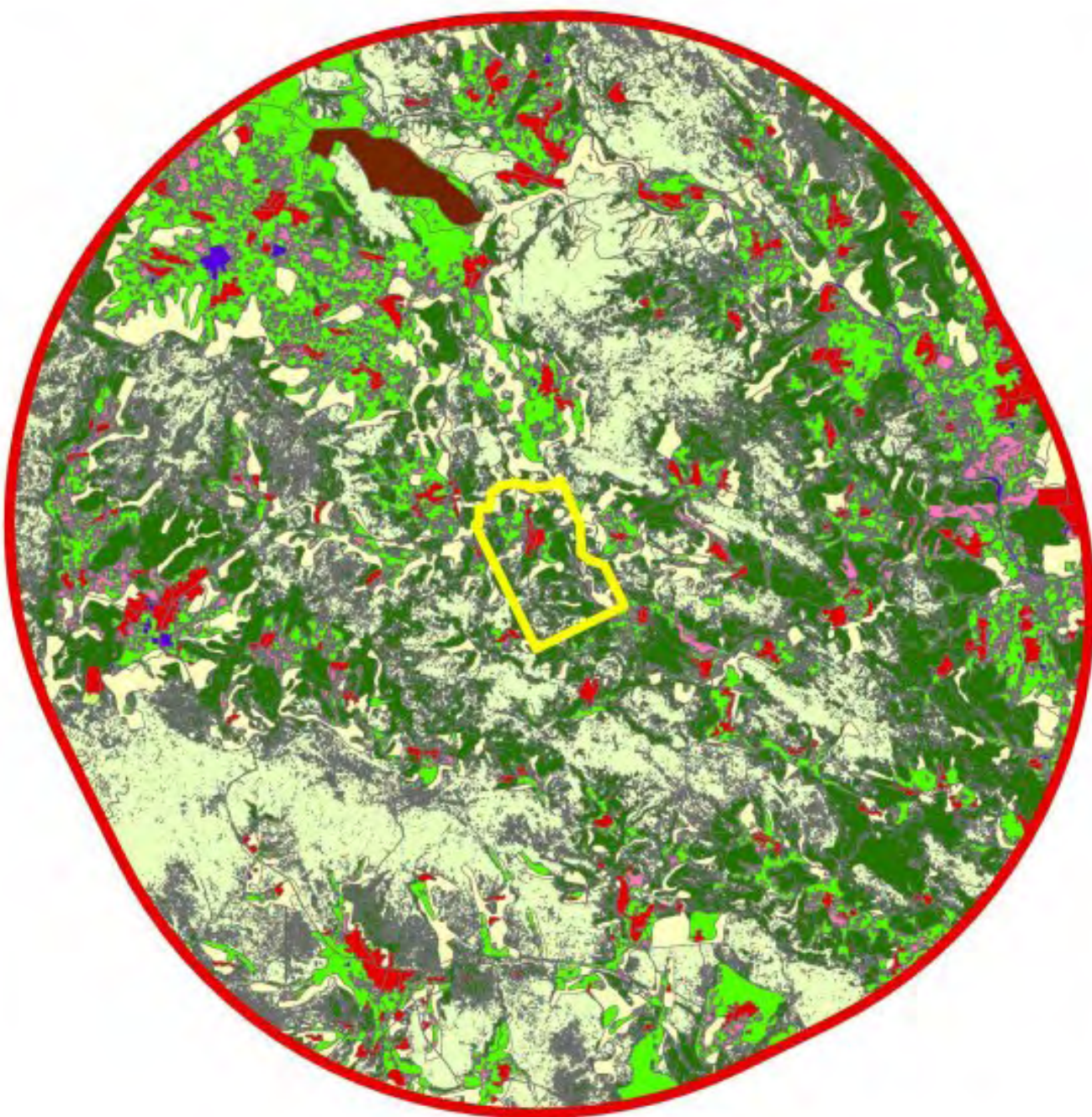
83°40'0"E

83°45'0"E

83°50'0"E

22°0'0"N

21°55'0"N



Buffer Area Classification Of Manoharpur Coal Mine Project



1:5000

0 1.5 3 6

Kilometers

Legend

- Mine Boundary
- 10 Kms Buffer Boundary

Map Symbol	Land Use Land Cover Class	Area in Hectares	Area Percentage
	Agriculture	7,266.435284	16.46198354
	Fallow Land	2,437.148490	5.521317778
	Plantation	13.510610	0.0306085063
	Dense Forest	14,229.536832	32.23676974
	Open Forest	11,790.552669	26.64332879
	Land with / without scrub	4,442.628404	10.06469786
	Mining area	263.844703	0.6430452694
	Built up land	3,233.224262	7.32481368
	Water Bodies	273.448360	0.6194925329
	Roads	200.373323	0.4539422997

Client:



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Fig 6 : Land Use/ Land Cover pattern map of the Buffer Zone

Land Use Land Cover Study of Core Mine Area

The Satellite data of the core zone of 652.53 Ha has been presented. The classified data of the Mine core zone. The extents of various Land Use/Land Cover classes pertaining to the study area.

Table 1.4: Land use Land Cover details of Core zone

Land Use Land Cover Class	Area of Sub Class	Area of Class
	Area in Ha	Percentage of Usage
Agriculture	75.33	11.55
Fallow Land	33.45	5.13
Dense Forest	111.63	17.11
Open Forest	279.54	42.85
Land with / without scrub	120.63	18.49
Built-up land	23.59	3.62
Water Bodies	4.18	0.64
Roads	4.08	0.62
Total Area	652.43	100

Results for Core Area

Fig. 9 Shows the LULC map of Manoharpur Mine Project for Core Area. Area statistics of different categories of Core Area of land use/ land cover is also given in Table 1.4.

Eight categories of LULC were classified in Core Area are shown in Table 1.1.

Mining Area constitute the major proportion of Manoharpur Coal Mine Project. Other land use categories included water bodies covers 0.64% of the total area, Agriculture covers 11.55% of total area, Fallow Land 5.13%, Forest covers 59.95% of total area of total area, Build-up covers 3.61% of total area and Road covers 0.62% of the total area.

83°46'0"E

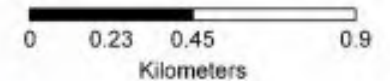
83°47'0"E

83°48'0"E

Core Area Classification Of Manoharpur Coal Mine Project



1:5000



Legend

Mine Boundary

Map Symbol	Land Use Land Cover Class	Area In Hectares	Area Percentage
	Agriculture	75.329454	11.54959574
	Fallow Land	33.447796	5.126641536
	Dense Forest	111.631339	17.11066171
	Open Forest	279.544277	42.84656872
	Land with / without scrub	120.632092	18.48963347
	Built up land	23.586895	3.61524766
	Water Bodies	4.183081	0.6411530367
	Roads	4.075920	0.6247281556

Client:



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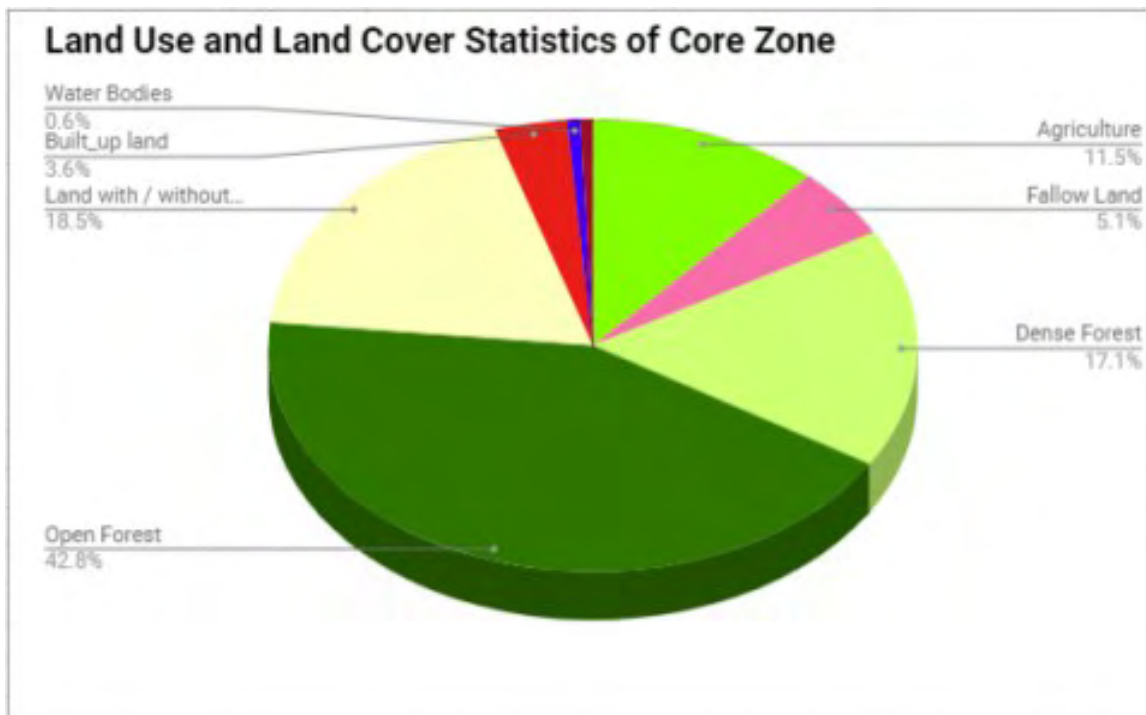
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Fig 7 : Land Use/ Land Cover pattern map of the Core Zone



Pie chart of Fig 9: Land use Land Cover details of Core zone

Accuracy Assessment

The classified land use/land cover types were validated with the help of an extensive Trimble Catalyst aided field survey. The ground reference data were compared with the classified map and the accuracy was quantitatively assessed. The overall accuracy of the classified map was calculated using the following formula (Rashid et al., 2013):

$$p = \left(\frac{n}{N} \right) \times 100$$

Where p is the Classification accuracy.

n is the number of Points correctly classified in the Image.

N of points checked in the field.

7. Topography

1) Source of Information

Survey of India Toposheets F44L12, F44L16, F44R9 and F44R13 has been used for the topography studies. In topography map of buffer zone contours, drainage pattern, Roads, settlements, water bodies and forest boundaries has been shown.

2) Study Results

The 10km buffer zone from the core zone boundary i.e. mine lease area of Manoharpur Coal Mine Project is mostly plain area, the elevation values range between -200m to 480m. There is hilly terrain in the South - East and South - West parts of the buffer zone.

The buffer zone covers the reserved forests namely Garjanpaharh Reserve Forest and Punjipaharh Reserve Forest. Balijori Reserve Forest, Makarachata Reserve Forest, Chhengapahar Reserve Forest and Basundhara River are passing through the buffer zone.

The buffer zone is covered with 1- 4th order streams.

Hemgir and Kanika are the major Settlements that are covered in the 10km buffer zone. The South- East Railway main line is passing in the buffer zone.

