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Proposal No :	IA/OR/CMIN/121286/2019	Proposal Name :	Talabira I Expansion (1 MTPA to 3 mTPA)
Category :	Coal Mining	MoEF File No. :	J-11015/58/2009-IA.II(M)

Compliance Letter/Report

Year of Compliance: -All Years- **Date of Compliance * :** Select

Remarks : **Upload Compliance Letter/Report * :** Choose File No file chosen (.pdf only)

Jugal Bhagat

From: Praveen Anant
Sent: Saturday, May 30, 2020 2:52 PM
To: 'roez.bsr-mef@nic.in'; 'suresh.pasupuleti@gov.in'
Subject: EC Compliance Oct19-Mrarch20 for Talabira-1 Opencast Coal Mine, Distric Sambhalpur
Attachments: EC Compliance Oct19-Mrarch20 for Talabira-1 Opencast Coal Mine.pdf

Dear Sir,

We are submitting herewith compliance report for Oct 19 to March 2020 for:

- Environment Clearance no J-11015/58/2009-IA.II dated 08.11.2011 for Talabira-1 Opencast in district Sambhalpur, Orissa and same is being uploaded on PARIVESH portal also.

Hope you will find this in order and suffice for the compliance requirement please. Thanking you.

Sincerely,

For, Raipur Energen Limited
A Subsidiary of Adani Power Limited

Ref: REL/Talabira-1/MoEF&CC/2020/May-1

Date: 30/05/2020

To
The Regional Officer,
Ministry of Environment and Forest & Climate Change
Easteren Regional Office, A/3, Chandrashekhapur,
Bhubaneshwar- 751023

Subject: Submission of six monthly compliance status of environment clearance no J-11015/58/2009-IA.II dated 08.11.2011 and its amended, dated on 16.04.2015 for Talabira-1 Opencast Coalmine Project at village Kinda, Tehsil Rengali, District Sambalpur Odisha for the period of Oct'2019 to Mar'2020.

Ref: Environment clearance no J-11015/58/2009-IA.II dated 08.11.2011 for Talabira-1 Opencast Coalmine

Dear Sir,

With reference to the above, please find enclosed six monthly compliance status of environment clearance for the period of October 19- March 20. We hope you will find this satisfactory and in line with requirement.

**Thanking You,
For, Raipur Energen Limited (A subsidiary of Adani Power Limited)**



(Authorized Signatory)

Enclosures: As above

CC:

1. Member Secretary, Central Pollution Control Board, Parivesh Bhavan, East Arjun Nagar, New Delhi- 110032
2. Member Secretary, Odisha Pollution Control Board, A/118, Nilakantha Nagar, Unit – VIII, Bhubneshwar, Odisha 751012

Talabira -1 Coal Mine Project

Status of Half yearly Compliance w.r.t Environmental Clearance

No. J-11015/58/2009-IA.II (M) dated 16th April 2015

(For the period October 2019- March 2020)

A. Specific conditions:

Sl. No.	Conditions	Compliance status
(i)	Production of coal shall not exceed 3.0 MTPA. The project proponent shall obtain prior EC for expansion in production beyond 3.0 MTPA.	Coal production from Oct' 2019 to Mar'2020 is Nil. The coal production was 0.560, 0.156 and 0.270 Million Metric Tons (MT) during FY 2015-16, 2016-17 and 2017-18, respectively. Thus, Complied.
(ii)	No coal washery shall be established without prior EC from this MOEF.	No washery has been established at Mine site till date. Thus, Complied.
(iii)	No fly ash shall be dumped into the de-coaled voids without prior approval of the MOEF.	No fly ash is dumped into the de-coaled voids till date. No fly ash will be dumped without prior approval from MoEF & CC. Thus, Complied.
(iv)	The embankment shall be stabilised with stone pitching on the reservoir side and compacted and plantation using a mix of native species shall be developed. Additional safety and protection measures including continued operation of high capacity pumps shall be in operation to prevent mine inundation. Prior approval of disaster management plan shall be obtained.	As per initial EC dated 08/11/2011, originally issued to M/s Hindalco Industries Ltd, embankment related activities have already been executed by the prior Mine Allottee (M/s Hindalco) under the guidance of DoWR, Odisha. The embankment is of 1.92 Km length and 1.5 m height and 10 m wide at the top and 3 m above the HFL of Hirakud Reservoir. The embankment has been stabilised with side-sloping on either side and plantation using a mix of native species is developed. There is a provision of high capacity pump for de-watering. The disaster Management plan is in place and submitted to Directorate of Mines Safety also. Thus, Complied.
(v)	Top soil, if generated, should be properly stacked with proper slope at earmarked dump site (S) with adequate measures and shall be used for reclamation and development of green belt and for reclamation of back filled quarry should be used for reclamation and	After taking over by GMR, Topsoil of 8,000 Cubic Meter had been spread over the external dump slope to facilitate Bio-reclamation and 12,000 Cubic Meter has been conserved in external Top soil dump and 8,925 Cubic meter has been preserved and properly

Sl. No.	Conditions	Compliance status
	rehabilitation of mined out areas within a year of generation.	stacked in internal top soil dump up to 31 st March 2018. Reclamation of back filled quarry and rehabilitation of mined out area will be done as per approved mine closure plan. No generation of top soil from mine since April' 2018 as mining operations were suspended. Thus, Complied.
(vi)	The entire OB generated in the expansion project shall be back filled and reclaimed and stabilized with plantation using a mix of species found in the reserve forests in the buffer zone. Monitoring and management of the existing reclaimed dump site shall continue until the vegetation becomes self-sustaining and no dumping of OB on reclaimed dumps shall be permitted. Compliance status shall be submitted to the Ministry of Environment & Forests and its Regional Office located at Bhubaneswar on yearly basis.	OB generated by prior allottee was stacked in three external dumps (Dump- 1, Dump- 2 & Dump- 3). Mine closure activities such as back filling, reclamation & stabilization with plantation will be done as per approved Mine Plan & Mine closure plan and status of compliances will be submitted to the Ministry of Environment & Forests and its Regional Office located at Bhubaneswar on yearly basis. Thus, Complied.
a	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 & Length) and sump capacity shall be designed keeping 50% safety margin over & above the peak sudden rain fall and maximum discharge in the area adjoining the mine site. Sump capacity also provide adequate retention period to allow proper settling of silt material.	Catch drains of average width 2.5 m and length 2.9 Km had been constructed and maintained along the toe of OB dumps. Water is collected in mine sump which is being utilized for water spraying in mine area, roads, green belt development etc. The drains are cleaned before every monsoon and maintained properly. Garland drains & sump capacity are designed by taking factor of safety 2.0 to deal with the sudden rain fall. There are no adjoining mines. Thus, Complied.
(viii)	Dimension of the retaining wall at the toe of the dumps and OB benches within the mine to check the run-off and siltation shall be based on the rain fall data.	Retaining wall at the toe of the dumps and OB benches within the mine to check the run-off and siltation is done by prior allottee. Maintenance & periodic repair of retaining wall has been undertaken by Raipur Energen Limited (Erstwhile, GMR Chhattisgarh Energy Limited). Thus, Complied.
(ix)	Mist type water sprinkling system shall be provided to check fugitive emissions from conveyor system, haulage roads, transfer points etc. Water sprinkling (Fixed & Mist type, mobile) shall be regularly carried out along the main haul roads.	There is no conveyor system in Talabira-1 mine. Mine operations are temporarily suspended. During mine operation, mist type mobile tankers are used for water sprinkling along haul roads, stock yards, transfer points etc. Thus, Complied.
(x)	No blasting shall be carried out.	No blasting practice is adopted in mine.

Sl. No.	Conditions	Compliance status
		Thus, Complied.
(xi)	A feasibility plan for transportation of coal to the railway siding by closed overhead conveyors shall be prepared and furnished to the MOEF within 6 months.	Feasibility plan for transport of coal to railway siding by closed overhead conveyor has been submitted by M/s REL after taking over the mine in April, 2015 Thus, Complied.
(xii)	Area brought under afforestation shall not be less than 137.905 Ha which includes reclaimed external OB dump area (45 Ha), backfilled area (60 Ha), along ML boundary, green belt (28.905 Ha) and top soil dump area (6.0 Ha) by using a mix of species found in the natural forests in the buffer zone in consultation with the local DFO / Agricultural department. The density of the trees shall be around 2500 plants per Ha.	37940 No's of additional saplings were planted by REL in addition to Green belt area developed. Total 33.79 Ha within mining lease area is covered with plantation. Back filling, Reclamation & plantation work will be carried out as per approved mine plan & mine closure plan after exhaustion of coal in mine. Thus, Complied.
(xiii)	A progressive mine closure plan shall be implemented and OB generated during the balance life of the mine shall be concurrently back filled and the area reclaimed with a mix of native species and at the end of mine life the balance area 24.4 Ha of de-coaled void shall also be reclaimed with the OB and the entire worked out area shall be back filled up to ground level. There shall be no water bod created at the post – mining stage.	Back filling in de-coaled void, reclamation & plantation work will be carried out as per approved mine plan & mine closure plan. Revised Mining plan and mine closure plan submitted in October'2016 was not approved. The existing mine plan & mine closure plan is already expired on 31.03.2018. . As on date, company is not authorized to take any activity related to mining in mine, without approved mining plans from Ministry of Coal for Talabira-1 mine.
(xiv)	A conservation plan comprising for in-situ and ex-situ conservation of schedule I and II, Fauna found within the core & buffer zone shall be implemented in consultation with the State Govt. for the balance life of the project and include a plan for habitat restoration at the post mining stage and which also includes a plan for development of 150 Ha of grass lands for the elephants visiting the area. The activities there under along with status of implementation (including expenditure) shall be regularly reported as part of the compliance reports furnished to MOEF RO, Bhubaneswar and also uploaded on the company website.	Conservation plan including plan for habitat restoration at post mining stage has been prepared which is duly approved by Chief Wildlife Warden (CWLW). Approved amount of Rs.257 Lacs has been deposited with PCCF, Orissa for implementation of above conservation plan. Conservation plan and status of implementation were submitted to RO MOEFC, Bhubaneswar and also uploaded on our website. Web-link: https://adanipower.com/Downloads Approved plan, Approval letter of conservation plan, payment letter for implementation of conservation plan, Screenshot of the web link was submitted with previous compliance report.

Sl. No.	Conditions	Compliance status
(xv)	Regular monitoring of ground water level on the 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 in a year pre-monsoon (May), monsoon (August), Post-Monsoon (November) and winter (January) seasons and for quality in May. Monitoring of heavy metals including mercury shall be carried out and data furnished as part of the compliance report. Data, thus collected shall be submitted to the Ministry of Environment & Forests and to the central Pollution Control board quarterly and regularly uploaded on the company website.	<p>Thus, Complied.</p> <p>A NABL accredited testing agency has been appointed for monthly monitoring of the ground water. It is being collected from the existing wells at the nearby villages and also from piezometer installed in front of site office of Talabira-1 mine. Analysis of ground water is being done by NABL certified lab and report is being submitted on quarterly basis to the office.</p> <p>Photographs of Installed piezometer were submitted with previous compliance report.</p> <p>Environmental monitoring report for the period of Oct'19 to Mar'20 are attached as Annexure-1</p> <p>Six month compliance report including environmental monitoring report has been uploaded on the company website.</p> <p>Website Link: https://adanipower.com/Downloads</p> <p>Thus Complied.</p>
(xvi)	The extent of use of water in the mining operations shall be reduced by recycling and reuse. The company shall put up artificial ground water recharge measures for augmentation of water resource if the water table shows a declining trend. The project authorities shall meet water requirement of nearby village(s) in case the village wells go dry due to dewatering of mine. Mine water to be discharged into the Hirakud reservoir shall be treated to prescribed standards before discharge.	<p>Only stagnated water in the sump of mine is being used for mining operations and plantation.</p> <p>Water is contained in the pits within ML, which facilitates recharging the ground water. Hirakud reservoir backwater is adjacent to the mine. Hence, ground Water table varies according to the level of Hirakud reservoir back water. REL is supplying water to nearby villages by 6 no's of water tankers throughout the year.</p> <p>No water from mine is being discharged to Hirakud Reservoir.</p> <p>Thus, Complied.</p>
(xvii)	Besides carrying out regular periodic health check-up of their workers, 10% of the workers identified from workforce engaged in active mining operations shall be subjected to health check-up for occupational diseases and hearing impairment, if any through any local/regional health institutions and the results reported to the this ministry and to DGMS.	<p>Periodic health check- up including occupational disease and hearing impairment was done as per Rule 29 (b) of Mining Rules, 1955. There was no occupational disease and hearing impairment to any workers.</p> <p>Thus, Complied.</p>
(xviii)	For monitoring land use pattern and for post mining land use, time series of land use maps, based on satellite imagery (on a scale of	The land use analysis based on satellite imagery for core zone of the mine

Sl. No.	Conditions	Compliance status
	1:5000) of the core zone and buffer zone, from the start of the project, until the end of the mine life shall be prepared once in three years (for any one particular season which is consistent in the time series), and the report submitted to MOEF and its regional office at Bhubaneswar.	including the land use of 10 km buffer zone has been done for 2015 and 2018. Land use analysis report is attached herewith as Annexure- 2 . Thus, Complied.
(xix)	A detailed Final Mine Closure Plan along with details of corpus fund submitted to the Ministry of Environment & Forest which shall be implemented from 2017-18. The time period for reclamation shall be completed within a year of completion of project. The plan for habitat restoration plan for a minimum period of five years (under the MMDR Act) shall be under taken after completion of reclamation in consultation with and a joint inspection carried with the state forest department.	All the provisions of mine closure plan will be implemented after the approval of mine plan and mine closure plan as previous plan is expired on 1 st April, 2018.
(xx)	CSR would be implemented in 8 villages – Talabira, Nua Khinda, Purana Khinda, Lapanga, Bhudiapalli, Matul Camp, Behara Munda and Mundapara. Budgetary provisions at @ Rs. 10 per tonne of Coal should be made for CSR activities. The socio-economic development of the villages shall be monitored over the life of the project using UNDP. Human development indices and reported as part of the report submitted to MOEF RO, Bhubaneswar.	Budgetary provision of @ Rs 10/ Ton of coal was kept. Total Expenditure made for CSR activities by REL (Since inception- April'2015 to Mar'2020) is Rs 1, 42, 88,914.00 . Mine operations are temporarily suspended since 1 st April' 2018. Preliminary report on socio-economic development of the villages has been Prepared and submitted with previous compliance report. Company shall be taking socio economic development assessment in the area every three years after the approval of revised mining plan. Thus, Complied.
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 Forest.	There is no change in mining technology in mines. Thus, Complied.
(ii)	No change in the calendar plan including excavation, quantum of mineral coal and waste shall be made.	Adhered to the mine plan. Thus, Complied.
(iii)	Four ambient air quality monitoring stations shall be established in the core zone as well as in the buffer zone for monitoring PM10, PM 2.5, SO2, NOx and heavy metals such as Hg, Pb, Cr, As etc. Location of the stations shall be decided based on Meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the state pollution control board.	5 numbers Ambient air quality monitoring stations are established in core zone as well as in the buffer zone for monitoring PM10, PM 2.5, SO2, NOx and heavy metals such as Hg, Pb, Cr by external agency (Approved by MOEFC / NABL) and report is being submitted to MOEFC, Bhubaneswar on quarterly basis.

Sl. No.	Conditions	Compliance status
		<p>Recent Environmental Report is uploaded in company website. Website Link: https://adanipower.com/Downloads</p> <p>Thus, Complied.</p>
(iv)	<p>Data on ambient air quality (PM10, PM 2.5, SO2, NOx and heavy metals such as Hg, Pb, Cr, As etc.) shall be regularly submitted to the ministry including its regional office at Bhubaneswar and to the State Pollution Control Board and Central pollution Control Board once in Six Months.</p>	<p>Data on ambient air quality (PM10, PM 2.5, SO2, NOx and heavy metals such as Hg, Pb, Cr, As etc.) is being monitored on quarterly basis by external agency (Approved by MoEFCC / NABL) engaged for this purpose and reports are being submitted to the concerned authorities.</p> <p>Recent Environmental Report is uploaded in company website. Website Link: https://adanipower.com/Downloads</p> <p>Thus, Complied.</p>
(v)	<p>Fugitive dust emissions quality (PM10, PM 2.5 and heavy metals such as Hg, Pb, Cr, As etc.) from all the sources shall be controlled regularly monitored and data recorded properly. Water spraying arrangement on haul road, wagon loading and dump trucks (Loading & un loading) points shall be provided and properly maintained.</p>	<p>Fugitive dust emissions quality (PM10, PM 2.5 and heavy metals such as Hg, Pb, Cr, As etc.) from all the sources are being monitored by external agency (Approved by MOEFC / NABL) and reports are being submitted.</p> <p>During mine operation, water spraying arrangement on haul road, wagon loading and dump trucks (Loading & un loading) points were provided and maintained.</p> <p>Recent Environmental Report is uploaded in company website.</p> <p>Website Link: https://adanipower.com/Downloads</p> <p>Thus, Complied.</p>
(vi)	<p>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.</p>	<p>Noise within ML is well below the stipulated norms. Ear plugs/muffs are also issued to HEMM operators. No drilling & blasting is practiced in mine.</p> <p>Thus, Complied.</p>
(vii)	<p>Industrial waste water (workshop and waste water 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.</p>	<p>Grease and Oil Trap has been provided in the workshop to treat the waste water. The treated water is being stored and reused for water spraying and cleaning of vehicles in the wash bay.</p> <p>Thus, Complied.</p>

Sl. No.	Conditions	Compliance status
(viii)	Vehicular emissions shall be kept under control and regularly monitored.	During the mine operation, regular maintenance of vehicles was being done to control the vehicular emissions. Thus, Complied.
(ix)	Environmental laboratory shall be established with adequate number and type of pollution monitoring and analysis equipment in consultation with the State Pollution Control Board.	Pollution monitoring and analysis is being done regularly by external agency (approved by MOEFC / NABL) engaged for this purpose. Recent Environmental Report is uploaded in company website. Website Link: https://adanipower.com/Downloads Thus, Complied.
(x)	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. Occupational health surveillance programme of worker shall be undertaken periodically to observe any contractions due to exposure to dust and to take corrective measures, if needed. A separate environmental management cell with suitable qualified personnel shall be set up under the control of senior executive, who will report directly to the Head of the company.	Dust masks were issued to all employees working in dusty environment. Initial & refresher training was imparted to contractual employees as per Mines Vocational Rules 1966, Periodical Medical Examination of 140 no's of employees were conducted to observe any contractions due to exposure to dust. Thus, Complied.
(xi)	The funds earmarked for environmental protection measures shall be kept in separate account and shall not be diverted to other purpose. Year-wise expenditure shall be reported to this Ministry and its Regional Office at Bhubaneswar.	There is a separate cost centre maintained for the fund earmarked for environmental protection. Total expenditure incurred towards Environment protection measures is as follows: FY 2015-16: Rs.62.61 Lacs FY 2016-17: Rs. 118.23 Lacs FY 2017-18: Rs. 89.48 Lacs FY 2018-19: Rs. 2.5 Lacs FY 2019-20: Rs. 11.25 Lacs Thus, Complied.
(xii)	A copy of the environmental clearance shall be marked to concerned Panchayat / local NGO, if any, from whom any suggestion/representation has been received while processing the proposal.	This EC was originally issued to M/s Hindalco in 2011 and in 2015 the EC was transferred to M/s REL (Formerly GMR Chhattisgarh Energy Ltd). Copy of the Environmental Clearance (EC) and Public Notice Advertisements in Newspapers related to EC have been displayed in Panchayat Office, Khinda and Sambalpur. Thus, Complied.