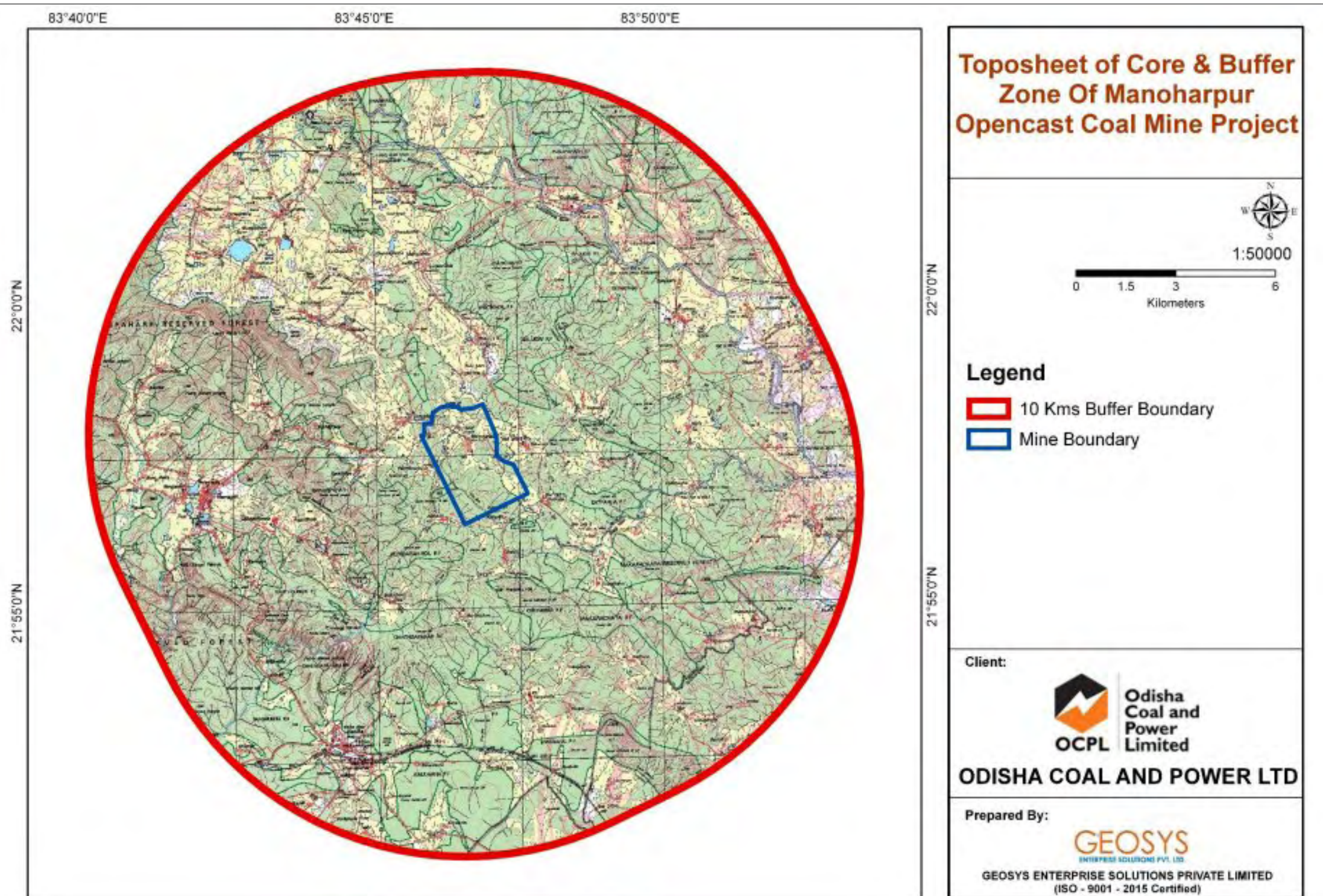
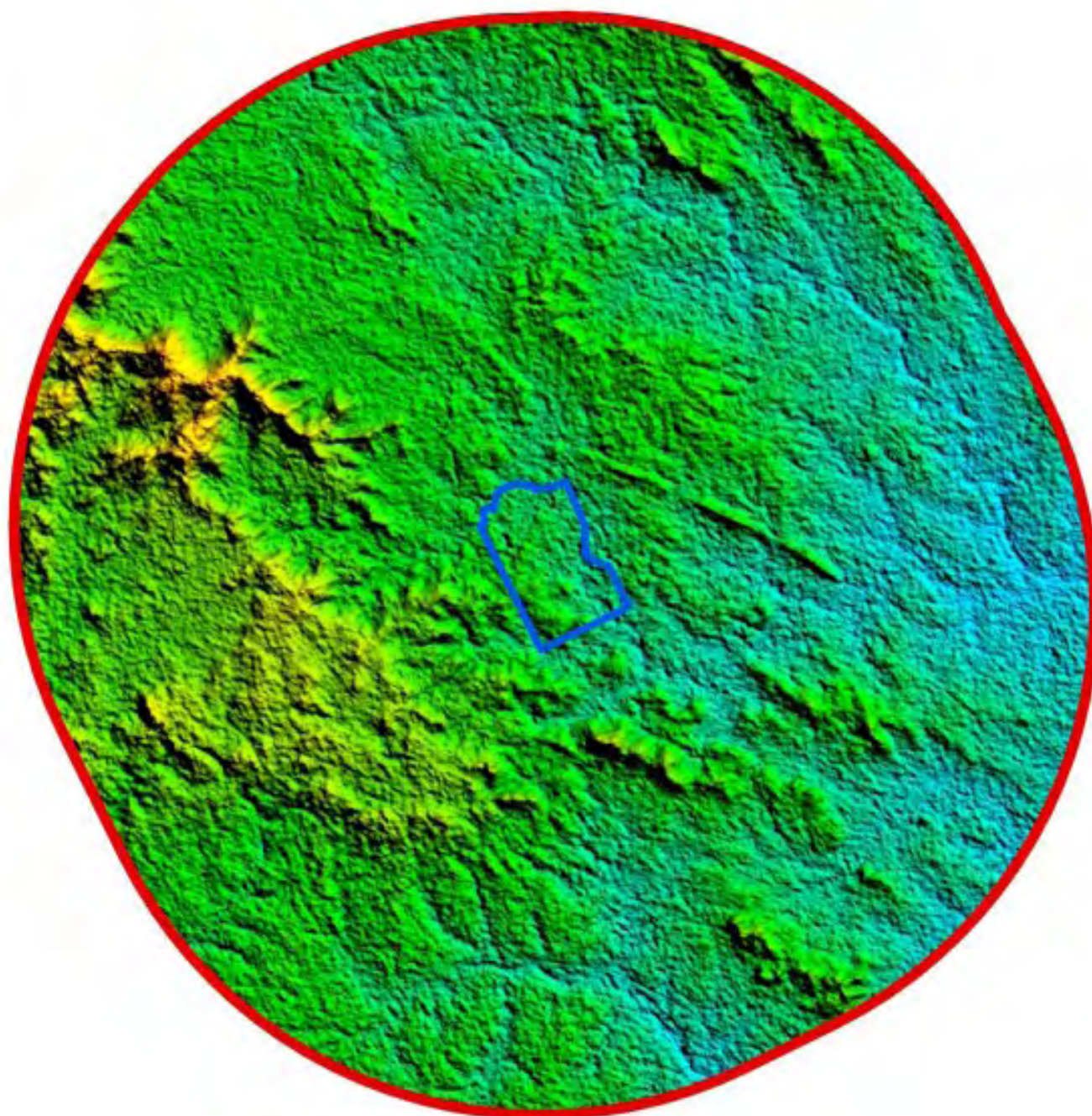


Fig 8 : Toposheet of Core & Buffer Zone

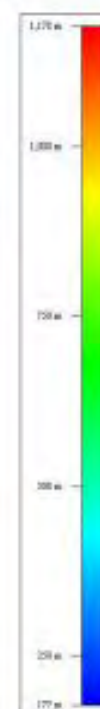
83°40'0"E 83°45'0"E 83°50'0"E

22°0'0"N

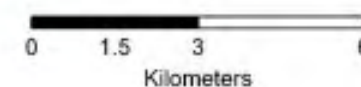
21°55'0"N



Digital Elevation Model Of Core & Buffer Zone Of Manoharpur Coal Mine Project



1:5000



Legend

 Mine Boundary

Client:



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Fig 9 : DEM For Core & Buffer Zone

83°40'0"E

83°45'0"E

83°50'0"E

22°0'0"N

21°55'0"N

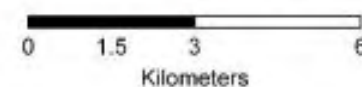
22°0'0"N

21°55'0"N

Contour Map of Core & Buffer Zone Of Manoharpur Coal Mine Project



1:25000



Contour Interval 20 meters

Legend

- ▭ Mine Boundary
- ▭ 10 Kms Buffer Boundary
- Contours

Client:



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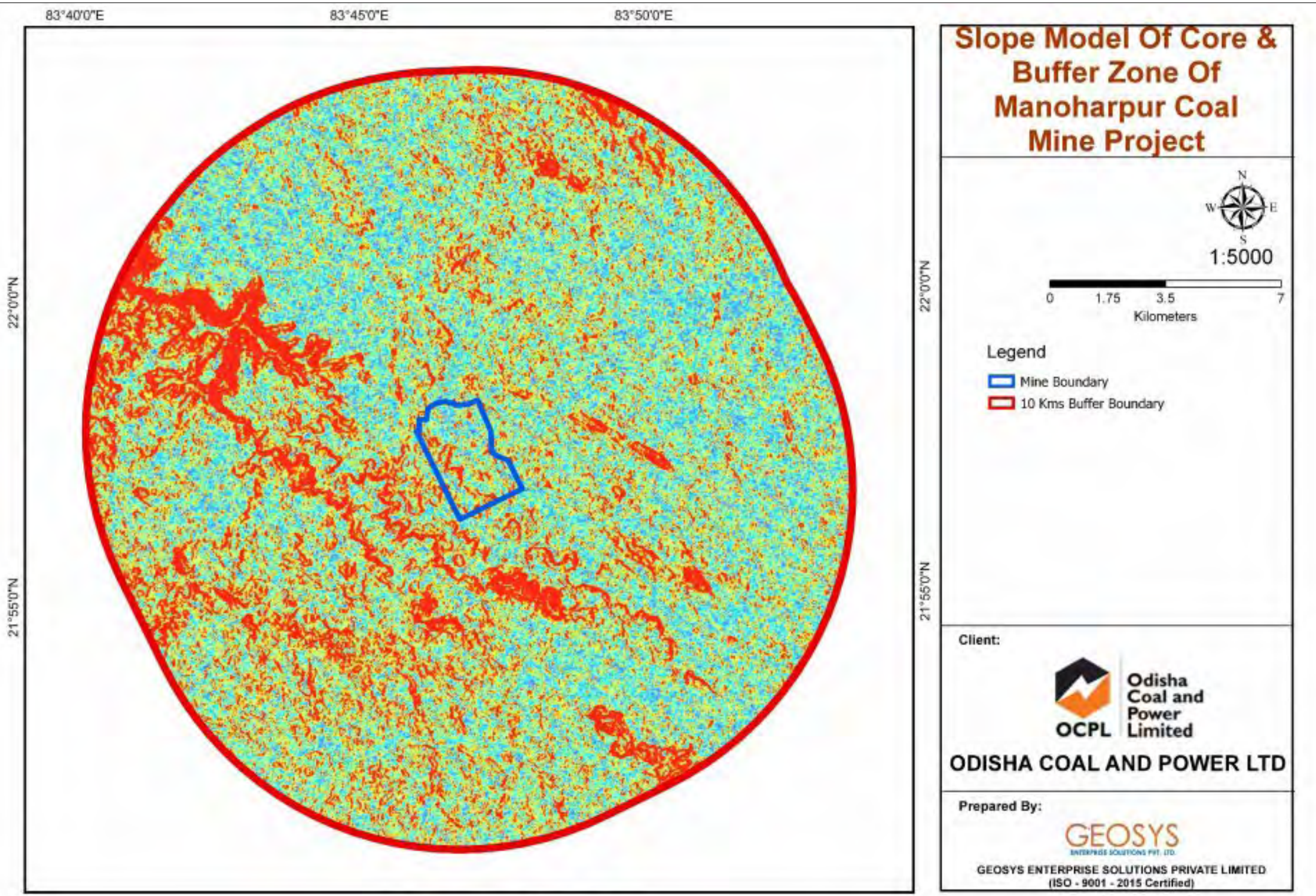
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Fig 10 : Contour Map Of Core & Buffer Zone With 20 Meter