Sl. No.	Conditions	Compliance status
(xiii)	State Pollution Control Board shall display a copy of clearance letter at the Regional Office, District Industry Centre and Collectors Office/ Tehsil Office for 30 days.	-----
(xiv)	The project authorities shall advertise at least in two local newspapers widely circulated around the projects, 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 clearance letter is available with State Pollution Control Board and may also be seen at the website of the Ministry of Environment & Forest at http://envfor.nic.in . The compliance status including data on monitoring of environmental quality (air, water and noise) shall also be uploaded by the project authorities in their website and also at their main gate of project premises and office so as to bring the same in the public domain.	<p>Advertisements have been published in two local newspapers of Odisha state namely Samay (Dt.01.10.2016, Odia news paper) and in Dainik Jagaran (Dt.01.10.2016, Hindi news paper).</p> <p>Data on monitoring of environmental quality (air, water & noise) and status of compliance have been uploaded in the company's website.</p> <p>Web-link : https://adanipower.com/Downloads</p> <p>Thus, Complied.</p>
(3)	The Ministry or any other competent authority may stipulate any further condition for environmental protection.	----
(4)	Failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract the provisions of the Environment (Protection) Act, 1986.	-----
(5)	The above conditions will be enforced inter-alia, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and the Public Liability Insurance Act, 1991 along with their amendments and Rules. The proponent shall ensure to undertake and provide for costs incurred for taking up remedial measures in case of soil contamination, contamination of groundwater and surface water and occupation and other diseases due to the mining operations.	----

ANNEXURE – 1
Environment Monitoring Report

TALABIRA-I COAL BLOCK, SAMBALPUR

M/s Raipur Energen Limited

ANALYSIS REPORT ON ENVIRONMENTAL MONITORING DATA GENERATED FOR THE MONTH OF OCTOBER-2019

ENVIRONMENTAL MONITORING DONE BY

KALYANI LABORATORIES PVT. LTD.
LAB: PLOT NO. 78, MILLENIUM CITY,
PAHAL, BBSR-752101



This Report Contains Data On Ambient Air, Ground Water, Surface Water, Soil And Noise Monitoring
And Analysis

CONTENTS

SL. No.	DESCRIPTION	TEST REPORT NO.
1.	AMBIENT AIR MONITORING RESULTS	KLPL-TR/10/19/AAQM-396A- 396H
2.	NOISE LEVEL MONITORING RESULTS	KLPL-TR/10/19/NOISE-426I-426O
3.	SURFACE WATER ANALYSIS RESULTS	KLPL-TR/10/19/WATER-1673C
4.	GROUND WATER ANALYSIS RESULTS	KLPL-TR/10/19/WATER-1673A-1673B





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/10/19/AAQM-396H

Issue date: 05.11.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 29.10.2019

Testing Dt.: 29.10.2019

Test completion Dt.: 05.11.2019

Sample Description: Ambient Air Quality

No. of Samples: 1

Sampling Point.: Downwind direction of Talabira 1 mines

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	Test Method
1.	20/09/2019	A1-Downwind point of Talabira-1 mine area	Total VOC ($\mu\text{g}/\text{m}^3$)	< 0.001	Solvent Extraction followed by GC analysis.
2.			PAH ($\mu\text{g}/\text{m}^3$)	< 0.001	
Remarks		Nil			
Any unusual feature observed during determination				Nil	

End of Test Report

Digambar Anandhu
Authorized Signatory
Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHIUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/10/19/NOISE(4261 – 4260)

Issue date: 05.11.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 5700280156 DT-11.12.2019

Date of Sample Receipt: Not Applicable

Testing Dt.: Not Applicable

Test completion Dt.: Not Applicable

Sample Description: Noise Level

No. of Samples: 07

Sample Condition: NA

Sampling Method used, if any: KLPL/SOP/ Air-06

SL. NO	DATE OF MONITORING	SAMPLING LOCATION	NOISE LEVEL IN dB(A) LEQ, DAY TIME (6.00AM TO 10.00PM)	NOISE LEVEL IN dB(A) LEQ, NIGHT TIME (10.00 PM to 6.00 AM)
1.	26.10.2019	Near Weigh Bridge	57.1	42.2
2.	25.10.2019	Near Petrol Pump	56.3	42.5
3.	28.10.2019	In front of Mining Office	59.5	50.3
4.	27.10.2019	Rest Shelter	55.5	42.0
5.	26.10.2019	Khinda Village	51.1	40.5
6.	27.10.2019	Babu Khinda	49.8	40.1
7.	25.10.2019	R & R Colony	47.9	41.4
		Standard as per Noise Rule, 2000 (Industrial Area)	75.0	70.0
		Standard as per Noise Rule, 2000 (Residential Area)	55.0	45.0
Remarks:			Nil	
Any unusual feature observed during determination			Nil	

***** End of Test Report *****

Digambar Anand
Authorized Signatory
Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHIUBANESWAR-752101, ODISHA

Kalyani Laboratories

TEST REPORT

Test Report No.: KLPL-TR/10/19/S-1673C

Issue Date: 05.11.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 5700280156 DT-11.12.2019

Date of sampling: 28.10.2019

Date of Sample Receipt: 29.10.2019

Testing Dt.: 29.10.2019

Test completion Dt: 05.11.2019

Sample Description: Surface Water

Place of collection: Mines Pond Water

Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any:

KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Standards as per IS-2296 class-"C"	Test Methods
1.	Colour	< 1.0	Hazen, Max	300	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	36	mg/l	--	APHA-22 nd Edition (2540 D)
3.	pH value	8.0	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Electrical Conductivity	0.402	ms/cm	--	APHA-22 nd Edition (2510 A)
5.	Turbidity	2.2	NTU, max	--	IS 3025 (Part 10):1984 RA 2006
6.	Total dissolved solids	242	mg/l, max	1500	IS 3025 (Part 16):1984 RA 2006
7.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
8.	Total Organic Carbon	< 5.0	mg/l, max	--	APHA-22 nd Eds.
9.	Total Kjeldal Nitrogen	1.68	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	30	mg/l, max	--	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.01	mg/l, max	1.5	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	< 0.05	mg/l, max	1.5	IS 3025 (Part 60):2008
13.	Iron (as Fe)	1.9	mg/l, max	50	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.1	mg/l, max	--	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	3.5	mg/l, max	50	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	41	mg/l, max	--	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity	32	mg/l, max	--	IS 3025 (Part 23):1986





TEST REPORT

	(as CaCO ₃)				RA 2009
18.	Total hardness (as CaCO ₃)	124	mg/l, max	--	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.046	mg/l, max	15	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, max	0.01	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.01	mg/l, max	0.1	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.001	mg/l, max	--	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, max	--	IS 3025 (Part 54):2003 RA 2009
25.	Biochemical Oxygen Demand	< 1.0	mg/l, max	3.0	APHA-22 nd Edition - 2012 (5210 B)
26.	Total arsenic (as As)	< 0.001	mg/l, max	0.2	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.01	mg/l, max	--	IS 3025 (Part 52): 2003 RA 2009
28.	Dissolved Oxygen	6.7	mg/l,min	4.0	APHA-22 nd Edition (4500-O-C)
Remarks: Nil					
Any unusual feature observed during determination					Nil

***** End of Test Report *****

Digambar Ananta

Authorized Signatory
Kalyani Laboratories Private Limited



TEST REPORT

Test Report No.: KLPL-TR/10/19/WATER-1673A

Issue Date: 05.11.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of sampling: 26.10.2019

Date of Sample Receipt: 29.10.2019

Testing Dt.: 29.10.2019

Test completion Dt: 05.11.2019

Sample Description: Ground Water **Place of collection:** R & R COLONY OPEN WELL (Purushotam Meher)

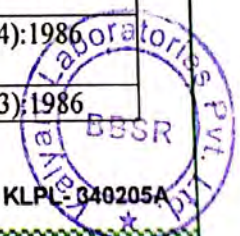
Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any:

KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Acceptable Limit (IS: 10500:2012)	Test Methods
1.	Colour	< 1.0	Hazen, Max	5	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	38	mg/l, max	--	APHA-22 nd Edition (2540 D)
3.	pH value	7.6	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Ground Water Level	5.27	Meter	--	--
5.	Electrical Conductivity	0.372	ms/cm	--	APHA-22 nd Edition (2510 A)
6.	Turbidity	0.5	NTU, Max	1.0	IS 3025 (Part 10):1984 RA 2006
7.	Total dissolved solids	202	mg/l, max	500	IS 3025 (Part 16):1984 RA 2006
8.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
9.	Total Kjeldal Nitrogen	1.16	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	28	mg/l, max	250	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.02	mg/l, max	0.05	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	0.18	mg/l, max	1.0	IS 3025 (Part 60):2008
13.	Iron (as Fe)	< 0.05	mg/l, max	1.0	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.05	mg/l, max	0.10	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	3.0	mg/l, max	45.0	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	28	mg/l, max	200	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity (as	92	mg/l, Max	200	IS 3025 (Part 23):1986





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	CaCO ₃)				RA 2009
18.	Total hardness (as CaCO ₃)	120	mg/l, Max	200	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.036	mg/l, Max	5.0	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, Max	0.003	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, Max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.005	mg/l, Max	0.01	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.0005	mg/l, Max	0.001	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, Max	0.02	IS 3025 (Part 54):2003 RA 2009
25.	Total Pesticide	< 0.0001	mg/l, Max	0.0005	USEPA
26.	Total arsenic (as As)	< 0.001	mg/l, Max	0.01	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.02	mg/l, Max	0.05	IS 3025 (Part 52): 2003 RA 2009
Remarks: Ground water level monitor manually.					
Any unusual feature observed during determination				Nil	

***** End of Test Report *****

Digambar Anubala
 Authorized Signatory
 Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/10/19/WATER-1673B

Issue Date: 05.11.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda,Block-Tilda,dist-Raipur,493224,CG .

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of sampling: 29.10.2019

Date of Sample Receipt: 29.10.2019 Testing Dt.: 29.10.2019 Test completion Dt: 05.11.2019

Sample Description: Ground Water

Place of collection: Inside Mines Office

Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any:

KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Acceptable Limit (IS: 10500:2012)	Test Methods
1.	Colour	< 1.0	Hazen, Max	5	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	44	mg/l, max	--	APHA-22 nd Edition (2540 D)
3.	pH value	7.8	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Ground Water Level	5.30	Meter	--	--
5.	Electrical Conductivity	0.430	ms/cm	--	APHA-22 nd Edition (2510 A)
6.	Turbidity	0.8	NTU, Max	1.0	IS 3025 (Part 10):1984 RA 2006
7.	Total dissolved solids	224	mg/l, max	500	IS 3025 (Part 16):1984 RA 2006
8.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
9.	Total Kjeldal Nitrogen	1.68	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	32	mg/l, max	250	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.02	mg/l, max	0.05	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	0.23	mg/l, max	1.0	IS 3025 (Part 60):2008
13.	Iron (as Fe)	< 0.05	mg/l, max	1.0	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.05	mg/l, max	0.10	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	3.3	mg/l, max	45.0	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	31	mg/l, max	200	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity (as	116	mg/l, Max	200	IS 3025 (Part 23):1986



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78/944, PAHAL, BHUBANESWAR-752101, ODISHA

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	CaCO ₃)				RA 2009
18.	Total hardness (as CaCO ₃)	128	mg/l, Max	200	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.04	mg/l, Max	5.0	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, Max	0.003	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, Max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.005	mg/l, Max	0.01	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.0005	mg/l, Max	0.001	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, Max	0.02	IS 3025 (Part 54):2003 RA 2009
25.	Total Pesticide	< 0.0001	mg/l, Max	0.0005	USEPA
26.	Total arsenic (as As)	< 0.001	mg/l, Max	0.01	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.02	mg/l, Max	0.05	IS 3025 (Part 52): 2003 RA 2009
Remarks: Ground water level monitor manually (Provision for Potable Pizzometric Monitoring).					
Any unusual feature observed during determination				Nil	

End of Test Report

Diganta Das
Authorized Signatory
Kalyani Laboratories Private Limited



TEST REPORT

Test Report No.: KLPL-TR/10/19/AAQM-396F

Issue date: 05.11.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 5700280156 DT-11.12.2019

Date of Sample Receipt: 29.10.2019

Testing Dt.: 29.10.2019

Test completion Dt.: 05.11.2019

Sample Description: Ambient Air Quality

No. of Samples: 1

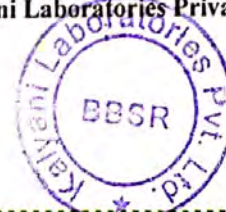
Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	26-27/10/2019	Khinda village. 3 Km from the mines in direction of South East	Sulphur Dioxide (SO ₂), µg/m ³	9.07	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	16.19	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	56.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	38.30	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks			Nil			
Any unusual feature observed during determination			Nil			

***** End of Test Report *****

Digambar Anandh
Authorized Signatory
Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/10/19/AAQM-396G

Issue date: 05.11.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 5700280156 DT-11.12.2019

Date of Sample Receipt: 29.10.2019

Testing Dt.: 29.11.2019

Test completion Dt.: 05.11.2019

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	27-28/10/2019	Babu Khinda 3.5 Km from the mines in direction of North East	Sulphur Dioxide (SO ₂), µg/m ³	8.24	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	18.12	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	56.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	38.30	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

***** End of Test Report *****

Digambar Das
Authorized Signatory
Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/10/19/AAQM-396A

Issue date: 05.11.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 5700280156 DT-11.12.2019

Date of Sample Receipt: 29.10.2019

Testing Dt.: 29.10.2019

Test completion Dt.: 05.11.2019

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	25-26/10/2019	R & R Colony. 3.2 Km from the mines in direction of North East	Sulphur Dioxide (SO ₂), µg/m ³	7.39	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	14.10	80	
3.			Particulate Matter (Size less than 10µm) or PM10, go/m ³	60.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	43.11	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

End of Test Report

Digambar Anand
Authorized Signatory
Kalyani Laboratories Private Limited

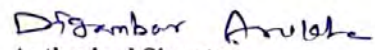


TEST REPORT

Test Report No.: KLPL-TR/10/19/AAQM-396B		
Issue date: 05.11.2019		
Name and address of the Customer: M/s Raipur Energen Limited. Raikheda, Block-Tilda, dist-Raipur, 493224, CG		
Customer's reference: Service Order No.: 5700280156 DT-11.12.2019		
Date of Sample Receipt: 29.10.2019	Testing Dt.: 29.10.2019	Test completion Dt.: 05.11.2019
Sample Description: Ambient Air Quality		No. of Samples: 1
Sample Condition: Gaseous sample absorbing solutions refrigerated		
Sampling Method used, if any: KLPL/SOP/ Air-06		

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	26-27/10/2019	Weigh Bridge 0.5 Km from the mines in direction south	Sulphur Dioxide (SO ₂), µg/m ³	7.39	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	15.31	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	47.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	30.18	60	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

***** End of Test Report *****


 Authorized Signatory
 Kalyani Laboratories Private Limited





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KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/10/19/AAQM-396C		
Issue date: 05.11.2019		
Name and address of the Customer: M/s Raipur Energen Limited, Raikheda,Block-Tilda,dist-Raipur,493224,CG		
Customer's reference: Service Order No.: 5700280156 DT-11.12.2019		
Date of Sample Receipt: 29.10.2019	Testing Dt.: 29.10.2019	Test completion Dt.: 05.11.2019
Sample Description: Ambient Air Quality		No. of Samples: 1
Sample Condition: Gaseous sample absorbing solutions refrigerated		
Sampling Method used, if any: KLPL/SOP/ Air-06		

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	25-26/10/2019	Near the Petrol pump	Sulphur Dioxide (SO ₂), µg/m ³	6.10	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	14.38	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	51.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	35.25	60	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

***** End of Test Report *****

Digambar Aoulah
Authorized Signatory
Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/10/19/AAQM-396D

Issue date: 05.11.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 5700280156 DT-11.12.2019

Date of Sample Receipt: 29.10.2019

Testing Dt.: 29.10.2019

Test completion Dt.: 05.11.2019

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	28-29/10/2019	In front of the Mines Office	Sulphur Dioxide (SO ₂), µg/m ³	5.50	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	13.30	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	62.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	40.19	60	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

***** End of Test Report *****

Dijambar Aouela

Authorized Signatory
Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/10/19/AAQM-396E

Issue date: 05.11.2019

Name and address of the Customer: M/s Raipur Energen Limited,
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 5700280156 DT-11.12.2019