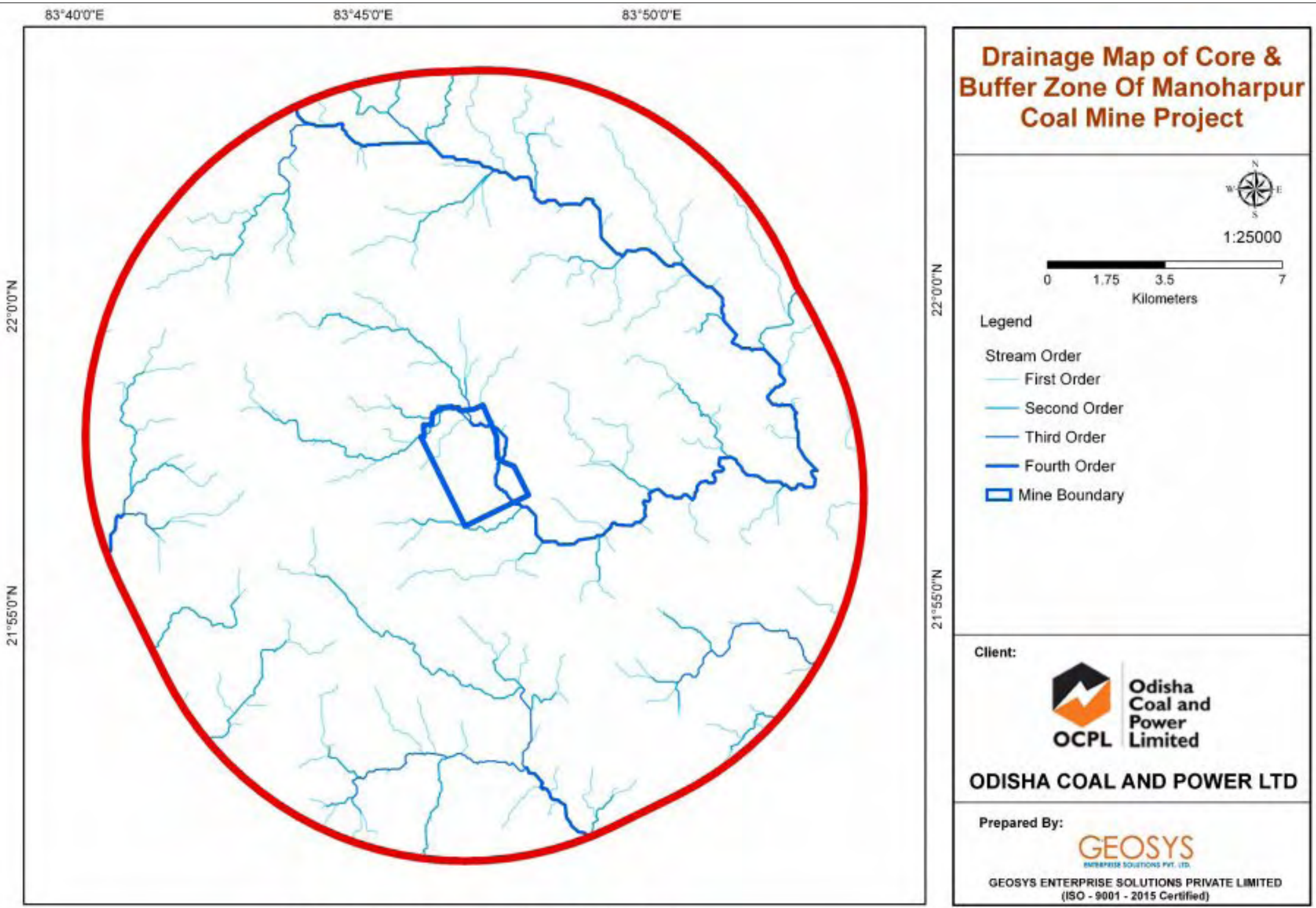
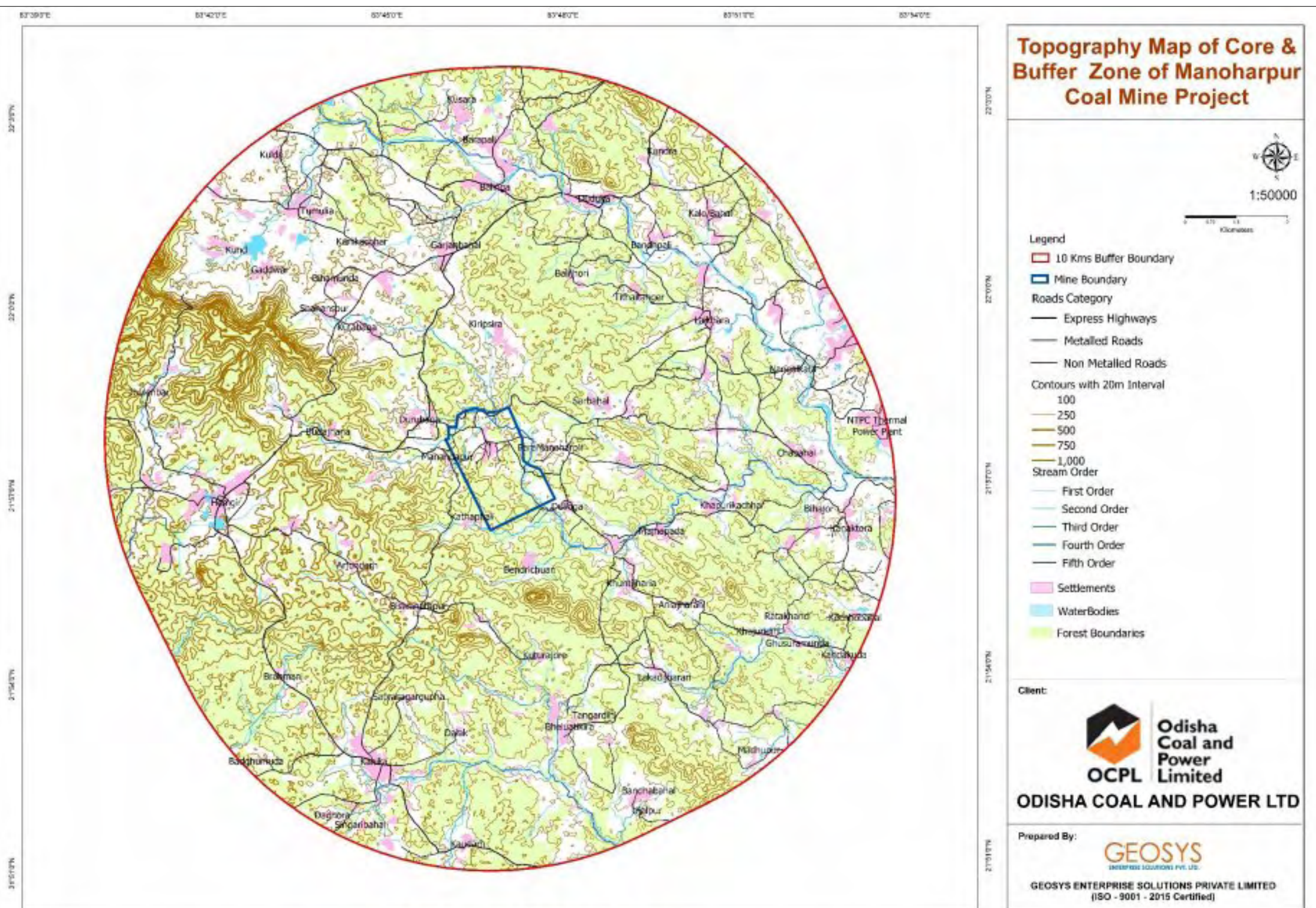