Date of Sample Receipt: 29.10.2019

Testing Dt.: 29.11.2019

Test completion Dt.: 05.11.2019

Sample Description: Ambient Air Quality

No. of Samples: 01

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	27-28/10/2019	Rest Shelter. 1.5 Km from the mines in direction South East	Sulphur Dioxide (SO ₂), µg/m ³	6.08	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	12.33	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	51.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	34.05	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

End of Test Report

Authorized Signatory
Kalyani Laboratories Private Limited



TALABIRA-I COAL BLOCK, SAMBALPUR

M/s Raipur Energen Limited

ANALYSIS REPORT ON ENVIRONMENTAL MONITORING DATA GENERATED FOR THE MONTH OF DECEMBER-2019

ENVIRONMENTAL MONITORING DONE BY

KALYANI LABORATORIES PVT. LTD.
LAB: PLOT NO. 78, MILLENIUM CITY,
PAHAL, BBSR-752101



This Report Contains Data On Ambient Air, Ground Water, Surface Water, Soil And Noise Monitoring
And Analysis

CONTENTS

SL. No.	DESCRIPTION	TEST REPORT NO.
1.	AMBIENT AIR MONITORING RESULTS	KLPL-TR/12/19/AAQM-478A- 478H
2.	NOISE LEVEL MONITORING RESULTS	KLPL-TR/12/19/NOISE-478I-478O
3.	SURFACE WATER ANALYSIS RESULTS	KLPL-TR/12/19/WATER-2026C
4.	GROUND WATER ANALYSIS RESULTS	KLPL-TR/12/19/WATER-2026A-2026B





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/12/19/AAQM-478A

Issue date: 04.01.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 29.12.2019 Testing Dt.: 29.12.2019 Test completion Dt.: 04.01.2020

Sample Description: Ambient Air Quality No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	24-25/12/2019	R & R Colony. 3.2 Km from the mines in direction of North East	Sulphur Dioxide (SO ₂), µg/m ³	7.07	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	16.33	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	61.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	39.31	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

***** End of Test Report *****

Authorized Signatory
Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/94, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/012/19/AAQM-478B

Issue date: 04.01.2020

Name and address of the Customer: M/s Raipur Energen Limited,
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 29.12.2019 Testing Dt.: 29.12.2019 Test completion Dt.: 04.01.2019

Sample Description: Ambient Air Quality No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	25-26/12/2019	Weigh Bridge 0.5 Km from the mines in direction south	Sulphur Dioxide (SO ₂), µg/m ³	8.19	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	20.31	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	45.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	31.26	60	
Remarks				Nil		
Any unusual feature observed during determination				Nil		

End of Test Report

Authorized Signatory
Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/12/19/AAQM-478C

Issue date: 04.01.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800133242, Date-27.12.2016

Date of Sample Receipt: 29.12.2019

Testing Dt.: 29.12.2019

Test completion Dt.: 04.01.2020

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	24-25/12/2019	Near the Petrol pump	Sulphur Dioxide (SO ₂), µg/m ³	4.40	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	18.07	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	50.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	33.34	60	
Remarks			Nil			
Any unusual feature observed during determination			Nil			

***** End of Test Report *****

M. B. S. R.
Authorized Signatory
Kalyani Laboratories Private Limited





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78944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/12/19/AAQM-478D

Issue date: 04.01.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 29.12.2019

Testing Dt.: 29.12.2019

Test completion Dt.: 04.01.2020

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

SL No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	27-28/12/2019	In front of the Mines Office	Sulphur Dioxide (SO ₂), µg/m ³	6.13	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	12.04	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	64.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	42.38	60	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

***** End of Test Report *****

Signature
Authorized Signatory
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78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/12/19/AAQM-478E

Issue date: 04.01.2020

Name and address of the Customer: M/s Raipur Energen Limited,
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 29.12.2019

Testing Dt.: 29.12.2019

Test completion Dt.: 04.01.2020

Sample Description: Ambient Air Quality

No. of Samples: 01

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

No	Sampling	Location	Parameter	Value	2009	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
1.	26-27/12/2019	Rest Shelter, 1.5 Km from the mines in direction South East	Sulphur Dioxide (SO ₂), $\mu\text{g}/\text{m}^3$	5.38	80	
2.			Nitrogen Dioxide (NO ₂), $\mu\text{g}/\text{m}^3$	10.16	80	
3.			Particulate Matter (Size less than 10 μm) or PM ₁₀ , $\mu\text{g}/\text{m}^3$	52.0	100	
4.			Particulate Matter (Size less than 2.5 μm) or PM _{2.5} , $\mu\text{g}/\text{m}^3$	30.44	60	
5.			Lead (Pb), $\mu\text{g}/\text{m}^3$	< 0.02	01	
6.			Arsenic (As), ng/m^3	< 1.0	06	
7.			Mercury (Hg), ng/m^3	< 1.0	--	
8.			Chromium (Cr), ng/m^3	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

End of Test Report

D. S. Prasad
Authorized Signatory
Kalyani Laboratories Private Limited



TEST REPORT

Test Report No.: KLPL-TR/12/19/AAQM-478F

Issue date: 04.01.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 29.12.2019 Testing Dt.: 29.12.2019 Test completion Dt.: 04.01.2020

Sample Description: Ambient Air Quality No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	25-26/12/2019	Khinda village. 3 Km from the mines in direction of South East	Sulphur Dioxide (SO ₂), µg/m ³	9.23	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	18.12	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	57.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	35.25	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks			Nil			
Any unusual feature observed during determination			Nil			

End of Test Report

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KALYANI LABORATORIES PVT. LTD.

78944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/12/19/AAQM-478G

Issue date: 04.01.2020

Name and address of the Customer: M/s Raipur Energen Limited,
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 29.12.2019

Testing Dt.: 29.12.2019

Test completion Dt.: 04.01.2020

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	26-27/12/2019	Babu Khinda 3.5 Km from the mines in direction of North East	Sulphur Dioxide (SO ₂), µg/m ³	9.39	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	19.29	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	58.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	34.05	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	-	
8.			Chromium (Cr), ng/m ³	< 1.0	-	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

End of Test Report



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78944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/12/19/AAQM-478H

Issue date: 04.01.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikhedra, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 29.12.2019

Testing Dt.: 29.12.2019

Test completion Dt.: 30.12.2019

Sample Description: Ambient Air Quality

No. of Samples: 1

Sampling Point.: Downwind direction of Talabira 1 mines

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	Test Method
1.	28/12/2019	A1-Downwind point of Talabira-1 mine area	Total VOC ($\mu\text{g}/\text{m}^3$)	< 0.001	Solvent Extraction followed by GC analysis.
2.			PAH ($\mu\text{g}/\text{m}^3$)	< 0.001	
Remarks		Nil			
Any unusual feature observed during determination				Nil	

End of Test Report

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78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/12/19/NOISE(4781 - 4780)

Issue date: 28.09.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: Not Applicable Testing Dt.: Not Applicable Test completion Dt.: Not Applicable

Sample Description: Noise Level No. of Samples: 07

Sample Condition: NA

Sampling Method used, if any: KLPL/SOP/ Air-06

SL NO	DATE OF MONITORING	SAMPLING LOCATION	NOISE LEVEL IN dB(A) LEQ, DAY TIME (6.00AM TO 10.00PM)	NOISE LEVEL IN dB(A) LEQ, NIGHT TIME (10.00 PM to 6.00 AM)
1.	25.12.2019	Near Weigh Bridge	58.0	42.9
2.	24.12.2019	Near Petrol Pump	56.9	42.9
3.	27.12.2019	In front of Mining Office	60.0	50.9
4.	26.12.2019	Rest Shelter	56.2	42.9
5.	25.12.2019	Khinda Village	51.8	40.9
6.	26.12.2019	Babu Khinda	50.6	40.6
7.	24.12.2019	R & R Colony	48.6	41.9
		Standard as per Noise Rule, 2000 (Industrial Area)	75.0	70.0
		Standard as per Noise Rule, 2000 (Residential Area)	55.0	45.0
Remarks:		Nil		
Any unusual feature observed during determination		Nil		

End of Test Report

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Authorized Signatory
Kalyani Laboratories Private Limited



TEST REPORT

Test Report No.: KLPL-TR/12/19/WATER-2026A

Issue Date: 04.01.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of sampling: 28.12.2019

Date of Sample Receipt: 29.12.2019 **Testing Dt.:** 29.12.2019 **Test completion Dt:** 04.01.2020

Sample Description: Ground Water **Place of collection:** R & R COLONY OPEN WELL (Purushotam Meher)

Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any:

KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Acceptable Limit (IS: 10500:2012)	Test Methods
1.	Colour	< 1.0	Hazen, Max	5	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	38	mg/l, max	--	APHA-22 nd Edition (2540 D)
3.	pH value	7.6	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Ground Water Level	5.30	Meter	--	--
5.	Electrical Conductivity	0.405	ms/cm	--	APHA-22 nd Edition (2510 A)
6.	Turbidity	0.8	NTU, Max	1.0	IS 3025 (Part 10):1984 RA 2006
7.	Total dissolved solids	228	mg/l, max	500	IS 3025 (Part 16):1984 RA 2006
8.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
9.	Total Kjeldal Nitrogen	1.16	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	36	mg/l, max	250	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.02	mg/l, max	0.05	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	0.24	mg/l, max	1.0	IS 3025 (Part 60):2008
13.	Iron (as Fe)	< 0.05	mg/l, max	1.0	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.05	mg/l, max	0.10	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	3.6	mg/l, max	45.0	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	35	mg/l, max	200	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity (as	112	mg/l, Max	200	IS 3025 (Part 23):1986



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	CaCO ₃				RA 2009
18.	Total hardness (as CaCO ₃)	136	mg/l, Max	200	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.041	mg/l, Max	5.0	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, Max	0.003	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, Max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.005	mg/l, Max	0.01	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.0005	mg/l, Max	0.001	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, Max	0.02	IS 3025 (Part 54):2003 RA 2009
25.	Total Pesticide	< 0.0001	mg/l, Max	0.0005	USEPA
26.	Total arsenic (as As)	< 0.001	mg/l, Max	0.01	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.02	mg/l, Max	0.05	IS 3025 (Part 52): 2003 RA 2009
Remarks: Ground water level monitor manually.					
Any unusual feature observed during determination				Nil	

End of Test Report

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TEST REPORT

Test Report No.: KLPL-TR/12/19/WATER-2026B

Issue Date: 04.01.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of sampling: 28.12.2019

Date of Sample Receipt: 29.12.2019

Testing Dt.: 29.12.2019

Test completion Dt: 04.01.2020

Sample Description: Ground Water Place of collection: Inside Mines Office

Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any:

KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Acceptable Limit (IS: 10500:2012)	Test Methods
1.	Colour	< 1.0	Hazen, Max	5	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	46	mg/l, max	--	APHA-22 nd Edition (2540 D)
3.	pH value	7.9	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Ground Water Level	5.31	Meter	--	--
5.	Electrical Conductivity	0.465	ms/cm	--	APHA-22 nd Edition (2510 A)
6.	Turbidity	0.7	NTU, Max	1.0	IS 3025 (Part 10):1984 RA 2006
7.	Total dissolved solids	248	mg/l, max	500	IS 3025 (Part 16):1984 RA 2006
8.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
9.	Total Kjeldal Nitrogen	1.16	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	38	mg/l, max	250	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.02	mg/l, max	0.05	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	0.26	mg/l, max	1.0	IS 3025 (Part 60):2008
13.	Iron (as Fe)	< 0.05	mg/l, max	1.0	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.05	mg/l, max	0.10	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	3.7	mg/l, max	45.0	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	38	mg/l, max	200	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity (as	118	mg/l, Max	200	IS 3025 (Part 23):1986



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	CaCO ₃)				RA 2009
18.	Total hardness (as CaCO ₃)	148	mg/l, Max	200	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.043	mg/l, Max	5.0	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, Max	0.003	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, Max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.005	mg/l, Max	0.01	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.0005	mg/l, Max	0.001	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, Max	0.02	IS 3025 (Part 54):2003 RA 2009
25.	Total Pesticide	< 0.0001	mg/l, Max	0.0005	USEPA
26.	Total arsenic (as As)	< 0.001	mg/l, Max	0.01	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.02	mg/l, Max	0.05	IS 3025 (Part 52): 2003 RA 2009
Remarks: Ground water level monitor manually (Provision for Potable Pizzometric Monitoring).					
Any unusual feature observed during determination				Nil	

End of Test Report

[Signature]
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TEST REPORT

Test Report No.: KLPL-TR/12/19/S-2026C

Issue Date: 04.01.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of sampling: 28.12.2019

Date of Sample Receipt: 29.12.2019

Testing Dt.: 29.12.2019

Test completion Dt: 04.01.2020

Sample Description: Surface Water

Place of collection: Mines Pond Water

Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any:

KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Standards as per IS-2296 class-"C"	Test Methods
1.	Colour	< 1.0	Hazen, Max	300	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	44	mg/l	--	APHA-22 nd Edition (2540 D)
3.	pH value	8.2	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Electrical Conductivity	0.449	ms/cm	--	APHA-22 nd Edition (2510 A)
5.	Turbidity	2.6	NTU, max	--	IS 3025 (Part 10):1984 RA 2006
6.	Total dissolved solids	272	mg/l, max	1500	IS 3025 (Part 16):1984 RA 2006
7.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
8.	Total Organic Carbon	< 5.0	mg/l, max	--	APHA-22 nd Eds.
9.	Total Kjeldal Nitrogen	1.68	mg/l, max	--	APHA-22 nd Edition (4500-N _{ox} -B)
10.	Chloride (as Cl)	38	mg/l, max	--	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.01	mg/l, max	1.5	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	< 0.05	mg/l, max	1.5	IS 3025 (Part 60):2008
13.	Iron (as Fe)	1.85	mg/l, max	50	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.1	mg/l, max	--	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	3.9	mg/l, max	50	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	46	mg/l, max	--	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity	44	mg/l, max	--	IS 3025 (Part 24):1986 RA 2009



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TEST REPORT

	(as CaCO ₃)				RA 2009
18.	Total hardness (as CaCO ₃)	144	mg/l, max	--	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.051	mg/l, max	15	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, max	0.01	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.01	mg/l, max	0.1	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.001	mg/l, max	--	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, max	--	IS 3025 (Part 54):2003 RA 2009
25.	Biochemical Oxygen Demand	< 1.0	mg/l, max	3.0	APHA-22 nd Edition - 2012 (5210 B)
26.	Total arsenic (as As)	< 0.001	mg/l, max	0.2	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.01	mg/l, max	--	IS 3025 (Part 52): 2003 RA 2009
28.	Dissolved Oxygen	7.0	mg/l,min	4.0	APHA-22 nd Edition (4500-O-C)
Remarks: Nil					
Any unusual feature observed during determination					Nil

*****: End of Test Report *****

[Signature]
Authorized Signatory
Kalyani Laboratories Private Limited



TALABIRA-I COAL BLOCK, SAMBALPUR

M/s Raipur Energen Limited

ANALYSIS REPORT ON ENVIRONMENTAL MONITORING DATA GENERATED FOR THE MONTH OF FEBRUARY- 2020

ENVIRONMENTAL MONITORING DONE BY

KALYANI LABORATORIES PVT. LTD.
LAB: PLOT NO. 78, MILLENIUM CITY,
PAHAL, BBSR-752101



This Report Contains Data On Ambient Air, Ground Water, Surface Water, Soil And Noise Monitoring
And Analysis

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3.	SURFACE WATER ANALYSIS RESULTS	KLPL-TR/02/20/WATER-2437C
4.	GROUND WATER ANALYSIS RESULTS	KLPL-TR/02/20/WATER-2437A - 2437B



TEST REPORT

Test Report No.: KLPL-TR/02/20/AAQM-565A

Issue date: 06.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 29.02.2020 Testing Dt.: 29.02.2020 Test completion DL: 06.03.2020

Sample Description: Ambient Air Quality No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	24-25/02/2020	R & R Colony. 3.2 Km from the mines in direction of North East	Sulphur Dioxide (SO ₂), µg/m ³	9.36	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	18.38	80	
3.			Particulate Matter (Size less than 10µm) or PM10, go/m ³	68.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	43.30	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination					Nil	

***** End of Test Report *****


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78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/02/20/AAQM-565B

Issue date: 06.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 29.02.2020

Testing Dt.: 29.02.2020

Test completion Dt.: 06.03.2020

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	25-26/02/2020	Weigh Bridge 0.5 Km from the mines in direction south	Sulphur Dioxide (SO ₂), $\mu\text{g}/\text{m}^3$	8.40	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), $\mu\text{g}/\text{m}^3$	15.32	80	
3.			Particulate Matter (Size less than 10 μm) or PM10, $\mu\text{g}/\text{m}^3$	50.0	100	
4.			Particulate Matter (Size less than 2.5 μm) or PM2.5, $\mu\text{g}/\text{m}^3$	33.34	60	
Remarks			Nil			
Any unusual feature observed during determination			Nil			

End of Test Report

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TEST REPORT

Test Report No.: KLPL-TR/02/20/AAQM-565C

Issue date: 06.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800133242, Date-27.12.2016

Date of Sample Receipt: 29.02.2020

Testing Dt.: 29.02.2020

Test completion Dt.: 06.03.2020

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	24-25/02/2020	Near the Petrol pump	Sulphur Dioxide (SO ₂), µg/m ³	6.10	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	16.38	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	51.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	34.19	60	
Remarks				Nil		
Any unusual feature observed during determination				Nil		

End of Test Report

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TEST REPORT

Test Report No.: KLPL-TR/02/20/AAQM-565D

Issue date: 06.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 29.02.2020

Testing Dt.: 29.02.2020

Test completion Dt.: 06.03.2020

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	27-28/02/2020	In front of the Mines Office	Sulphur Dioxide (SO ₂), µg/m ³	9.27	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	16.13	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	66.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	44.26	60	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

***** End of Test Report *****



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78944, PAHAL, BILUBANESWAR-752101 ODISHA

TEST REPORT

Test Report No.: KLPL-TR/02/20/AAQM-565E

Issue date: 06.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 29.02.2020 Testing Dt.: 29.02.2020 Test completion Dt.: 06.03.2020

Sample Description: Ambient Air Quality No. of Samples: 01

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	26-27/02/2020	Rest Shelter, 1.5 Km from the mines in direction South East	Sulphur Dioxide (SO ₂), µg/m ³	8.33	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	14.02	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	62.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	39.31	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

***** End of Test Report *****



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TEST REPORT

Test Report No.: KLPL-TR/02/20/AAQM-565F

Issue date: 06.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 29.02.2020 Testing Dt.: 29.02.2020 Test completion Dt.: 06.03.2020

Sample Description: Ambient Air Quality No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	25-26/02/2020	Khinda village. 3 Km from the mines in direction of South East	Sulphur Dioxide (SO ₂), µg/m ³	10.30	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	19.02	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	69.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	47.22	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks				Nil		
Any unusual feature observed during determination				Nil		

*****: End of Test Report *****



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TEST REPORT

Test Report No.: KLPL-TR/02/20/AAQM-565G

Issue date: 06.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 29.02.2020

Testing Dt.: 29.02.2020

Test completion Dt.: 06.03.2020

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	26-27/02/2020	Babu Khinda 3.5 Km from the mines in direction of North East	Sulphur Dioxide (SO ₂), µg/m ³	10.22	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	20.06	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	64.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	42.20	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

~~XXXXXXXXXXXX~~ End of Test Report ~~XXXXXXXXXXXX~~



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TEST REPORT

Test Report No.: KLPL-TR/02/20/AAQM-56511

Issue date: 06.03.2020

Name and address of the Customer: M/s Raipur Energen Limited,
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 29.02.2020

Testing Dt.: 29.02.2020

Test completion Dt.: 03.03.2020

Sample Description: Ambient Air Quality

No. of Samples: 1

Sampling Point.: Downwind direction of Talabira I mines

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	Test Method
1.	27/02/2020	A1-Downwind point of Talabira-I mine area	Total VOC ($\mu\text{g}/\text{m}^3$)	< 0.001	Solvent Extraction followed by GC analysis.
2.			PAH ($\mu\text{g}/\text{m}^3$)	< 0.001	
Remarks		Nil			
Any unusual feature observed during determination				Nil	

***** End of Test Report *****

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TEST REPORT

Test Report No.: KLPL-TR/02/20/NOISE(5651 - 5650)

Issue date: 06.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: Not Applicable Testing Dt.: Not Applicable Test completion Dt.: Not Applicable

Sample Description: Noise Level No. of Samples: 07

Sample Condition: NA

Sampling Method used, if any: KLPL/SOP/ Air-06

SL. NO	DATE OF MONITORING	SAMPLING LOCATION	NOISE LEVEL IN dB(A) LEQ, DAY TIME (6.00AM TO 10.00PM)	NOISE LEVEL IN dB(A) LEQ, NIGHT TIME (10.00 PM to 6.00 AM)
1.	25.02.2020	Near Weigh Bridge	59.3	43.8
2.	24.02.2020	Near Petrol Pump	57.1	43.2
3.	27.02.2020	In front of Mining Office	60.1	51.6
4.	26.02.2020	Rest Shelter	56.5	43.1
5.	25.02.2020	Khinda Village	51.9	41.6
6.	26.02.2020	Babu Khinda	50.9	40.9
7.	24.02.2020	R & R Colony	48.9	42.6
		Standard as per Noise Rule, 2000 (Industrial Area)	75.0	70.0
		Standard as per Noise Rule, 2000 (Residential Area)	55.0	45.0
Remarks:			Nil	
Any unusual feature observed during determination			Nil	

End of Test Report

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TEST REPORT

Test Report No.: KLPL-TR/02/20/WATER-2437A

Issue Date: 06.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of sampling: 28.02.2020

Date of Sample Receipt: 29.02.2020

Testing Dt.: 29.02.2020

Test completion Dt: 05.03.2020

Sample Description: Ground Water Place of collection: R & R COLONY OPEN WELL (Purusotam Meher)

Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any:

KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Acceptable Limit (IS: 10500:2012)	Test Methods
1.	Colour	< 1.0	Hazen, Max	5	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	30	mg/l, max	--	APHA-22 nd Edition (2540 D)
3.	pH value	7.5	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Ground Water Level	5.34	Meter	--	--
5.	Electrical Conductivity	0.362	ms/cm	--	APHA-22 nd Edition (2510 A)
6.	Turbidity	0.4	NTU, Max	1.0	IS 3025 (Part 10):1984 RA 2006
7.	Total dissolved solids	196	mg/l, max	500	IS 3025 (Part 16):1984 RA 2006
8.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
9.	Total Kjeldal Nitrogen	1.12	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	24	mg/l, max	250	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.02	mg/l, max	0.05	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	0.18	mg/l, max	1.0	IS 3025 (Part 60):2008
13.	Iron (as Fe)	< 0.05	mg/l, max	1.0	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.05	mg/l, max	0.10	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	2.8	mg/l, max	45.0	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	24	mg/l, max	200	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity (as	92	mg/l, Max	200	IS 3025 (Part 23):1986



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	CaCO ₃)				RA 2009
18.	Total hardness (as CaCO ₃)	116	mg/l, Max	200	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.035	mg/l, Max	5.0	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, Max	0.003	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, Max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.005	mg/l, Max	0.01	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.0005	mg/l, Max	0.001	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, Max	0.02	IS 3025 (Part 54):2003 RA 2009
25.	Total Pesticide	< 0.0001	mg/l, Max	0.0005	USEPA
26.	Total arsenic (as As)	< 0.001	mg/l, Max	0.01	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.02	mg/l, Max	0.05	IS 3025 (Part 52): 2003 RA 2009
Remarks: Ground water level monitor manually.					
Any unusual feature observed during determination				Nil	

***** End of Test Report *****

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TEST REPORT

Test Report No.: KLPL-TR/02/20/WATER-2437B

Issue Date: 06.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of sampling: 28.02.2020

Date of Sample Receipt: 29.02.2020

Testing Dt.: 29.02.2020

Test completion Dt: 05.03.2020

Sample Description: Ground Water Place of collection: Inside Mines Office

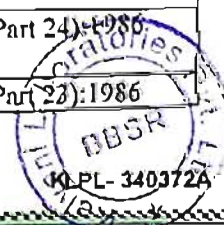
Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any:

KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Acceptable Limit (IS: 10500:2012)	Test Methods
1.	Colour	< 1.0	Hazen, Max	5	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	46	mg/l, max	--	APHA-22 nd Edition (2540 D)
3.	pH value	7.85	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Ground Water Level	5.33	Meter	--	--
5.	Electrical Conductivity	0.485	ms/cm	--	APHA-22 nd Edition (2510 A)
6.	Turbidity	0.7	NTU, Max	1.0	IS 3025 (Part 10):1984 RA 2006
7.	Total dissolved solids	260	mg/l, max	500	IS 3025 (Part 16):1984 RA 2006
8.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
9.	Total Kjeldal Nitrogen	2.24	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	38	mg/l, max	250	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.02	mg/l, max	0.05	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	0.29	mg/l, max	1.0	IS 3025 (Part 60):2008
13.	Iron (as Fe)	< 0.05	mg/l, max	1.0	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.05	mg/l, max	0.10	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	3.7	mg/l, max	45.0	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	39	mg/l, max	200	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity (as	128	mg/l, Max	200	IS 3025 (Part 23):1986



					RA 2009
18.	Total hardness (as CaCO ₃)	168	mg/l, Max	200	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.046	mg/l, Max	5.0	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, Max	0.003	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, Max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.005	mg/l, Max	0.01	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.0005	mg/l, Max	0.001	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, Max	0.02	IS 3025 (Part 54):2003 RA 2009
25.	Total Pesticide	< 0.0001	mg/l, Max	0.0005	USEPA
26.	Total arsenic (as As)	< 0.001	mg/l, Max	0.01	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.02	mg/l, Max	0.05	IS 3025 (Part 52): 2003 RA 2009
Remarks: Ground water level monitor manually (Provision for Potable Pizzometric Monitoring).					
Any unusual feature observed during determination					Nil

End of Test Report

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TEST REPORT

Test Report No.: KLPL-TR/02/20/WATER2437C

Issue Date: 06.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikhedra,Block-Tilda,dist-Raipur,493224,CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of sampling: 28.02.2020

Date of Sample Receipt: 29.02.2020

Testing Dt.: 29.02.2020

Test completion Dt: 05.03.2020

Sample Description: Surface Water

Place of collection: Mines Pond Water

Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any:

KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Standards as per IS-2296 class-"C"	Test Methods
1.	Colour	< 1.0	Hazen, Max	300	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	48	mg/l	--	APHA-22 nd Edition (2540 D)
3.	pH value	8.3	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Electrical Conductivity	0.430	ms/cm	--	APHA-22 nd Edition (2510 A)
5.	Turbidity	2.8	NTU, max	--	IS 3025 (Part 10):1984 RA 2006
6.	Total dissolved solids	268	mg/l, max	1500	IS 3025 (Part 16):1984 RA 2006
7.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
8.	Total Organic Carbon	< 5.0	mg/l, max	--	APHA-22 nd Eds.
9.	Total Kjeldal Nitrogen	2.24	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	36	mg/l, max	--	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.01	mg/l, max	1.5	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	< 0.05	mg/l, max	1.5	IS 3025 (Part 60):2008
13.	Iron (as Fe)	2.0	mg/l, max	50	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.1	mg/l, max	--	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	3.8	mg/l, max	50	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	46	mg/l, max	--	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity	52	mg/l, max	--	IS 3025 (Part 23):1986





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78944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

	(as CaCO ₃)				RA 2009
18.	Total hardness (as CaCO ₃)	140	mg/l, max	--	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.052	mg/l, max	15	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, max	0.01	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.01	mg/l, max	0.1	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.001	mg/l, max	--	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, max	--	IS 3025 (Part 54):2003 RA 2009
25.	Biochemical Oxygen Demand	< 1.0	mg/l, max	3.0	APHA-22 nd Edition - 2012 (5210 B)
26.	Total arsenic (as As)	< 0.001	mg/l, max	0.2	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.01	mg/l, max	--	IS 3025 (Part 52): 2003 RA 2009
28.	Dissolved Oxygen	6.6	mg/l,min	4.0	APHA-22 nd Edition (4500-O-C)
Remarks: Nil					
Any unusual feature observed during determination					Nil

***** End of Test Report *****

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TALABIRA-I COAL BLOCK, SAMBALPUR

M/s Raipur Energen Limited

ANALYSIS REPORT ON ENVIRONMENTAL MONITORING DATA
GENERATED FOR THE MONTH OF JANUARY-2020

ENVIRONMENTAL MONITORING DONE BY

KALYANI LABORATORIES PVT. LTD.
LAB: PLOT NO. 78, MILLENIUM CITY,
PAHAL, BBSR-752101



This Report Contains Data On Ambient Air, Ground Water, Surface Water, Soil And Noise Monitoring
And Analysis

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SL. No.	DESCRIPTION	TEST REPORT NO.
1.	AMBIENT AIR MONITORING RESULTS	KLPL-TR/01/20/AAQM-528A- 528H
2.	NOISE LEVEL MONITORING RESULTS	KLPL-TR/01/20/NOISE-528I-528O
3.	SURFACE WATER ANALYSIS RESULTS	KLPL-TR/01/20/WATER-2228C
4.	GROUND WATER ANALYSIS RESULTS	KLPL-TR/01/20/WATER-2228A-2228B





KALYANI LABORATORIES PVT. LTD.

78944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/01/20/AAQM-528A

Issue date: 05.02.2020

Name and address of the Customer: M/s Raipur Energen Limited,
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 30.01.2020

Testing Dt.: 30.01.2020

Test completion Dt.: 05.02.2020

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	25-26/01/2020	R & R Colony. 3.2 Km from the mines in direction of North East	Sulphur Dioxide (SO ₂), µg/m ³	8.17	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	17.25	80	
3.			Particulate Matter (Size less than 10µm) or PM10, go/m ³	64.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	41.11	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

***** End of Test Report *****

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KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/01/20/AAQM-528B

Issue date: 05.02.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 30.01.2020 Testing Dt.: 30.01.2020 Test completion Dt.: 05.02.2020

Sample Description: Ambient Air Quality No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	26-27/01/2020	Weigh Bridge 0.5 Km from the mines in direction south	Sulphur Dioxide (SO ₂), $\mu\text{g}/\text{m}^3$	7.39	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), $\mu\text{g}/\text{m}^3$	17.33	80	
3.			Particulate Matter (Size less than 10 μm) or PM10, $\mu\text{g}/\text{m}^3$	47.0	100	
4.			Particulate Matter (Size less than 2.5 μm) or PM2.5, $\mu\text{g}/\text{m}^3$	30.18	60	
Remarks				Nil		
Any unusual feature observed during determination				Nil		

End of Test Report

M. S. S. S.
Authorized Signatory
Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/01/20/AAQM-528C

Issue date: 05.02.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Ralkhedn,Block-Tilda,dist-Raipur,493224,CG

Customer's reference: Service Order No.: 4800133242, Date-27.12.2016

Date of Sample Receipt: 30.01.2020

Testing Dt.: 30.01.2020

Test completion Dt.: 05.02.2020

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	25-26/01/2020	Near the Petrol pump	Sulphur Dioxide (SO ₂), µg/m ³	5.40	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	15.11	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	52.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	35.25	60	
Remarks			Nil			
Any unusual feature observed during determination			Nil			

***** End of Test Report *****

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78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/01/20/AAQM-528D

Issue date: 05.02.2020

Name and address of the Customer: M/s Raipur Energen Limited,
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 30.01.2020

Testing Dt.: 30.01.2020

Test completion Dt.: 05.02.2020

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	28-29/01/2020	In front of the Mines Office	Sulphur Dioxide (SO ₂), $\mu\text{g}/\text{m}^3$	7.20	80	Guidelines for the Measurement of Ambient Air Pollutants Volume- I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), $\mu\text{g}/\text{m}^3$	14.14	80	
3.			Particulate Matter (Size less than 10 μm) or PM10, $\mu\text{g}/\text{m}^3$	67.0	100	
4.			Particulate Matter (Size less than 2.5 μm) or PM2.5, $\mu\text{g}/\text{m}^3$	46.42	60	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

End of Test Report

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TEST REPORT

Test Report No.: KLPL-TR/01/20/AAQM-528E

Issue date: 05.02.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 30.01.2020

Testing Dt.: 30.01.2020

Test completion Dt.: 05.02.2020

Sample Description: Ambient Air Quality

No. of Samples: 01

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	27-28/01/2020	Rest Shelter. 1.5 Km from the mines in direction South East	Sulphur Dioxide (SO ₂), µg/m ³	6.40	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	11.39	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	63.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	40.19	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

End of Test Report



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78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/01/20/AAQM-528G

Issue date: 05.02.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 30.01.2020 Testing Dt.: 23.09.2019 Test completion Dt.: 30.01.2020

Sample Description: Ambient Air Quality No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

SL No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	27-28/01/2020	Babu Khinda 3.5 Km from the mines in direction of North East	Sulphur Dioxide (SO ₂), µg/m ³	10.26	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	19.34	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	60.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	39.14	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

***** End of Test Report *****



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78/94, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/01/20/AAQM-528H

Issue date: 05.02.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 30.01.2020 Testing Dt.: 30.01.2020 Test completion Dt.: 31.01.2020

Sample Description: Ambient Air Quality No. of Samples: 1

Sampling Point: Downwind direction of Talabira I mines

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl No	Date of Sampling	Sampling Location	Parameters	Observed Value	Test Method
1.	28/01/2020	A1-Downwind point of Talabira-I mine area	Total VOC ($\mu\text{g}/\text{m}^3$)	< 0.001	Solvent Extraction followed by GC analysis.
2.			PAH ($\mu\text{g}/\text{m}^3$)	< 0.001	
Remarks		Nil			
Any unusual feature observed during determination				Nil	

***** End of Test Report *****



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78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/01/20/NOISE(5281 - 5280)

Issue date: 05.02.2020

Name and address of the Customer: M/s Raipur Energen Limited,
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: Not Applicable

Testing Dt.: Not Applicable

Test completion Dt.: Not Applicable

Sample Description: Noise Level

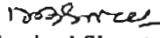
No. of Samples: 07

Sample Condition: NA

Sampling Method used, if any: KLPL/SOP/ Air-06

SL. NO	DATE OF MONITORING	SAMPLING LOCATION	NOISE LEVEL IN dB(A) LEQ, DAY TIME (6.00AM TO 10.00PM)	NOISE LEVEL IN dB(A) LEQ, NIGHT TIME (10.00 PM to 6.00 AM)
1.	26.01.2020	Near Weigh Bridge	56.8	41.5
2.	25.01.2020	Near Petrol Pump	54.7	41.9
3.	28.01.2020	In front of Mining Office	57.6	48.5
4.	27.01.2020	Rest Shelter	54.1	40.5
5.	26.01.2020	Khinda Village	49.3	39.2
6.	27.01.2020	Babu Khinda	48.1	38.2
7.	25.01.2020	R & R Colony	46.3	39.8
		Standard as per Noise Rule, 2000 (Industrial Area)	75.0	70.0
		Standard as per Noise Rule, 2000 (Residential Area)	55.0	45.0
Remarks:			Nil	
Any unusual feature observed during determination			Nil	

***** End of Test Report *****


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78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/01/20/WATER-2228A

Issue Date: 05.02.2020

Name and address of the Customer: M/s Raipur Energen Limited.

Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of sampling: 29.01.2020

Date of Sample Receipt: 30.01.2020

Testing Dt.: 30.01.2020

Test completion Dt: 05.02.2020

Sample Description: Ground Water Place of collection: R & R COLONY OPEN WELL (Purushotam Meher)

Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any:

KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Acceptable Limit (IS: 10500:2012)	Test Methods
1.	Colour	< 1.0	Hazen, Max	5	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	40	mg/l, max	--	APHA-22 nd Edition (2540 D)
3.	pH value	7.7	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Ground Water Level	5.31	Meter	--	--
5.	Electrical Conductivity	0.415	ms/cm	--	APHA-22 nd Edition (2510 A)
6.	Turbidity	0.7	NTU, Max	1.0	IS 3025 (Part 10):1984 RA 2006
7.	Total dissolved solids	240	mg/l, max	500	IS 3025 (Part 16):1984 RA 2006
8.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
9.	Total Kjeldal Nitrogen	1.68	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	40	mg/l, max	250	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.02	mg/l, max	0.05	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	0.22	mg/l, max	1.0	IS 3025 (Part 60):2008
13.	Iron (as Fe)	< 0.05	mg/l, max	1.0	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.05	mg/l, max	0.10	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	3.1	mg/l, max	45.0	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	33	mg/l, max	200	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity (as	108	mg/l, Max	200	IS 3025 (Part 23):1986





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	CaCO ₃				RA 2009
18.	Total hardness (as CaCO ₃)	144	mg/l, Max	200	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.042	mg/l, Max	5.0	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, Max	0.003	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, Max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.005	mg/l, Max	0.01	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.0005	mg/l, Max	0.001	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, Max	0.02	IS 3025 (Part 54):2003 RA 2009
25.	Total Pesticide	< 0.0001	mg/l, Max	0.0005	USEPA
26.	Total arsenic (as As)	< 0.001	mg/l, Max	0.01	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.02	mg/l, Max	0.05	IS 3025 (Part 52): 2003 RA 2009
Remarks: Ground water level monitor manually.					
Any unusual feature observed during determination				Nil	

End of Test Report

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78944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/01/20/WATER-2228B

Issue Date: 05.02.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of sampling: 29.01.2020

Date of Sample Receipt: 30.01.2020

Testing Dt.: 30.01.2020

Test completion Dt: 05.02.2020

Sample Description: Ground Water Place of collection: Inside Mines Office

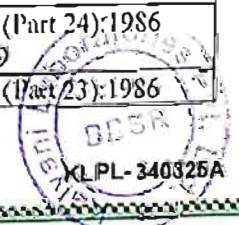
Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any:

KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Acceptable Limit (IS: 10500:2012)	Test Methods
1.	Colour	< 1.0	Hazen, Max	5	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	44	mg/l, max	--	APHA-22 nd Edition (2540 D)
3.	pH value	7.8	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Ground Water Level	5.32	Meter	--	--
5.	Electrical Conductivity	0.471	ms/cm	--	APHA-22 nd Edition (2510 A)
6.	Turbidity	0.8	NTU, Max	1.0	IS 3025 (Part 10):1984 RA 2006
7.	Total dissolved solids	252	mg/l, max	500	IS 3025 (Part 16):1984 RA 2006
8.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
9.	Total Kjeldal Nitrogen	1.68	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	40	mg/l, max	250	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.02	mg/l, max	0.05	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	0.28	mg/l, max	1.0	IS 3025 (Part 60):2008
13.	Iron (as Fe)	< 0.05	mg/l, max	1.0	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.05	mg/l, max	0.10	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	3.9	mg/l, max	45.0	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	36	mg/l, max	200	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity (as	122	mg/l, Max	200	IS 3025 (Part 23):1986



	CaCO ₃)				RA 2009
18.	Total hardness (as CaCO ₃)	160	mg/l, Max	200	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.045	mg/l, Max	5.0	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, Max	0.003	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, Max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.005	mg/l, Max	0.01	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.0005	mg/l, Max	0.001	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, Max	0.02	IS 3025 (Part 54):2003 RA 2009
25.	Total Pesticide	< 0.0001	mg/l, Max	0.0005	USEPA
26.	Total arsenic (as As)	< 0.001	mg/l, Max	0.01	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.02	mg/l, Max	0.05	IS 3025 (Part 52): 2003 RA 2009
Remarks: Ground water level monitor manually (Provision for Potable Pizzometric Monitoring).					
Any unusual feature observed during determination				Nil	

End of Test Report

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KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/01/20/WATER-2228C

Issue Date: 05.02.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of sampling: 29.01.2020

Date of Sample Receipt: 30.01.2020

Testing Dt.: 30.01.2020

Test completion Dt: 05.02.2020

Sample Description: Surface Water

Place of collection: Mines Pond Water

Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any: KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Standards as per IS-2296 class-"C"	Test Methods
1.	Colour	< 1.0	Hazen, Max	300	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	34	mg/l	--	APHA-22 nd Edition (2540 D)
3.	pH value	8.0	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Electrical Conductivity	0.412	ms/cm	--	APHA-22 nd Edition (2510 A)
5.	Turbidity	2.2	NTU, max	--	IS 3025 (Part 10):1984 RA 2006
6.	Total dissolved solids	256	mg/l, max	1500	IS 3025 (Part 16):1984 RA 2006
7.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
8.	Total Organic Carbon	< 5.0	mg/l, max	--	APHA-22 nd Eds.
9.	Total Kjeldal Nitrogen	1.68	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	26	mg/l, max	--	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.01	mg/l, max	1.5	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	< 0.05	mg/l, max	1.5	IS 3025 (Part 60):2008
13.	Iron (as Fe)	1.8	mg/l, max	50	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.1	mg/l, max	--	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	3.2	mg/l, max	50	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	32	mg/l, max	--	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity	32	mg/l, max	--	IS 3025 (Part 23):1986





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TEST REPORT

	(as CaCO ₃)				RA 2009
18.	Total hardness (as CaCO ₃)	124	mg/l, max	--	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.045	mg/l, max	15	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, max	0.01	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.01	mg/l, max	0.1	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.001	mg/l, max	--	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, max	--	IS 3025 (Part 54):2003 RA 2009
25.	Biochemical Oxygen Demand	< 1.0	mg/l, max	3.0	APHA-22 nd Edition - 2012 (5210 B)
26.	Total arsenic (as As)	< 0.001	mg/l, max	0.2	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.01	mg/l, max	--	IS 3025 (Part 52): 2003 RA 2009
28.	Dissolved Oxygen	6.5	mg/l,min	4.0	APHA-22 nd Edition (4500-O-C)
Remarks: Nil					
Any unusual feature observed during determination					Nil

***** End of Test Report *****

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TALABIRA-I COAL BLOCK, SAMBALPUR

M/s Raipur Energen Limited

ANALYSIS REPORT ON ENVIRONMENTAL MONITORING DATA GENERATED FOR THE MONTH OF MARCH- 2020

ENVIRONMENTAL MONITORING DONE BY

KALYANI LABORATORIES PVT. LTD.
LAB: PLOT NO. 78, MILLENIUM CITY,
PAHAL, BBSR-752101



This Report Contains Data On Ambient Air, Ground Water, Surface Water, Soil And Noise Monitoring
And Analysis

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SL. No.	DESCRIPTION	TEST REPORT NO.
1.	AMBIENT AIR MONITORING RESULTS	KLPL-TR/03/20/AAQM-575A- 575H
2.	NOISE LEVEL MONITORING RESULTS	KLPL-TR/03/20/NOISE-575I-575O
3.	SURFACE WATER ANALYSIS RESULTS	KLPL-TR/03/20/WATER-2553C
4.	GROUND WATER ANALYSIS RESULTS	KLPL-TR/03/20/WATER-2553A - 2553B





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TEST REPORT

Test Report No.: KLPL-TR/03/20/AAQM-575A

Issue date: 21.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 19.03.2020

Testing Dt.: 19.03.2020

Test completion Dt.: 21.03.2020

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	14-15/03/2020	R & R Colony. 3.2 Km from the mines in direction of North East	Sulphur Dioxide (SO ₂), µg/m ³	8.10	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	19.10	80	
3.			Particulate Matter (Size less than 30µm) or PM10, go/m ³	72.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	46.42	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

***** End of Test Report *****

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TEST REPORT

Test Report No.: KLPL-TR/03/20/AAQM-575B

Issue date: 21.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 19.03.2020 Testing Dt.: 19.03.2020 Test completion Dt.: 21.03.2020

Sample Description: Ambient Air Quality No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	15-16/03/2020	Weigh Bridge 0.5 Km from the mines in direction south	Sulphur Dioxide (SO ₂), $\mu\text{g}/\text{m}^3$	7.29	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), $\mu\text{g}/\text{m}^3$	18.30	80	
3.			Particulate Matter (Size less than 10 μm) or PM10, $\mu\text{g}/\text{m}^3$	55.0	100	
4.			Particulate Matter (Size less than 2.5 μm) or PM2.5, $\mu\text{g}/\text{m}^3$	35.41	60	
Remarks			Nil			
Any unusual feature observed during determination			Nil			

***** End of Test Report *****



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TEST REPORT

Test Report No.: KLPL-TR/03/20/AAQM-575C

Issue date: 21.03.2020

Name and address of the Customer: M/s Raipur Energen Limited,
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800133242, Date-27.12.2016

Date of Sample Receipt: 19.03.2020

Testing Dt.: 19.03.2020

Test completion Dt.: 21.03.2020

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	14-15/03/2020	Near the Petrol pump	Sulphur Dioxide (SO ₂), µg/m ³	5.06	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	17.38	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	53.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	36.21	60	
Remarks				Nil		
Any unusual feature observed during determination				Nil		

***** End of Test Report *****



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TEST REPORT

Test Report No.: KLPL-TR/03/20/AAQM-575D

Issue date: 21.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 19.03.2020

Testing Dt.: 19.03.2020

Test completion Dt.: 21.03.2020

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	17-18/03/2020	In front of the Mines Office	Sulphur Dioxide (SO ₂), µg/m ³	10.44	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	17.22	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	70.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	43.49	60	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

End of Test Report



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TEST REPORT

Test Report No.: KLPL-TR/03/20/AAQM-575E

Issue date: 21.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 19.03.2020

Testing Dt.: 19.03.2020

Test completion Dt.: 21.03.2020

Sample Description: Ambient Air Quality

No. of Samples: 01

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	16-17/03/2020	Rest Shelter. 1.5 Km from the mines in direction South East	Sulphur Dioxide (SO ₂), $\mu\text{g}/\text{m}^3$	8.54	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), $\mu\text{g}/\text{m}^3$	18.45	80	
3.			Particulate Matter (Size less than 10 μm) or PM10, $\mu\text{g}/\text{m}^3$	67.0	100	
4.			Particulate Matter (Size less than 2.5 μm) or PM2.5, $\mu\text{g}/\text{m}^3$	45.06	60	
5.			Lead (Pb), $\mu\text{g}/\text{m}^3$	< 0.02	01	
6.			Arsenic (As), ng/m^3	< 1.0	06	
7.			Mercury (Hg), ng/m^3	< 1.0	--	
8.			Chromium (Cr), ng/m^3	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

End of Test Report



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TEST REPORT

Test Report No.: KLPL-TR/03/20/AAQM-575F

Issue date: 21.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 19.03.2020

Testing Dt.: 19.03.2020

Test completion Dt.: 21.03.2020

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	15-16/03/2020	Khinda village. 3 Km from the mines in direction of South East	Sulphur Dioxide (SO ₂), µg/m ³	11.43	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	20.36	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	71.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	48.47	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks				Nil		
Any unusual feature observed during determination				Nil		

End of Test Report



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TEST REPORT

Test Report No.: KLPL-TR/03/20/AAQM-575G

Issue date: 21.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 19.03.2020 Testing Dt.: 19.03.2020 Test completion Dt.: 21.03.2020

Sample Description: Ambient Air Quality No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

SL No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	16-17/03/2020	Babu Khinda 3.5 Km from the mines in direction of North East	Sulphur Dioxide (SO ₂), µg/m ³	9.39	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	22.22	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	67.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	45.06	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

*****: End of Test Report *****



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TEST REPORT

Test Report No.: KLPL-TR/03/20/AAQM-575H

Issue date: 21.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.

Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 19.03.2020

Testing Dt.: 19.03.2020

Test completion Dt.: 21.03.2020

Sample Description: Ambient Air Quality

No. of Samples: 1

Sampling Point.: Downwind direction of Talabira I mines

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	Test Method
1.	17/03/2020	A1-Downwind point of Talabira-I mine area	Total VOC ($\mu\text{g}/\text{m}^3$)	< 0.001	Solvent Extraction followed by GC analysis.
2.			PAH ($\mu\text{g}/\text{m}^3$)	< 0.001	
Remarks		Nil			
Any unusual feature observed during determination				Nil	

End of Test Report



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TEST REPORT

Test Report No.: KLPL-TR/03/20/NOISE(5751 - 5750)

Issue date: 21.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: Not Applicable Testing Dt.: Not Applicable Test completion Dt.: Not Applicable

Sample Description: Noise Level No. of Samples: 07

Sample Condition: NA

Sampling Method used, if any: KLPL/SOP/ Air-06

SL NO	DATE OF MONITORING	SAMPLING LOCATION	NOISE LEVEL IN dB(A) LEQ, DAY TIME (6.00AM TO 10.00PM)	NOISE LEVEL IN dB(A) LEQ, NIGHT TIME (10.00 PM to 6.00 AM)
1.	15.03.2020	Near Weigh Bridge	59.7	44.2
2.	14.03.2020	Near Petrol Pump	57.8	43.7
3.	17.03.2020	In front of Mining Office	60.8	52.4
4.	16.03.2020	Rest Shelter	57.2	43.8
5.	15.03.2020	Khinda Village	52.5	42.1
6.	16.03.2020	Babu Khinda	51.6	41.5
7.	14.03.2020	R & R Colony	49.5	43.1
		Standard as per Noise Rule, 2000 (Industrial Area)	75.0	70.0
		Standard as per Noise Rule, 2000 (Residential Area)	55.0	45.0
Remarks:			Nil	
Any unusual feature observed during determination			Nil	

End of Test Report

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TEST REPORT

Test Report No.: KLPL-TR/03/20/WATER-2553A

Issue Date: 21.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.

Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of sampling: 18.03.2020

Date of Sample Receipt: 19.03.2020

Testing Dt.: 19.03.2020

Test completion Dt: 21.03.2020

Sample Description: Ground Water Place of collection: R & R COLONY OPEN WELL (Purushtam Meher)

Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any:

KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Acceptable Limit (IS: 10500:2012)	Test Methods
1.	Colour	< 1.0	Hazen, Max	5	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	26	mg/l, max	--	APHA-22 nd Edition (2540 D)
3.	pH value	7.4	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Ground Water Level	5.36	Meter	--	--
5.	Electrical Conductivity	0.382	ms/cm	--	APHA-22 nd Edition (2510 A)
6.	Turbidity	0.6	NTU, Max	1.0	IS 3025 (Part 10):1984 RA 2006
7.	Total dissolved solids	216	mg/l, max	500	IS 3025 (Part 16):1984 RA 2006
8.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
9.	Total Kjeldal Nitrogen	1.12	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	28	mg/l, max	250	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.02	mg/l, max	0.05	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	0.19	mg/l, max	1.0	IS 3025 (Part 60):2008
13.	Iron (as Fe)	< 0.05	mg/l, max	1.0	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.05	mg/l, max	0.10	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	2.5	mg/l, max	45.0	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	26	mg/l, max	200	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity (as	98	mg/l, Max	200	IS 3025 (Part 23):1986



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	CaCO ₃)				RA 2009
18.	Total hardness (as CaCO ₃)	132	mg/l, Max	200	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.038	mg/l, Max	5.0	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, Max	0.003	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, Max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.005	mg/l, Max	0.01	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.0005	mg/l, Max	0.001	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, Max	0.02	IS 3025 (Part 54):2003 RA 2009
25.	Total Pesticide	< 0.0001	mg/l, Max	0.0005	USEPA
26.	Total arsenic (as As)	< 0.001	mg/l, Max	0.01	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.02	mg/l, Max	0.05	IS 3025 (Part 52): 2003 RA 2009
Remarks: Ground water level monitor manually.					
Any unusual feature observed during determination				Nil	

***** End of Test Report *****

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78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/03/20/WATER-2553B

Issue Date: 21.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of sampling: 18.03.2020

Date of Sample Receipt: 19.03.2020 Testing Dt.: 19.03.2020 Test completion Dt: 21.03.2020

Sample Description: Ground Water Place of collection: Inside Mines Office

Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any:

KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Acceptable Limit (IS: 10500:2012)	Test Methods
1.	Colour	< 1.0	Hazen, Max	5	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	50	mg/l, max	--	APHA-22 nd Edition (2540 D)
3.	pH value	7.95	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Ground Water Level	5.35	Meter	--	--
5.	Electrical Conductivity	0.494	ms/cm	--	APHA-22 nd Edition (2510 A)
6.	Turbidity	0.8	NTU, Max	1.0	IS 3025 (Part 10):1984 RA 2006
7.	Total dissolved solids	268	mg/l, max	500	IS 3025 (Part 16):1984 RA 2006
8.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
9.	Total Kjeldal Nitrogen	2.24	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	42	mg/l, max	250	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.02	mg/l, max	0.05	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	0.31	mg/l, max	1.0	IS 3025 (Part 60):2008
13.	Iron (as Fe)	< 0.05	mg/l, max	1.0	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.05	mg/l, max	0.10	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	4.0	mg/l, max	45.0	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	42	mg/l, max	200	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity (as	136	mg/l, Max	200	IS 3025 (Part 23):1986



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	CaCO ₃)				RA 2009
18.	Total hardness (as CaCO ₃)	172	mg/l, Max	200	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.049	mg/l, Max	5.0	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, Max	0.003	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, Max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.005	mg/l, Max	0.01	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.0005	mg/l, Max	0.001	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, Max	0.02	IS 3025 (Part 54):2003 RA 2009
25.	Total Pesticide	< 0.0001	mg/l, Max	0.0005	USEPA
26.	Total arsenic (as As)	< 0.001	mg/l, Max	0.01	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.02	mg/l, Max	0.05	IS 3025 (Part 52): 2003 RA 2009
Remarks: Ground water level monitor manually (Provision for Potable Pizzometric Monitoring).					
Any unusual feature observed during determination				Nil	

End of Test Report



D. S. Patel
Authorized Signatory
Kalyani Laboratories Private Limited



KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/03/20/WATER-2553C

Issue Date: 23.03.2020

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of sampling: 18.03.2020

Date of Sample Receipt: 19.03.2020

Testing Dt.: 19.03.2020

Test completion Dt: 23.03.2020

Sample Description: Surface Water

Place of collection: Mines Pond Water

Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any:

KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Standards as per IS-2296 class-"C"	Test Methods
1.	Colour	< 1.0	Hazen, Max	300	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	52	mg/l	--	APHA-22 nd Edition (2540 D)
3.	pH value	8.4	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Electrical Conductivity	0.450	ms/cm	--	APHA-22 nd Edition (2510 A)
5.	Turbidity	3.0	NTU, max	--	IS 3025 (Part 10):1984 RA 2006
6.	Total dissolved solids	286	mg/l, max	1500	IS 3025 (Part 16):1984 RA 2006
7.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
8.	Total Organic Carbon	< 5.0	mg/l, max	--	APHA-22 nd Eds.
9.	Total Kjeldal Nitrogen	2.8	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	44	mg/l, max	--	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.01	mg/l, max	1.5	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	< 0.05	mg/l, max	1.5	IS 3025 (Part 60):2008
13.	Iron (as Fe)	2.2	mg/l, max	50	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.1	mg/l, max	--	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	4.2	mg/l, max	50	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	50	mg/l, max	--	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity	58	mg/l, max	--	IS 3025 (Part 23):1986



KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

	(as CaCO ₃)				RA 2009
18.	Total hardness (as CaCO ₃)	152	mg/l, max	--	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.054	mg/l, max	15	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, max	0.01	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.01	mg/l, max	0.1	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.001	mg/l, max	--	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, max	--	IS 3025 (Part 54):2003 RA 2009
25.	Biochemical Oxygen Demand	< 1.0	mg/l, max	3.0	APHA-22 nd Edition - 2012 (5210 B)
26.	Total arsenic (as As)	< 0.001	mg/l, max	0.2	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.01	mg/l, max	--	IS 3025 (Part 52): 2003 RA 2009
28.	Dissolved Oxygen	6.9	mg/l,min	4.0	APHA-22 nd Edition (4500-O-C)
Remarks: Nil					
Any unusual feature observed during determination					Nil

*****: End of Test Report *****



M. S. Meher
Authorized Signatory
Kalyani Laboratories Private Limited

TALABIRA-I COAL BLOCK, SAMBALPUR

M/s Raipur Energen Limited

ANALYSIS REPORT ON ENVIRONMENTAL MONITORING DATA GENERATED FOR THE MONTH OF NOVEMBER-2019

ENVIRONMENTAL MONITORING DONE BY

KALYANI LABORATORIES PVT. LTD.
LAB: PLOT NO. 78, MILLENIUM CITY,
PAHAL, BBSR-752101



This Report Contains Data On Ambient Air, Ground Water, Surface Water, Soil And Noise Monitoring
And Analysis

CONTENTS

SL. No.	DESCRIPTION	TEST REPORT NO.
1.	AMBIENT AIR MONITORING RESULTS	KLPL-TR/11/19/AAQM-426A-426H
2.	NOISE LEVEL MONITORING RESULTS	KLPL-TR/11/19/NOISE-426I-426O
3.	SURFACE WATER ANALYSIS RESULTS	KLPL-TR/11/19/WATER-1815C
4.	GROUND WATER ANALYSIS RESULTS	KLPL-TR/11/19/WATER-1815A-1815B





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/11/19/NOISE(4261 – 4260)

Issue date: 06.12.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda,Block-Tilda,dist-Raipur,493224,CG

Customer's reference: Service Order No.: 5700280156 DT-11.12.2019

Date of Sample Receipt: Not Applicable Testing Dt.: Not Applicable Test completion Dt.: Not Applicable

Sample Description: Noise Level No. of Samples: 07

Sample Condition: NA

Sampling Method used, if any: KLPL/SOP/ Air-06

SL. NO	DATE OF MONITORING	SAMPLING LOCATION	NOISE LEVEL IN dB(A) LEQ, DAY TIME (6.00AM TO 10.00PM)	NOISE LEVEL IN dB(A) LEQ, NIGHT TIME (10.00 PM to 6.00 AM)
1.	26.11.2019	Near Weigh Bridge	57.8	42.5
2.	25.11.2019	Near Petrol Pump	56.5	42.8
3.	28.11.2019	In front of Mining Office	59.8	50.5
4.	27.11.2019	Rest Shelter	55.8	42.2
5.	26.11.2019	Khinda Village	51.4	40.8
6.	27.11.2019	Babu Khinda	50.1	40.5
7.	25.11.2019	R & R Colony	48.1	41.6
		Standard as per Noise Rule, 2000 (Industrial Area)	75.0	70.0
		Standard as per Noise Rule, 2000 (Residential Area)	55.0	45.0
Remarks:		Nil		
Any unusual feature observed during determination		Nil		

***** End of Test Report *****

Digambar Asurika
Authorized Signatory
Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/11/19/AAQM-426H

Issue date: 06.12.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800148522 Date-08.01.2019

Date of Sample Receipt: 30.11.2019

Testing Dt.: 30.11.2019

Test completion Dt.: 06.12.2019

Sample Description: Ambient Air Quality

No. of Samples: 1

Sampling Point. : Downwind direction of Talabira 1 mines

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	Test Method
1.	20/09/2019	A1-Downwind point of Talabira-1 mine area	Total VOC ($\mu\text{g}/\text{m}^3$)	< 0.001	Solvent Extraction followed by GC analysis.
2.			PAH ($\mu\text{g}/\text{m}^3$)	< 0.001	
Remarks		Nil			
Any unusual feature observed during determination				Nil	

***** End of Test Report *****

Digambar Anand
Authorized Signatory
Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/11/19/AAQM-426G

Issue date: 06.12.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 5700280156 DT-11.12.2019

Date of Sample Receipt: 30.11.2019

Testing Dt.: 30.11.2019

Test completion Dt.: 06.12.2019

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	27-28/11/2019	Babu Khinda 3.5 Km from the mines in direction of North East	Sulphur Dioxide (SO ₂), µg/m ³	7.42	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	19.02	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	56.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	35.09	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

***** End of Test Report *****

Digambar Anil

Authorized Signatory
Kalyani Laboratories Private Limited



TEST REPORT

Test Report No.: KLPL-TR/11/19/AAQM-426A

Issue date: 06.12.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 5700280156 DT-11.12.2019

Date of Sample Receipt: 30.11.2019 **Testing Dt.:** 30.11.2019 **Test completion Dt.:** 06.12.2019

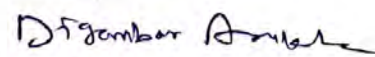
Sample Description: Ambient Air Quality **No. of Samples:** 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	25-26/11/2019	R & R Colony. 3.2 Km from the mines in direction of North East	Sulphur Dioxide (SO ₂), µg/m ³	8.19	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	15.23	80	
3.			Particulate Matter (Size less than 10µm) or PM10, go/m ³	63.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	41.49	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

***** End of Test Report *****


Authorized Signatory
Kalyani Laboratories Private Limited

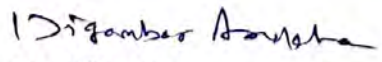


TEST REPORT

Test Report No.: KLPL-TR/11/19/AAQM-426B		
Issue date: 06.12.2019		
Name and address of the Customer: M/s Raipur Energen Limited. Raikheda, Block-Tilda, dist-Raipur, 493224, CG		
Customer's reference: Service Order No.: 4800148522 Date-08.01.2019		
Date of Sample Receipt: 30.11.2019	Testing Dt.: 30.11.2019	Test completion Dt.: 06.12.2019
Sample Description: Ambient Air Quality		No. of Samples: 1
Sample Condition: Gaseous sample absorbing solutions refrigerated		
Sampling Method used, if any: KLPL/SOP/ Air-06		

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	26-27/11/2019	Weigh Bridge 0.5 Km from the mines in direction south	Sulphur Dioxide (SO ₂), µg/m ³	6.40	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	17.28	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	46.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	29.41	60	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

***** End of Test Report *****


Authorized Signatory
Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

Kalyani Laboratories

TEST REPORT

Test Report No.: KLPL-TR/11/19/AAQM-426C

Issue date: 06.12.2019

Name and address of the Customer: M/s Raipur Energen Limited,
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 4800133242, Date-27.12.2016

Date of Sample Receipt: 30.11.2019

Testing Dt.: 30.11.2019

Test completion Dt.: 06.12.2019

Sample Description: Ambient Air Quality

No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	25-26/11/2019	Near the Petrol pump	Sulphur Dioxide (SO ₂), µg/m ³	5.10	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	16.28	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	49.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	31.26	60	
Remarks			Nil			
Any unusual feature observed during determination			Nil			

***** End of Test Report *****

Dipankar Das

Authorized Signatory
Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/11/19/AAQM-426D		
Issue date: 06.12.2019		
Name and address of the Customer: M/s Raipur Energen Limited. Raikheda, Block-Tilda, dist-Raipur, 493224, CG.		
Customer's reference: Service Order No.: 5700280156 DT-11.12.2019		
Date of Sample Receipt: 30.11.2019	Testing Dt.: 30.11.2019	Test completion Dt.: 06.12.2019
Sample Description: Ambient Air Quality		No. of Samples: 1
Sample Condition: Gaseous sample absorbing solutions refrigerated		
Sampling Method used, if any: KLPL/SOP/ Air-06		

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	28-29/11/2019	In front of the Mines Office	Sulphur Dioxide (SO ₂), µg/m ³	0.32	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	10.34	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	66.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	44.26	60	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

***** End of Test Report *****

Digambar Boudha
 Authorized Signatory
 Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/11/19/AAQM-426E

Issue date: 06.12.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 5700280156 DT-11.12.2019

Date of Sample Receipt: 30.11.2019

Testing Dt.: 30.11.2019

Test completion Dt.: 06.12.2019

Sample Description: Ambient Air Quality

No. of Samples: 01

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	27-28/11/2019	Rest Shelter. 1.5 Km from the mines in direction South East	Sulphur Dioxide (SO ₂), µg/m ³	7.16	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	11.17	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	53.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	35.41	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

End of Test Report

Digambar Anur

Authorized Signatory
Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

Kalyani Laboratories

TEST REPORT

Test Report No.: KLPL-TR/11/19/AAQM-426F

Issue date: 06.12.2019

Name and address of the Customer: M/s Raipur Energen Limited,
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 5700280156 DT-11.12.2019

Date of Sample Receipt: 30.11.2019 Testing Dt.: 30.11.2019 Test completion Dt.: 06.12.2019

Sample Description: Ambient Air Quality No. of Samples: 1

Sample Condition: Gaseous sample absorbing solutions refrigerated

Sampling Method used, if any: KLPL/SOP/ Air-06

Sl. No	Date of Sampling	Sampling Location	Parameters	Observed Value	NAAQS, 2009	Test Method
1.	26-27/11/2019	Khinda village. 3 Km from the mines in direction of South East	Sulphur Dioxide (SO ₂), µg/m ³	10.25	80	Guidelines for the Measurement of Ambient Air Pollutants Volume-I & II, CPCB
2.			Nitrogen Dioxide (NO ₂), µg/m ³	17.19	80	
3.			Particulate Matter (Size less than 10µm) or PM10, µg/m ³	58.0	100	
4.			Particulate Matter (Size less than 2.5µm) or PM2.5, µg/m ³	39.48	60	
5.			Lead (Pb), µg/m ³	< 0.02	01	
6.			Arsenic (As), ng/m ³	< 1.0	06	
7.			Mercury (Hg), ng/m ³	< 1.0	--	
8.			Chromium (Cr), ng/m ³	< 1.0	--	
Remarks		Nil				
Any unusual feature observed during determination				Nil		

***** End of Test Report *****

Digambar Boudha
Authorized Signatory
Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78°44, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/11/19/WATER-1815A

Issue Date: 06.12.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 5700280156 DT-11.12.2019

Date of sampling: 24.11.2019

Date of Sample Receipt: 29.11.2019

Testing Dt.: 29.11.2019

Test completion Dt: 06.12.2019

Sample Description: Ground Water Place of collection: R & R COLONY OPEN WELL (Purushotam Meher)

Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any:

KLPL/SOP/Chem-28

Sl No	Parameters	Results	Units	Acceptable Limit (IS: 10500:2012)	Test Methods
1.	Colour	< 1.0	Hazen, Max	5	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	42	mg/l, max	--	APHA-22 nd Edition (2540 D)
3.	pH value	7.7	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Ground Water Level	5.24	Meter	--	--
5.	Electrical Conductivity	0.396	ms/cm	--	APHA-22 nd Edition (2510 A)
6.	Turbidity	0.7	NTU, Max	1.0	IS 3025 (Part 10):1984 RA 2006
7.	Total dissolved solids	224	mg/l, max	500	IS 3025 (Part 16):1984 RA 2006
8.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
9.	Total Kjeldal Nitrogen	1.68	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	32	mg/l, max	250	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.02	mg/l, max	0.05	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	0.21	mg/l, max	1.0	IS 3025 (Part 60):2008
13.	Iron (as Fe)	< 0.05	mg/l, max	1.0	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.05	mg/l, max	0.10	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	3.4	mg/l, max	45.0	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	32	mg/l, max	200	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity (as	102	mg/l, Max	200	IS 3025 (Part 23):1986



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78944, PAHAL, BHUBANESWAR-752101, ODISHA

	CaCO ₃)				RA 2009
18.	Total hardness (as CaCO ₃)	132	mg/l, Max	200	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.04	mg/l, Max	5.0	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, Max	0.003	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, Max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.005	mg/l, Max	0.01	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.0005	mg/l, Max	0.001	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, Max	0.02	IS 3025 (Part 54):2003 RA 2009
25.	Total Pesticide	< 0.0001	mg/l, Max	0.0005	USEPA
26.	Total arsenic (as As)	< 0.001	mg/l, Max	0.01	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.02	mg/l, Max	0.05	IS 3025 (Part 52): 2003 RA 2009
Remarks: Ground water level monitor manually.					
Any unusual feature observed during determination				Nil	

***** End of Test Report *****

D. Sankar Doulate
 Authorized Signatory
 Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/11/19/WATER-1815B

Issue Date: 06.12.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG.

Customer's reference: Service Order No.: 5700280156 DT-11.12.2019

Date of sampling: 24.11.2019

Date of Sample Receipt: 29.11.2019

Testing Dt.: 29.11.2019

Test completion Dt: 06.12.2019

Sample Description: Ground Water

Place of collection: Inside Mines Office

Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any:

KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Acceptable Limit (IS: 10500:2012)	Test Methods
1.	Colour	< 1.0	Hazen, Max	5	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	48	mg/l, max	--	APHA-22 nd Edition (2540 D)
3.	pH value	7.9	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Ground Water Level	5.26	Meter	--	--
5.	Electrical Conductivity	0.470	ms/cm	--	APHA-22 nd Edition (2510 A)
6.	Turbidity	0.8	NTU, Max	1.0	IS 3025 (Part 10):1984 RA 2006
7.	Total dissolved solids	244	mg/l, max	500	IS 3025 (Part 16):1984 RA 2006
8.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
9.	Total Kjeldal Nitrogen	1.16	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	40	mg/l, max	250	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.02	mg/l, max	0.05	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	0.26	mg/l, max	1.0	IS 3025 (Part 60):2008
13.	Iron (as Fe)	< 0.05	mg/l, max	1.0	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.05	mg/l, max	0.10	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	3.6	mg/l, max	45.0	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	36	mg/l, max	200	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity (as	116	mg/l, Max	200	IS 3025 (Part 23):1986





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	CaCO ₃				RA 2009
18.	Total hardness (as CaCO ₃)	148	mg/l, Max	200	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.044	mg/l, Max	5.0	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, Max	0.003	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, Max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.005	mg/l, Max	0.01	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.0005	mg/l, Max	0.001	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, Max	0.02	IS 3025 (Part 54):2003 RA 2009
25.	Total Pesticide	< 0.0001	mg/l, Max	0.0005	USEPA
26.	Total arsenic (as As)	< 0.001	mg/l, Max	0.01	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.02	mg/l, Max	0.05	IS 3025 (Part 52): 2003 RA 2009
Remarks: Ground water level monitor manually (Provision for Potable Pizzometric Monitoring).					
Any unusual feature observed during determination				Nil	

***** End of Test Report *****

Digambar Anandh
 Authorized Signatory
 Kalyani Laboratories Private Limited





KALYANI LABORATORIES PVT. LTD.