Fig 12 : Drainage Map Of The Core & Buffer Zone



Boundary Coordinates

The geographic coordinates of the boundary have been collected with Trimble Catalyst. The Coordinates of the Mine Boundary GCPs are shown below.

GCP_ID	Longitude	Latitude
1	78.55030924	24.3131597
2	78.55960222	24.3132163
3	78.55878959	24.31667983
4	78.58203953	24.31670128
5	78.58551025	24.31984411
6	78.60914057	24.32156485
7	78.64137849	24.32218227
8	78.64834718	24.3217405
9	78.66295978	24.32181764
10	78.66593684	24.3211172
11	78.70845076	24.32136844
12	78.73573726	24.32257189
13	78.77635274	24.31311969
14	78.77866371	24.30687146
15	78.79694731	24.30554877
16	78.82840141	24.30433703
17	78.87137824	24.29570178
18	78.68238986	24.28643099

83°46'0"E

83°47'0"E

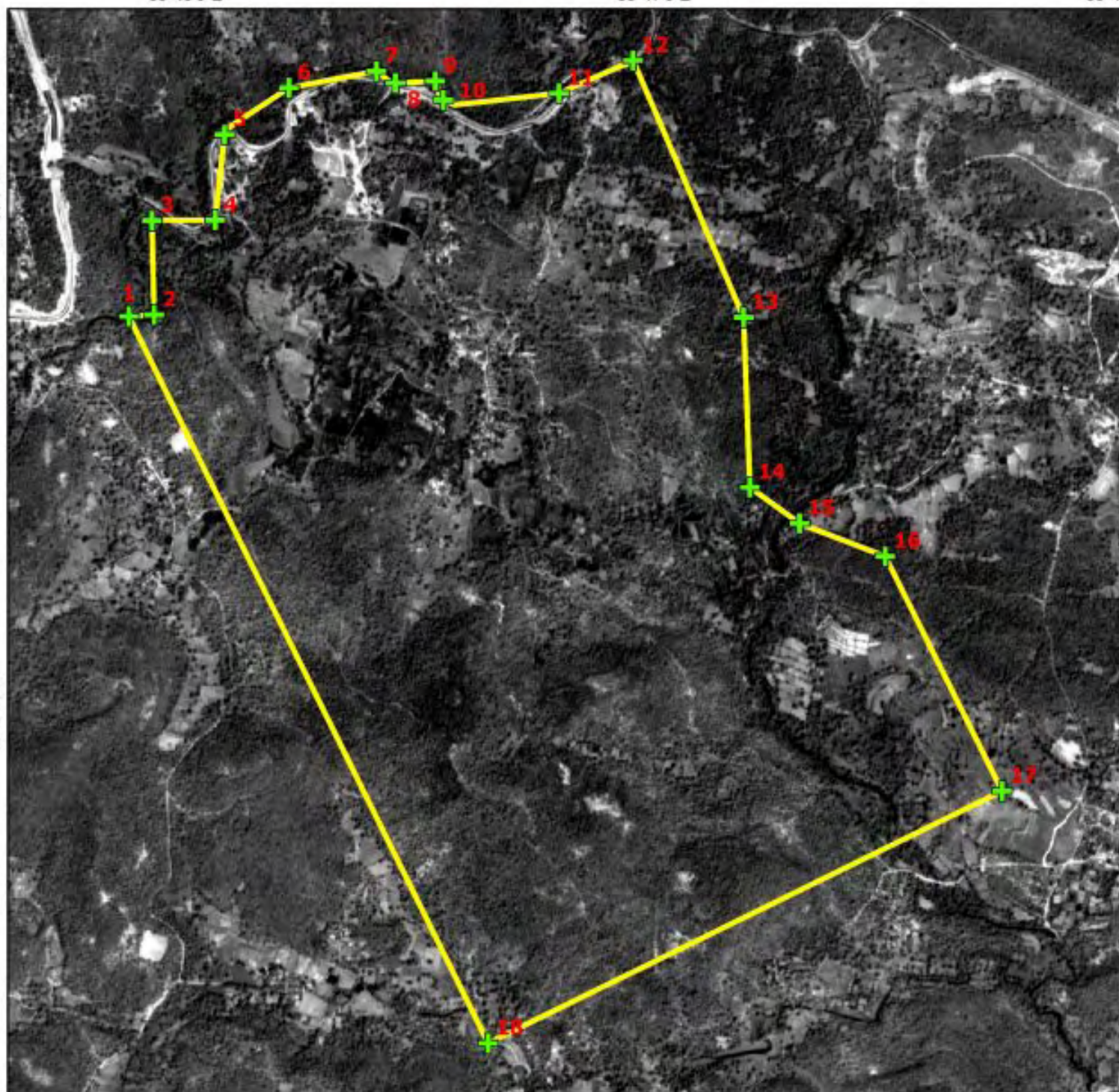
83°48'0"E

21°58'0"N

21°58'0"N

21°57'0"N

21°57'0"N



GCPs on Mine Boundary of Manoharpur Coal Mine Project



1:5000

0 0.33 0.65 1.3
Kilometers

Legend

 Ground Control Points

 Mine Boundary

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Fig 14 : GCPs on Mine Boundary

Site Photographs



Core Zone Settlement Area

Lat: 21°57'45.886"N Long: 83°46'32.515"E



Core Zone Village

Lat: 21°57'35.572"N Long: 83°47'49.101"E



Core Zone Agriculture Area

Lat: 21°47'20.319"N Long: 83°46'7.407"E



Buffer Zone Open Forest Area

Lat: 21°48'3.532"N Long: 83°47'46.572"E



Buffer Zone Fallow Land
Lat: 21°58'5.176"N Long: 83°46'3.019"E



Core Zone Proposed Railway Track
Lat: 21°58'8.809"N Long: 83°47'57.319"E



Buffer Zone Baran Land

Lat: 21°57'59.558"N Long: 83°46'20.009"E



Core Zone Agriculture land

Lat: 21°57'58.53"N Long: 83°47'26.995"E



Ref: Envlab/20/R-3119

Date: 03.08.2020

ANNEXURE 5

AAQ MONITORING REPORT FOR JULY-2020 (CORE ZONE)

1. Name of Project : Manoharpur Open Cast Coal Mine Project
2. Name of Industry : Odisha Coal and Power Limited (OCPL), Sundargarh
3. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550)
4. Sample collected by : VCSPL representative in presence of OCPL representative

Monitoring Location	Date	Hg (mg/m ³)	As (ng/m ³)	Ni (ng/m ³)	Cd (mg/m ³)	Cr (mg/m ³)
AAQMS-1:BGR Office Camp	02.07.2020	BDL	BDL	BDL	BDL	BDL
AAQMS-2: Vocational Training Center	06.07.2020	BDL	BDL	BDL	BDL	BDL
AAQMS-3: CHP OCPL Office	02.07.2020	BDL	BDL	BDL	BDL	BDL
AAQMS-4: OCPL Mines Area	06.07.2020	BDL	BDL	BDL	BDL	BDL
CPCB, New Delhi AAQ Standard		--	6	20	--	--
Testing Method		AAS Method IS 5182(Part -22):2004				

BDL Values: Ni<0.01 ng/m³, As < 0.001 ng/m³, Hg < 0.0001 mg/m³, Cd < 0.002 mg/m³, Cr < 0.006 mg/m³

M. Mohanty
Reviewed by



Pooja Mohanty
Approved by





Ref: Envlab/20/R-3124

Date: 03.08.2020

AAQ MONITORING REPORT FOR JULY-2020 (BUFFER ZONE)

1. Name of Project : Manoharpur Open Cast Coal Mine Project
2. Name of Industry : Odisha Coal and Power Limited (OCPL), Sundargarh
3. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550)
4. Sample collected by : VCSPL representative in presence of OCPL representative

Monitoring Location	Date	Hg (mg/m ³)	As (ng/m ³)	Ni (ng/m ³)	Cd (mg/m ³)	Cr (mg/m ³)
AAQMS-1: Dulanga Village	07.07.2020	BDL	BDL	BDL	BDL	BDL
AAQMS-2: Kalamegha Village	09.07.2020	BDL	BDL	BDL	BDL	BDL
AAQMS-3: Paramanandpur Village	07.07.2020	BDL	BDL	BDL	BDL	BDL
AAQMS-4: Kiripsira Village	09.07.2020	BDL	BDL	BDL	BDL	BDL
CPCB, New Delhi AAQ Standard		--	6	20	--	--
Testing Method		AAS Method IS 5182(Part -22):2004				

BDL Values: Ni < 0.01 ng/m³, As < 0.001 ng/m³, Hg < 0.0001 mg/m³, Cd < 0.002 mg/m³, Cr < 0.006 mg/m³

Manish
Reviewed by



Puja Mohanty
Approved by





Ref: Envlab/20/R-3115

Date: 03.08.2020

ANNEXURE 6

AAQ MONITORING REPORT FOR JULY-2020 (CORE ZONE)

1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Monitoring Instruments : **RDS (APM 460 BL), FPS (APM 550)**
4. Sampling Location : **AAQMS-1:BGR Office Camp**
5. Sample collected by : **VCSPL representative in presence of OCPL representative**

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
02.07.2020	59.0	32.0	20.7	27.6
23.07.2020	55.0	29.7	18.5	26.1
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob & Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³

M. Panda
Reviewed by



Puja Mohanty
Approved by





Ref: Envlab/20/R-3116

Date: 03.08.2020

AAQ MONITORING REPORT FOR JULY-2020 (CORE ZONE)

1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Monitoring Instruments : **RDS (APM 460 BL), FPS (APM 550)**
4. Sampling Location : **AAQMS-2: Vocational Training Center**
5. Sample collected by : **VCSPL representative in presence of OCPL representative**

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
06.07.2020	53.0	28.6	14.6	19.6
28.07.2020	57.0	30.3	17.1	21.3
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob & Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³

M. Anand
Reviewed by



Puja Mohanty
Approved by





Ref: Envlab/20/R-3117

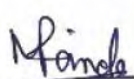
Date: 03.08.2020

AAQ MONITORING REPORT FOR JULY-2020 (CORE ZONE)

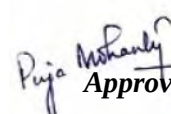
1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Monitoring Instruments : **RDS (APM 460 BL), FPS (APM 550)**
4. Sampling Location : **AAQMS-3: CHP OCPL Office**
5. Sample collected by : **VCSPL representative in presence of OCPL representative**

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
02.07.2020	69.0	37.5	24.1	28.8
23.07.2020	75.0	41.0	23.2	26.3
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob & Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³


Reviewed by




Approved by





Ref: Envlab/20/R-3118

Date: 03.08.2020

AAQ MONITORING REPORT FOR JULY-2020 (CORE ZONE)

1. Name of Project : Manoharpur Open Cast Coal Mine Project
2. Name of Industry : Odisha Coal and Power Limited (OCPL), Sundargarh
3. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550)
4. Sampling Location : AAQMS-4: OCPL Mines Area
5. Sample collected by : VCSPL representative in presence of OCPL representative

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
06.07.2020	71.0	39.6	23.7	31.5
28.07.2020	77.0	42.4	26.2	32.1
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob & Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³

M. P. Singh
Reviewed by



Pooja Mohanty
Approved by





Ref: Envlab/20/R-3120

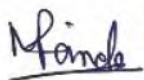
Date: 03.08.2020

AAQ MONITORING REPORT FOR JULY-2020 (BUFFER ZONE)

1. Name of Project : Manoharpur Open Cast Coal Mine Project
2. Name of Industry : Odisha Coal and Power Limited (OCPL), Sundargarh
3. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550)
4. Sampling Location : AAQMS-1: Dulanga Village
5. Sample collected by : VCSPL representative in presence of OCPL representative

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
07.07.2020	53.0	28.2	9.7	16.6
24.07.2020	49.0	26.4	7.6	14.8
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob & Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³


Reviewed by




Approved by





Ref: Envlab/20/R-3121

Date: 03.08.2020

AAQ MONITORING REPORT FOR JULY-2020 (BUFFER ZONE)

1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Monitoring Instruments : **RDS (APM 460 BL), FPS (APM 550)**
4. Sampling Location : **AAQMS-2: Kalamegha Village**
5. Sample collected by : **VCSPL representative in presence of OCPL representative**

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
09.07.2020	48.0	25.7	10.2	15.1
29.07.2020	45.0	24.1	8.8	13.7
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob & Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³