78/944, PAHAL, BHUBANESWAR-752101, ODISHA

TEST REPORT

Test Report No.: KLPL-TR/11/19/S-1815C

Issue Date: 06.12.2019

Name and address of the Customer: M/s Raipur Energen Limited.
Raikheda, Block-Tilda, dist-Raipur, 493224, CG

Customer's reference: Service Order No.: 5700280156 DT-11.12.2019

Date of sampling: 23.11.2019

Date of Sample Receipt: 29.11.2019

Testing Dt.: 29.11.2019

Test completion Dt: 06.12.2019

Sample Description: Surface Water Place of collection: Mines Pond Water

Sample Condition: Sealed plastic and sterilized glass Bottle

No. of Samples: 01

Sampling Method used, if any: KLPL/SOP/Chem-28

Sl. No	Parameters	Results	Units	Standards as per IS-2296 class-"C"	Test Methods
1.	Colour	< 1.0	Hazen, Max	300	IS 3025 (Part 4):1983 RA 2012
2.	Total Suspended Solid	42	mg/l	--	APHA-22 nd Edition (2540 D)
3.	pH value	8.3	--	6.5-8.5	IS 3025 (Part 11):1983 RA 2012
4.	Electrical Conductivity	0.435	ms/cm	--	APHA-22 nd Edition (2510 A)
5.	Turbidity	2.7	NTU, max	--	IS 3025 (Part 10):1984 RA 2006
6.	Total dissolved solids	260	mg/l, max	1500	IS 3025 (Part 16):1984 RA 2006
7.	Chemical Oxygen Demand	< 5.0	mg/l, max	--	APHA-22 nd Edition (5220 B)
8.	Total Organic Carbon	< 5.0	mg/l, max	--	APHA-22 nd Eds.
9.	Total Kjeldal Nitrogen	1.68	mg/l, max	--	APHA-22 nd Edition (4500-N _{org} -B)
10.	Chloride (as Cl)	36	mg/l, max	--	IS 3025 (Part 32):1988 RA 2009
11.	Copper (as Cu)	< 0.01	mg/l, max	1.5	IS 3025 (Part 42):1992 RA 2009
12.	Fluoride (as F)	< 0.05	mg/l, max	1.5	IS 3025 (Part 60):2008
13.	Iron (as Fe)	1.98	mg/l, max	50	IS 3025 (Part 53):2003 RA 2009
14.	Manganese (as Mn)	< 0.1	mg/l, max	--	IS 3025 (Part 59):2006 RA 2012
15.	Nitrate (as NO ₃)	3.7	mg/l, max	50	IS 3025 (Part 34):1988 RA 2009
16.	Sulphate (as SO ₄)	44	mg/l, max	--	IS 3025 (Part 24):1986 RA 2009
17.	Total alkalinity	48	mg/l, max	--	IS 3025 (Part 23):1986





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TEST REPORT

	(as CaCO ₃)				RA 2009
18.	Total hardness (as CaCO ₃)	140	mg/l, max	--	IS 3025 (Part 21):2009
19.	Zinc (as Zn)	0.049	mg/l, max	15	IS 3025 (Part 49):1994 RA 2009
TOXIC SUBSTANCES					
20.	Cadmium (as Cd)	< 0.001	mg/l, max	0.01	IS 3025 (Part 41):1992 RA 2009
21.	Cyanide (as CN)	< 0.01	mg/l, max	0.05	IS 3025 (Part 27):1986 RA 2009
22.	Lead (as Pb)	< 0.01	mg/l, max	0.1	IS 3025 (Part 47):1994 RA 2009
23.	Mercury (as Hg)	< 0.001	mg/l, max	--	IS 3025 (Part 48):1994 RA 2009
24.	Nickel (as Ni)	< 0.01	mg/l, max	--	IS 3025 (Part 54):2003 RA 2009
25.	Biochemical Oxygen Demand	< 1.0	mg/l, max	3.0	APHA-22 nd Edition - 2012 (5210 B)
26.	Total arsenic (as As)	< 0.001	mg/l, max	0.2	IS 3025 (Part 37): 1988 RA 2009
27.	Total chromium (as Cr)	< 0.01	mg/l, max	--	IS 3025 (Part 52): 2003 RA 2009
28.	Dissolved Oxygen	6.9	mg/l,min	4.0	APHA-22 nd Edition (4500-O-C)
Remarks: Nil					
Any unusual feature observed during determination					Nil

***** End of Test Report *****

Digambar Adhikari

**Authorized Signatory
Kalyani Laboratories Private Limited**



ANNEXURE - 2
Land Use Analysis Report

Study Report on
“Preparation of Temporal change detection & Land-use/Land-cover Mapping of Talabira-I Coal Mine based on High-Resolution Satellite Data for the year 2015 & 2018.”

Submitted

to

Raipur Energen Limited
Village- Raikheda, Block – Tilda
District- Raipur

Submitted by

IORA Ecological Solutions Pvt. Ltd.
635 – 636, GF, Lane No. 3, Westend Marg,
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1.0 Introduction

The IB valley coal mines are surrounding the Hirakund Reservoir is India's mini capital of energy comprises of one of the most important new coalmines both in terms of reserves and in terms of productions. The small-scale pocket mining activities have generated a high environmental impact not only on the LULC but also on entire ecosystems of this region.

The mining activities resulted in the rapid increase of human population, which leads to changes in LULC, displacement of the native population, deforestation and conversion of natural forest ecosystems into grassland and marginal croplands. This drastically disturbed system is highly prone to land and water contamination.

The LULC of the area of interest is created using LISS 4 MX images of 5.8-meter resolution for the year 2015 and year 2018. Change in land use/land cover is mapped and is depicted as change map in Annexure I of this report.

The Talabira-I coalmine and its surrounding area is the area of interest for the current study to assess the LULC and its changes due the Year 2015 and 2018 using Geospatial technology.

1.1 Objectives

The objective of this assignment is the following:

- ❖ To prepare a LULC and change maps from satellite images of two different dates using geospatial technology:
- ❖ Change detection analysis of Spatio-Temporal sequential changes in land-use patterns aligns in 10km buffer from Talabira-I Coalmine area.

1.2 Profile of the study area

The Talabira block Coalmine is located in the southern part of the in IB valley coalmines in between Jharsuguda and Sambalpur Tehsil in Sambalpur district of Odisha. The Talabira coal Mine is confined to an area bounded by latitude $21^{\circ} 42' 58''$ N to $21^{\circ} 44' 37''$ N and longitudes $83^{\circ} 58' 51''$ E to $84^{\circ} 00' 39''$ E. As per reports the Geological block area of the Talabira-I mine is around 260 Ha while the mining lease area is nearly 170.30 Ha. The location map of Talabira-I Coalmine is shown in Figure 1.

The area is well connected through roads and railways to important business centres in Odisha like Rourkela, Jharsuguda, Sundargarh and Bhubaneswar. The physiography of the IB valley has an undulating landscape with a minimum elevation of 200 to 350 m above the mean sea level.

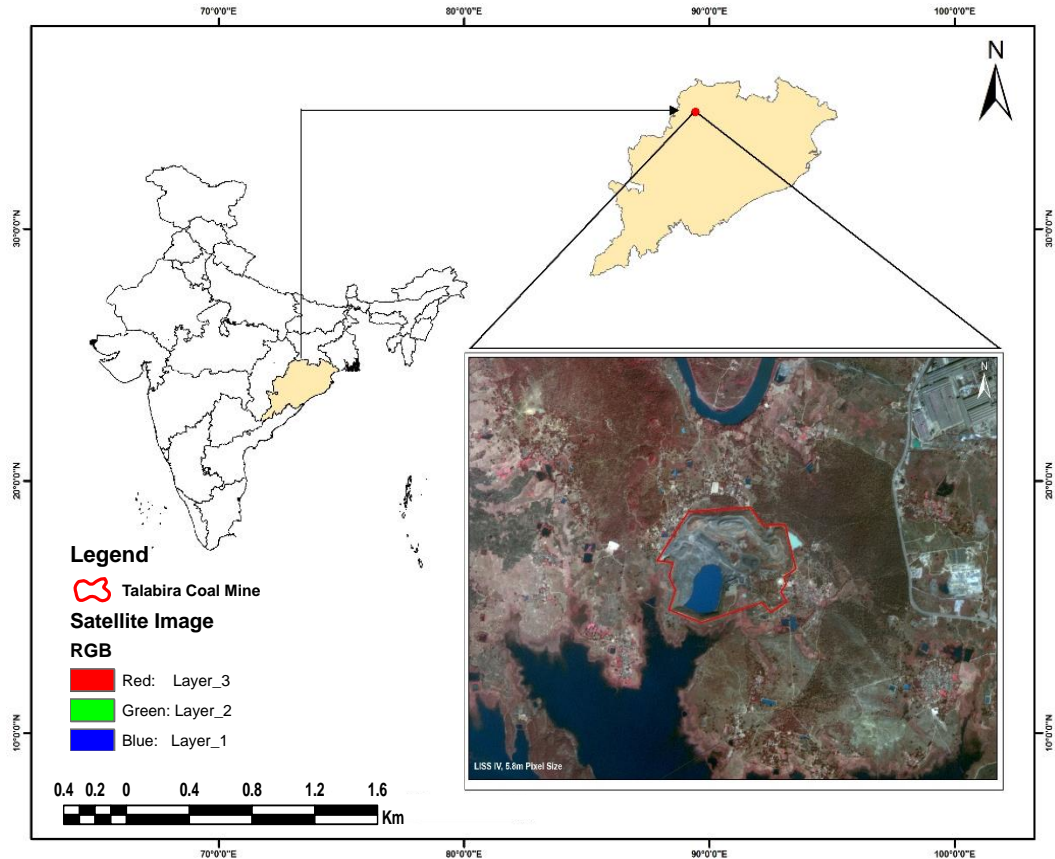


Figure 1. Location of Talabira-I Coal mine

2.0 Methodology

The LISS IV-MX data from Resourcesat-2 satellite image of the years of 2015 (13 March 2015) and 2018 (1 Feb 2018) temporal data were obtained from NRSC Hyderabad. Both the images are pre-processed, ortho-rectified (geometrically corrected) and resampled in UTM projection with WGS-84 datum and WGS-84 spheroid. The study area was obtained by sub-setting the required area of 10 Km buffer from Talabira-I coal mine. Both the images were classified using the unsupervised classification method with k-mean and ISODATA cluster suitable algorithm in ERDAS Imagine v2015. The image classification accuracies have been performed on visual satellite images interpretation of object identification. Finally, the changes in various LULC classes are obtained by post-processing classification using image differencing method.

2.1 Data used specification

The detail specification of the LISS IV MX satellite data used in the current study the given table 1.

Table 1 Main features of satellite data used

Year	Satellite	Sensor	Spectral Bands (μ m)	Radiometric Resolution	Spatial Resolution	Date of Acquisition
2015	Resourcesat-2	LISS IV-MX	B2- Green (0.52- 0.59) B3 = Red (0.62- 0.68) B4 = NIR (0.77- 0.86)	10 Bit	5.8 m	13-Mar-15
2018	Resourcesat-2	LISS IV-MX	B2- Green (0.52- 0.59) B3 = Red (0.62- 0.68) B4 = NIR (0.77- 0.86)	10 Bit	5.8 m	01-Feb-18

2.2 Data pre-processing

The adopted satellite image scenes had been normalised to each other by taking some necessary digital image enhancement and interpretation techniques of the raw images. The radiometric correction, like contrast stretching and histogram equalisation, was performed for each pixel value. The brightness value based on neighbouring pixels were applied on image data using ERDAS Imagine software.

2.3 Image classification methods

The unsupervised classification techniques have been adopted for LULC by capturing the information of each class based on the spectral information of the image. The entire work process is shown in figure 2. The K-mean and ISODATA algorithms were selected for clustering classified groups for the outcome classification, further refinements by splitting and merging of clusters by certain groups thresholds using cluster busting of mixed group of classes. The image interpretation, label and colour coding for define classes are done. The statistically

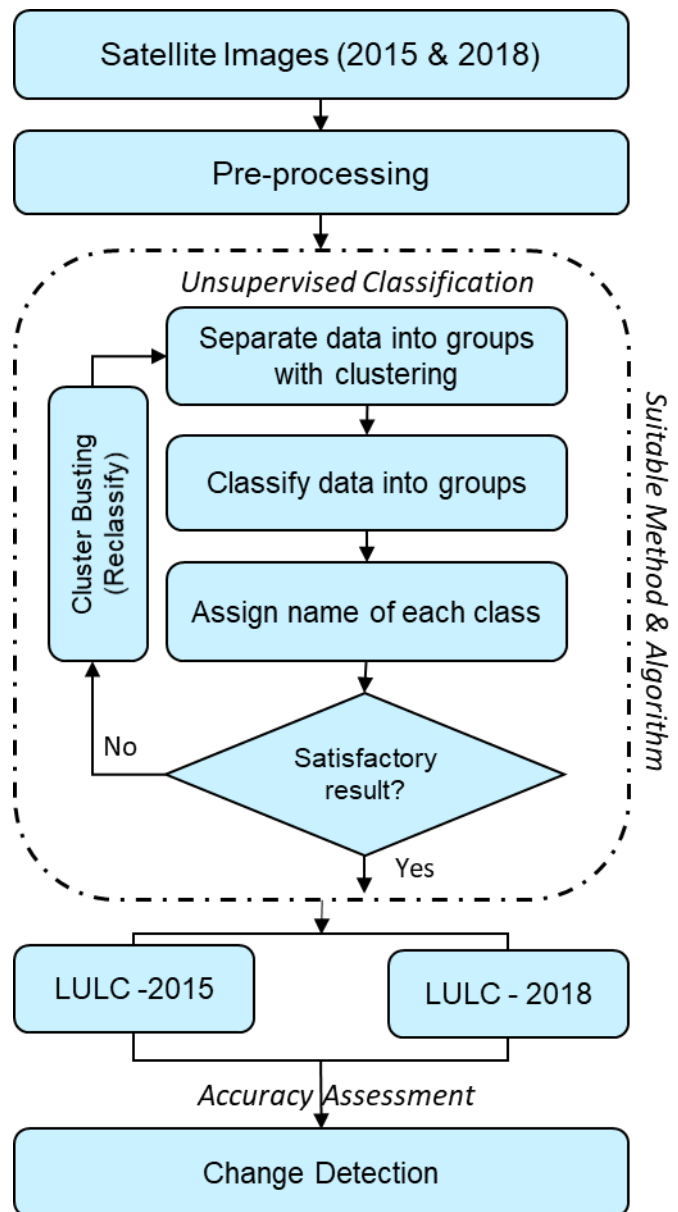


Figure 2. Work flow of adopted Methodology

computed random reference points are used for validating accuracies assessment through the classified outputs.

2.4 Land-use/ Land-cover classification scheme

The define land-use and land-cover classes (Table 2) were mapped for the Talabira-I coal mine area: The description of Forest, Barren land, Scrubland, Settlement, Mining area, Agriculture, Water bodies and transport layers are shown in Table 2. The classification scheme created by NRSC is used for this classification. The following in scheme has to be adopted for this study area.

Table 2. Land-use and land-cover classification scheme

Land Use Type	Description
Forest land	Open Forest and Plantation
Mining area	Coal Piles and Coal Gangue Piles
Barren land	Wasteland and Permanent Fellow Land
Scrubland	Grassland, Small Trees and Shrubs
Settlement	Residential, Commercial and Services, Industrial and Transportation
Agriculture land	Croplands and Crop Fields and Fellow Land
Water bodies	River, Lakes, Ponds, and Wetland areas
Road & Transport network	NH, SH, DR, ODR, Tracks and Railway Lines

3.0 Land-use/ land-cover classification

3.1 Unsupervised Classification

After the preparation of the classification scheme, the unsupervised classification technique was applied for preparation of land use/land cover maps of the study area. Through the satellite images, the independent reference points were created to check the classification accuracies and errors for each classified classes. The lower accuracy classes were also refined through re-classification (cluster busting) technique to improve the maximum accuracy of the classification results. The unsupervised classification techniques are more objective, automated and accurate in comparison of other conventional classification methods. The classified images for the year 2015 and 2018 are enclosed in Annexure I.

3.2 Accuracy assessment

The Assessment of images classification accuracy of the year 2015 and 2018 was carried out to determine the quality of the land use/land cover derived from the above images. The random points were generated from the satellite images to extract the object base signature information. The accuracy assessment was carried out using 91 points based on the visual interpretation of the referenced satellite images. The comparison of the referenced pointed was done with the classification results and performed a statistical analysis of the information for correctness using the error matrices.

The accuracy assessment error matrices and reports of the study area are shown in table number 3, 4, 5 and 6 below. The accuracy assessment is computed from classification results of 2015 and 2018 images.

Table 3. Accuracy Assessment Error Matrix of 2015 classified image

Reference Data								
Classified Data	Water bodies	Open Forest	Scrub land	Crop land	Built-up	Barren Land	Mining	Classified Total
Water bodies	17	0	0	0	0	0	0	17
Open Forest	0	12	1	2	0	0	0	15
Scrub land	0	0	9	0	1	0	0	10
Crop land	0	0	0	15	0	0	0	15
Built-up	0	0	0	0	9	0	0	9
Barren land	0	0	0	2	0	8	0	10
Mining	0	0	0	0	0	0	15	15
Reference Total	17	12	10	19	10	8	15	91

Table 4. Producer's and User's Accuracy assessment of 2015 classified image

Class Name	Reference Total	Classified Total	Number Correct	Producers Accuracy	Users Accuracy
Waterbodies	17	17	17	100.00%	100.00%
Open Forest	12	15	12	100.00%	80.00%
Scrubland	10	10	9	90.00%	90.00%
Cropland	19	15	15	78.95%	100.00%
Built-up	10	9	9	90.00%	100.00%
Barren Land	8	10	8	100.00%	80.00%
Mining	15	15	15	100.00%	100.00%
Total	91	91	85		
Overall Classification Accuracy = 93.41%					

Table 5. Accuracy Assessment Error Matrix of 2018 classified image

Reference Data								
Classified Data	Water bodies	Open Forest	Scrub land	Crop land	Built-up	Barren land	Mining	Classified Total
Waterbodies	17	0	0	0	0	0	0	17
Open Forest	0	15	0	0	0	0	0	15
Scrubland	0	0	8	1	0	1	0	10
Cropland	0	0	0	14	0	1	0	15
Built-up	0	0	0	0	9	0	0	9

Barren Land	0	0	1	0	0	8	1	10
Mining	0	0	0	0	0	0	15	15
Reference Total	17	15	9	15	9	10	16	91

Table 6. Producer's and User's Accuracy assessment of 2015 classified image

Class Name	Reference Total	Classified Total	Number Correct	Producers Accuracy	Users Accuracy
Waterbodies	17	17	17	100.00%	100.00%
Open Forest	15	15	15	100.00%	100.00%
Scrub Land	10	9	8	90.00%	93.33%
Cropland	15	14	14	93.33%	93.33%
Built-up	9	9	9	100.00%	100.00%
Barren Land	10	10	8	100.00%	80.00%
Mining	15	14	15	93.33%	93.33%
Total	91	88	86		
Overall Classification Accuracy = 94.06%					

4.0 Result and Discussion

4.1 Spatio-temporal LULC change assessment

The change detection analysis of map was computed in the ERDAS imaging and ArcGIS software using raster and spatial analyst tool. The classified images are characterising the differences between a pair of initial classified image (2015) and final classified images (2018). The differences between the land use and land cover class's results generated by subtracting of initial results 2015 LU/LC image from the final 2018 LU/LC image. The differencing image techniques were adopted for the assessment of change detection analysis.

The cross-matrix was computed for the assessment of change in the study area, to determine the quantum of conversions from a particular land cover class to other land cover class and their corresponding area over the evaluated period.