M. Panda
Reviewed by



Puja Mohanty
Approved by





Ref: Envlab/20/R-3122

Date: 03.08.2020

AAQ MONITORING REPORT FOR JULY-2020 (BUFFER ZONE)

1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Monitoring Instruments : **RDS (APM 460 BL), FPS (APM 550)**
4. Sampling Location : **AAQMS-3: Paramanandpur Village**
5. Sample collected by : **VCSPL representative in presence of OCPL representative**

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
07.07.2020	52.0	27.6	9.9	16.0
24.07.2020	47.0	25.3	8.5	15.5
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob & Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³

M. Anand

Reviewed by



Puja Mohanty

Approved by





Ref: Envlab/20/R-3123

Date: 03.08.2020

AAQ MONITORING REPORT FOR JULY-2020 (BUFFER ZONE)

1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Monitoring Instruments : **RDS (APM 460 BL), FPS (APM 550)**
4. Sampling Location : **AAQMS-4: Kiripsira Village**
5. Sample collected by : **VCSPL representative in presence of OCPL representative**

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
09.07.2020	51.0	27.4	9.5	12.8
29.07.2020	56.0	29.7	11.2	14.6
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob & Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³

M. Mohanty
Reviewed by



Puja Mohanty
Approved by





Ref: Envlab/20/R-3732

Date: 03.09.2020

AAQ MONITORING REPORT FOR AUGUST-2020(CORE ZONE)

1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Monitoring Instruments : **RDS (APM 460 BL), FPS (APM 550)**
4. Sampling Location : **AAQMS-1:BGR Office Camp**
5. Location Co-ordinates : **21° 56' 57.6996" N 83° 47' 46.1436" E**
6. Sample collected by : **VCSPL representative in presence of OCPL representative**

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
05.08.2020	54.0	28.3	17.6	25.3
17.08.2020	49.0	25.6	18.2	23.7
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³

M. Anand
Reviewed by



Puja Mohanty
Approved by





Ref: Envlab/20/R-3733

Date: 03.09.2020

AAQ MONITORING REPORT FOR AUGUST-2020 (CORE ZONE)

1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Monitoring Instruments : **RDS (APM 460 BL), FPS (APM 550)**
4. Sampling Location : **AAQMS-2: Vocational Training Center**
5. Location Co-ordinates : **21° 57' 46.2636" N, 83° 46' 32.7828" E**
6. Sample collected by : **VCSPL representative in presence of OCPL representative**

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
04.08.2020	55.0	28.8	15.4	20.0
17.08.2020	50.0	26.1	13.7	17.6
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³

Manish

Reviewed by



Priya Mohanty

Approved by





Ref:Envlab/20/R-3734

Date: 03.09.2020

AAQ MONITORING REPORT FOR AUGUST-2020 (CORE ZONE)

1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Monitoring Instruments : **RDS (APM 460 BL), FPS (APM 550)**
4. Sampling Location : **AAQMS-3: CHP OCPL Office**
5. Location Co-ordinates : **21° 58' 4.782" N, 83° 47' 56.0616" E**
6. Sample collected by : **VCSPL representative in presence of OCPL representative**

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
05.08.2020	67.0	35.1	21.3	29.4
18.08.2020	61.0	31.8	18.5	25.7
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³

Manish

Reviewed by



Puja Mohanty

Approved by





Ref:Envlab/20/R-3735

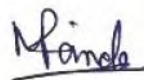
Date: 03.09.2020

AAQ MONITORING REPORT FOR AUGUST-2020 (CORE ZONE)

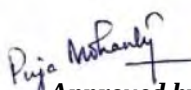
1. Name of Project : Manoharpur Open Cast Coal Mine Project
2. Name of Industry : Odisha Coal and Power Limited (OCPL), Sundargarh
3. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550)
4. Sampling Location : AAQMS-4:OCPL Mines Area
5. Location Co-ordinates : 21° 57' 48.1284" N, 83° 46' 55.6068" E
6. Sample collected by : VCSPL representative in presence of OCPL representative

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
04.08.2020	74.0	38.6	24.6	28.8
18.08.2020	65.0	33.7	22.0	32.4
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values:SO₂< 4 µg/m³, NO_x< 9 µg/m³


Reviewed by




Approved by





Ref: Envlab/20/R-3736

Date: 03.09.2020

AAQ MONITORING REPORT FOR AUGUST-2020 (BUFFER ZONE)

1. Name of Project : Manoharpur Open Cast Coal Mine Project
2. Name of Industry : Odisha Coal and Power Limited (OCPL), Sundargarh
3. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550)
4. Sampling Location : AAQMS-1:Dulanga Village
5. Location Co-ordinates : 21° 56' 46.2372" N, 83° 47' 54.9456" E
6. Sample collected by : VCSPL representative in presence of OCPL representative

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
06.08.2020	48.0	25.3	8.6	13.2
21.08.2020	43.0	22.2	8.1	14.0
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³

M. Panda

Reviewed by



Pooja Mohanty

Approved by





Ref: Envlab/20/R-3738

Date: 03.09.2020

AAQ MONITORING REPORT FOR AUGUST-2020 (BUFFER ZONE)

1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Monitoring Instruments : **RDS (APM 460 BL), FPS (APM 550)**
4. Sampling Location : **AAQMS-2:Kalamegha Village**
5. Location Co-ordinates : **21° 56' 55.5288" N, 83° 50' 33.9036" E**
6. Sample collected by : **VCSPL representative in presence of OCPL representative**

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
07.08.2020	42.0	21.8	7.6	12.8
20.08.2020	46.0	23.6	9.3	14.5
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³

Manish
Reviewed by



Puja Mohanty
Approved by





Ref:Envlab/20/R-3739

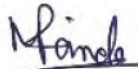
Date: 03.09.2020

AAQ MONITORING REPORT FOR AUGUST-2020 (BUFFER ZONE)

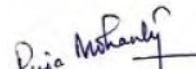
1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Monitoring Instruments : **RDS (APM 460 BL), FPS (APM 550)**
4. Sampling Location : **AAQMS-3:Paramanandpur Village**
5. Location Co-ordinates : **21° 57' 15.7464" N, 83° 45' 54.8172" E**
6. Sample collected by : **VCSPL representative in presence of OCPL representative**

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
06.08.2020	49.0	25.5	8.4	15.1
20.08.2020	45.0	23.3	7.8	14.3
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values:SO₂< 4 µg/m³, NO_x< 9 µg/m³


Reviewed by




Approved by





Ref:Envlab/20/R-3740

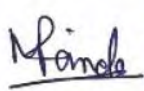
Date: 03.09.2020

AAQ MONITORING REPORT FOR AUGUST-2020 (BUFFER ZONE)

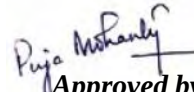
1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Monitoring Instruments : **RDS (APM 460 BL), FPS (APM 550)**
4. Sampling Location : **AAQMS-4: Kiripsira Village**
5. Location Co-ordinates : **21° 59' 22.6788" N, 83° 46' 47.2368" E**
6. Sample collected by : **VCSPL representative in presence of OCPL representative**

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
07.08.2020	43.0	22.7	8.6	11.7
21.08.2020	46.0	24.1	9.7	13.6
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³


Reviewed by




Approved by





Ref: Envlab/20/R-4580

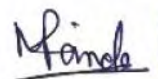
Date: 03.10.2020

AAQ MONITORING REPORT FOR SEPTEMBER-2020(CORE ZONE)

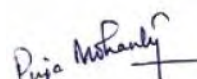
1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Monitoring Instruments : **RDS (APM 460 BL), FPS (APM 550)**
4. Sampling Location : **AAQMS-1:BGR Office Camp**
5. Location Co-ordinates : **21° 56' 57.6996" N 83° 47' 46.1436" E**
6. Sample collected by : **VCSPL representative in presence of OCPL representative**

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
01.09.2020	57.0	30.7	16.1	23.6
17.09.2020	61.0	32.4	18.4	26.8
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³


Reviewed by




Approved by





Ref: Envlab/20/R-4581

Date: 03.10.2020

AAQ MONITORING REPORT FOR SEPTEMBER-2020 (CORE ZONE)

1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Monitoring Instruments : **RDS (APM 460 BL), FPS (APM 550)**
4. Sampling Location : **AAQMS-2: Vocational Training Center**
5. Location Co-ordinates : **21° 57' 46.2636" N, 83° 46' 32.7828" E**
6. Sample collected by : **VCSPL representative in presence of OCPL representative**

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
02.09.2020	58.0	30.6	14.7	21.5
18.09.2020	53.0	27.8	12.2	18.7
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³

Manish

Reviewed by



Priya Mohanty

Approved by





Ref:Envlab/20/R-4582

Date: 03.10.2020

AAQ MONITORING REPORT FOR SEPTEMBER-2020 (CORE ZONE)

1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Monitoring Instruments : **RDS (APM 460 BL), FPS (APM 550)**
4. Sampling Location : **AAQMS-3: CHP OCPL Office**
5. Location Co-ordinates : **21° 58' 4.782" N, 83° 47' 56.0616" E**
6. Sample collected by : **VCSPL representative in presence of OCPL representative**

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
01.09.2020	65.0	35.2	22.7	27.5
17.09.2020	72.0	38.6	20.4	29.7
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³

M. Panda

Reviewed by



Puja Mohanty

Approved by





Ref:Envlab/20/R-4583

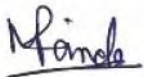
Date: 03.10.2020

AAQ MONITORING REPORT FOR SEPTEMBER-2020 (CORE ZONE)

1. Name of Project : Manoharpur Open Cast Coal Mine Project
2. Name of Industry : Odisha Coal and Power Limited (OCPL), Sundargarh
3. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550)
4. Sampling Location : AAQMS-4:OCPL Mines Area
5. Location Co-ordinates : 21° 57' 48.1284" N, 83° 46' 55.6068" E
6. Sample collected by : VCSPL representative in presence of OCPL representative

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
02.09.2020	77.0	41.5	23.8	34.1
18.09.2020	71.0	38.2	21.6	31.7
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values:SO₂< 4 µg/m³, NO_x< 9 µg/m³


Reviewed by




Approved by





Ref: Envlab/20/R-4584

Date: 03.10.2020

AAQ MONITORING REPORT FOR SEPTEMBER-2020 (BUFFER ZONE)

1. Name of Project : Manoharpur Open Cast Coal Mine Project
2. Name of Industry : Odisha Coal and Power Limited (OCPL), Sundargarh
3. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550)
4. Sampling Location : AAQMS-1:Dulanga Village
5. Location Co-ordinates : 21° 56' 46.2372" N, 83° 47' 54.9456" E
6. Sample collected by : VCSPL representative in presence of OCPL representative

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
03.09.2020	51.0	26.8	8.5	15.6
19.09.2020	47.0	24.3	9.1	17.1
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³

M. Panda

Reviewed by



Pooja Mohanty

Approved by





Ref: Envlab/20/R-4585

Date: 03.10.2020

AAQ MONITORING REPORT FOR SEPTEMBER-2020 (BUFFER ZONE)

1. Name of Project : Manoharpur Open Cast Coal Mine Project
2. Name of Industry : Odisha Coal and Power Limited (OCPL), Sundargarh
3. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550)
4. Sampling Location : AAQMS-2:Kalamegha Village
5. Location Co-ordinates : 21° 56' 55.5288" N, 83° 50' 33.9036" E
6. Sample collected by : VCSPL representative in presence of OCPL representative

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
04.09.2020	45.0	23.7	8.3	13.3
21.09.2020	49.0	25.6	8.8	14.6
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³

Mande
Reviewed by



Puja Mohanty
Approved by





Ref:Envlab/20/R-4586

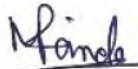
Date: 03.10.2020

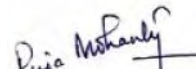
AAQ MONITORING REPORT FOR SEPTEMBER-2020 (BUFFER ZONE)

1. Name of Project : **Manoharpur Open Cast Coal Mine Project**
2. Name of Industry : **Odisha Coal and Power Limited (OCPL), Sundargarh**
3. Monitoring Instruments : **RDS (APM 460 BL), FPS (APM 550)**
4. Sampling Location : **AAQMS-3:Paramanandpur Village**
5. Location Co-ordinates : **21° 57' 15.7464" N, 83° 45' 54.8172" E**
6. Sample collected by : **VCSPL representative in presence of OCPL representative**

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
03.09.2020	53.0	27.6	7.6	15.4
19.09.2020	48.0	25.2	8.4	16.2
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values:SO₂< 4 µg/m³, NO_x< 9 µg/m³


Reviewed by


Approved by



Ref:Envlab/20/R-4587

Date: 03.10.2020

AAQ MONITORING REPORT FOR SEPTEMBER-2020 (BUFFER ZONE)

1. Name of Project : Manoharpur Open Cast Coal Mine Project
2. Name of Industry : Odisha Coal and Power Limited (OCPL), Sundargarh
3. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550)
4. Sampling Location : AAQMS-4: Kiripsira Village
5. Location Co-ordinates : 21° 59' 22.6788" N, 83° 46' 47.2368" E
6. Sample collected by : VCSPL representative in presence of OCPL representative

Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
04.09.2020	46.0	23.8	9.0	14.8
21.09.2020	52.0	27.0	8.7	14.1
CPCB, New Delhi AAQ Standard	100	60	80	80
Testing Method	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017

BDL Values: SO₂ < 4 µg/m³, NO_x < 9 µg/m³

M. Panda
Reviewed by



P. Mohanty
Approved by



MANOHARPUR COAL MINE PROJECT**ANNEXURE - 7****EXPENDITURE INCURED ON EMP**

Sr. No.	Details of Expenditure incurred	Activities	2018-19 (Rs.)	2019-20 (Rs.)	2020-21 (Rs.)
1	Air Pollution Control Measures	Water sprinkling	7,80,920	22,26,350	24,50,766
		Plantation	Nil	7,41,225	75,000
2	Water Pollution Control Measures	Settling Pond, Septic Tank etc.	-	1,19,732	4,59,866
3	Hazardous Waste Pollution Control Measures	Waste storage facility etc.	-	-	14,15,000
4	Top Soil Conservation	Dumping, Mulching, Seeding, garland drain etc.	-	63,55,400	56,000
5	Miscellaneous	Awareness, compliance etc.	7,50,000	13,75,000	27,40,000
6	Sub Total		15,30,920	1,08,17,707	71,96,632
	Total Expenditure incurred on EMP so far		Rs. 1,95,45,259 or Say Rs. 1.95 Crores		