LU/LC class wise cross-matrix analysis results are shown in Table 7 below. As per this analysis, a thematic layer map was generated to depict the results of change detection refer to Annexure-II. The change map generated from the various classes containing the differences and combinations of "from-to" change classes.

Table 7. Cross-matrix of LULC change in 2015 and 2018 (area in km²)

2015 (Area in Km2)	LULC Class	2018 (Area in Km2)							
		Waterbodies	Open Forest	Scrub land	Crop land	Built-up	Barren Land	Mining	Total
	Waterbodies	33.93	0.29	0.83	0.09	0.07	0.50	0.02	35.73
	Open Forest	0.74	49.30	10.16	13.24	0.63	6.31	0.01	80.38
	Scrubland	12.65	6.02	23.64	9.33	1.32	11.58	0.18	64.70
	Cropland	1.25	6.09	7.09	66.70	1.81	21.66	0.01	104.62
	Built-up	0.06	0.29	1.14	1.99	5.60	2.86	0.01	11.95
	Barren Land	5.85	6.32	12.65	7.54	5.10	34.42	0.26	72.14
	Mining	0.17	0.00	0.15	0.01	0.00	0.23	1.08	1.65
	Total	54.64	68.32	55.66	98.90	14.52	77.57	1.55	371.17

Note: The change cross-matrix values shown in bold numbers indicate no change in land cover categories produced by given temporal results.

4.2 LU/LC patterns for 2015-2018

In the Spatio-temporal change assessment of the land use and land cover patterns for March 2015 and Feb 2018, significant changes were observed in water bodies, scrubland, open forest and cropland. The LU/LC change cross-matrix shows following major changes in land use pattern:

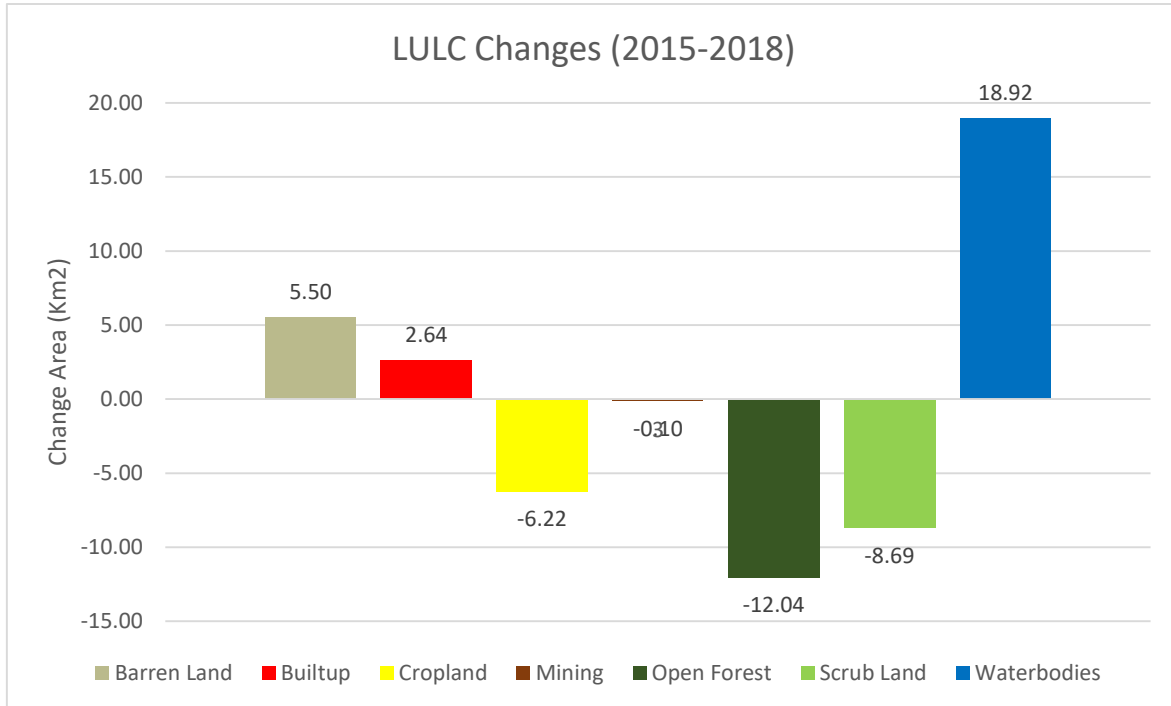
- Land-use change from cropland to barren land is 21.66 Sq. Km.,
- Land-use change from open forest to cropland is 13.24 Sq. Km.
- Land-use change from barren land to scrubland is 12.65 Sq. Km.
- Land-use change form scrubland to water bodies is 12.65 Sq. Km.
- Land-use change form scrubland to barren land is 11.58 Sq. Km.
- Land-use change form open forest to scrubland is 10.16 Sq. Km.
- Land-use change form scrubland to cropland is 9.33 Sq. Km.
- Land-use change form barren land to cropland is 7.54 Sq. Km
- Land-use change form cropland to scrubland is 7.09 Sq. Km.
- Land-use change form cropland to open forest is 6.09 Sq. Km
- Land-use change form scrubland to open forest is 6.02 Sq. Km
- Land-use change form barren land to open forest is 6.32 Sq. Km
- Land-use change form barren land to water bodies is 5.85 Sq. Km

Table 8 and Graph represent the total increase and decrease of major land use and land cover class of the study area from 2015 to 2018.

Table 8. Overview of changes in LU/LC Class wise (in Km²)

LU/LC Class	Area 2015	Area 2018	Net change in 2018 - 2015
Barren Land	72.17	77.67	5.50
Built-up	11.84	14.48	2.64
Cropland	105.22	99.00	-6.22

Mining	1.66	1.56	-0.10
Open Forest	80.30	68.26	-12.04
Scrub Land	64.29	55.59	-8.69
Waterbodies	35.72	54.64	18.92



As per the overall analysis the open forest, scrubland and cropland are significantly decreased between the year 2015 and year 2018. It is also observed that there are significant increase in waterbodies, barren land and built up area.

The outcomes of temporal LU/LC and LU/LC change maps of the study area has been composed through cartographic manner. The map composition of the entire area is done in two different scales namely at 1:25,000 for the entire area of interest and the leasehold area of Talabira –I coal mine on the scale of 1:5000. The maps are composed for printing at A3 paper.

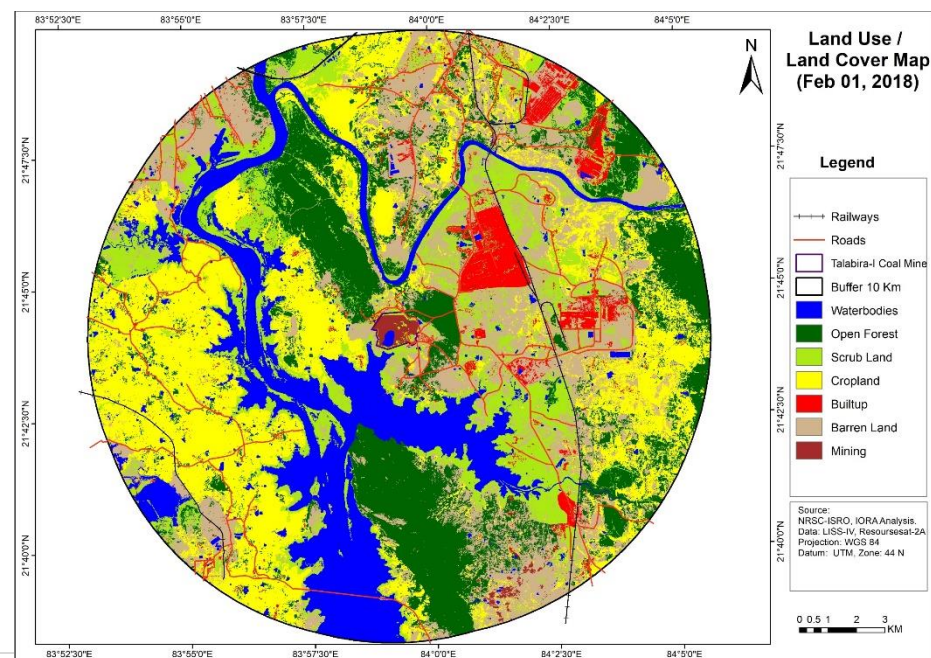
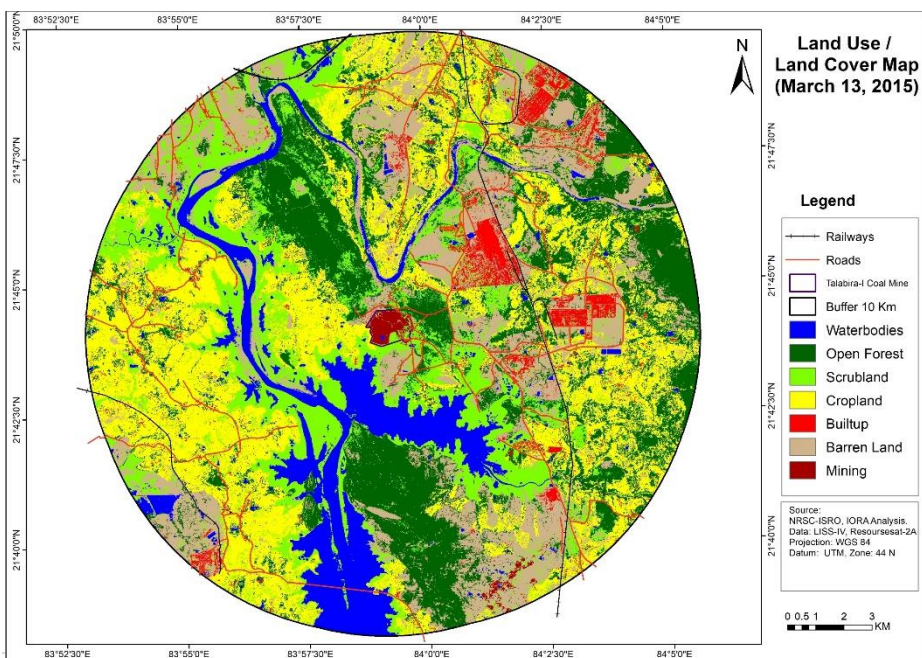
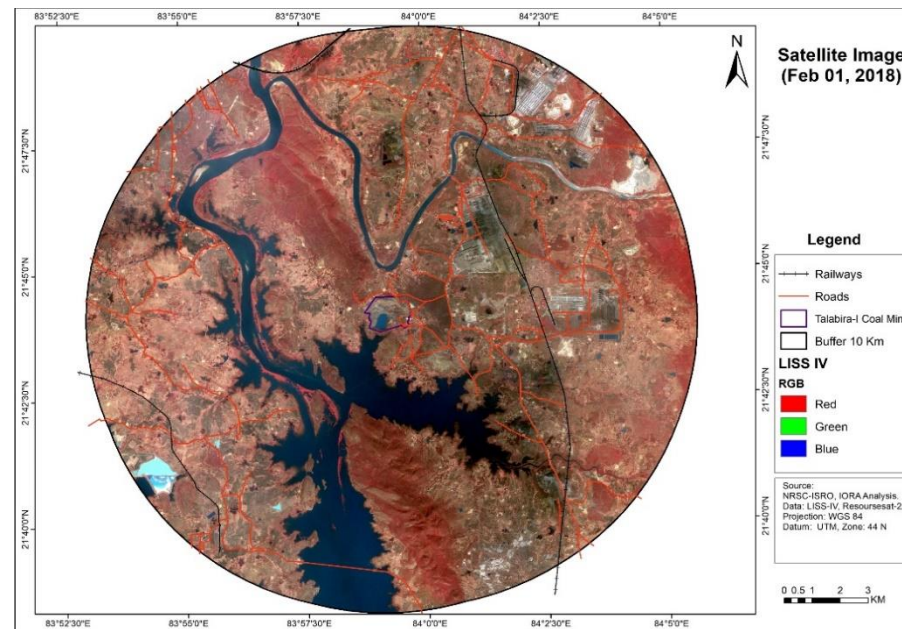
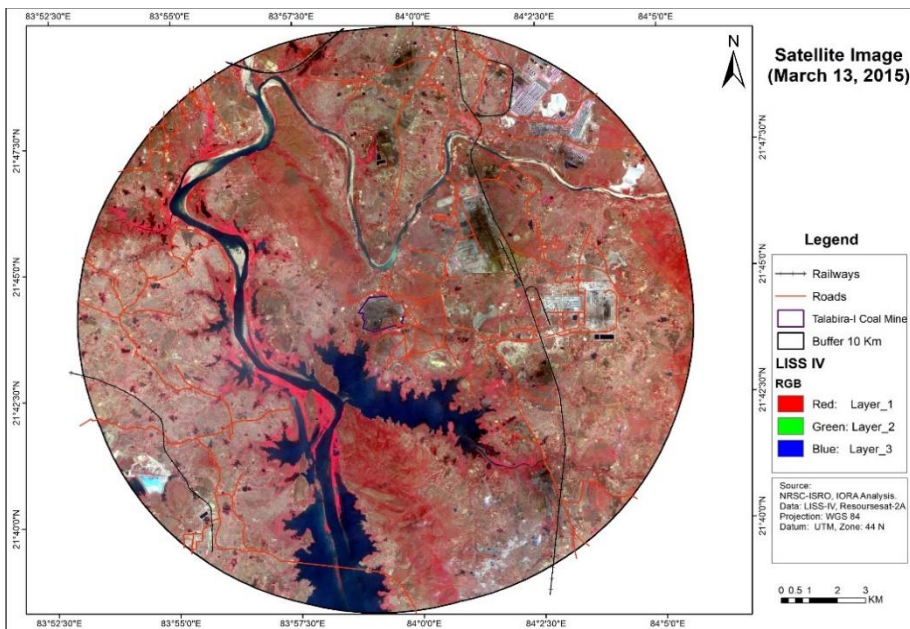
5.0 Conclusion

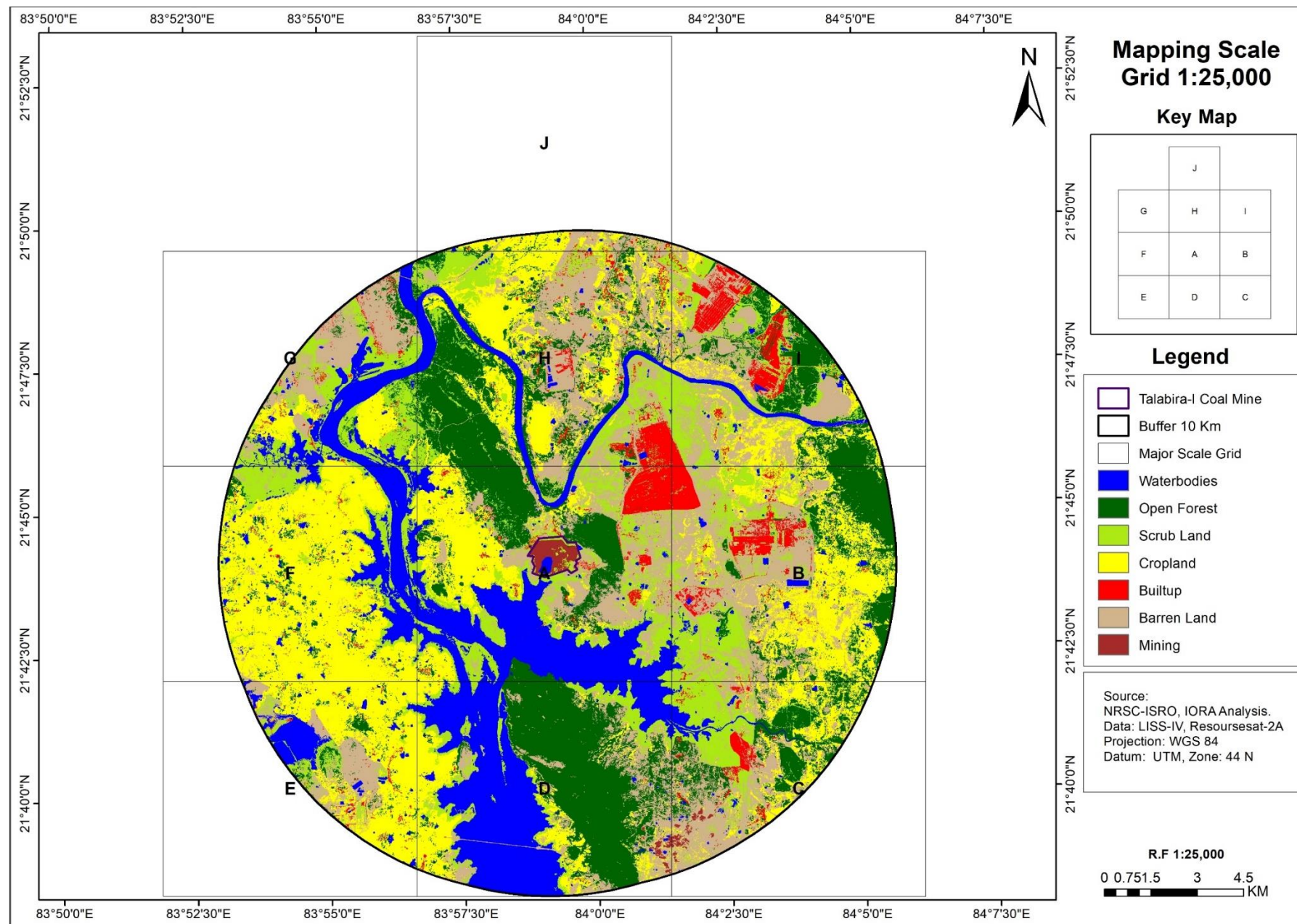
This high-resolution satellite image-based interpretation and analysis is undertaken to observe the changes in LU/LC pattern in the area of interest which is derived by putting a 10 Km buffer around the Talabira – I Coal mine area. LISS –IV high-resolution (5.8 m spatial resolution) Resourcesat-2A satellite data from 2015 and 2018 are used for interpretation and analysis. Following are the conclusion of this study:

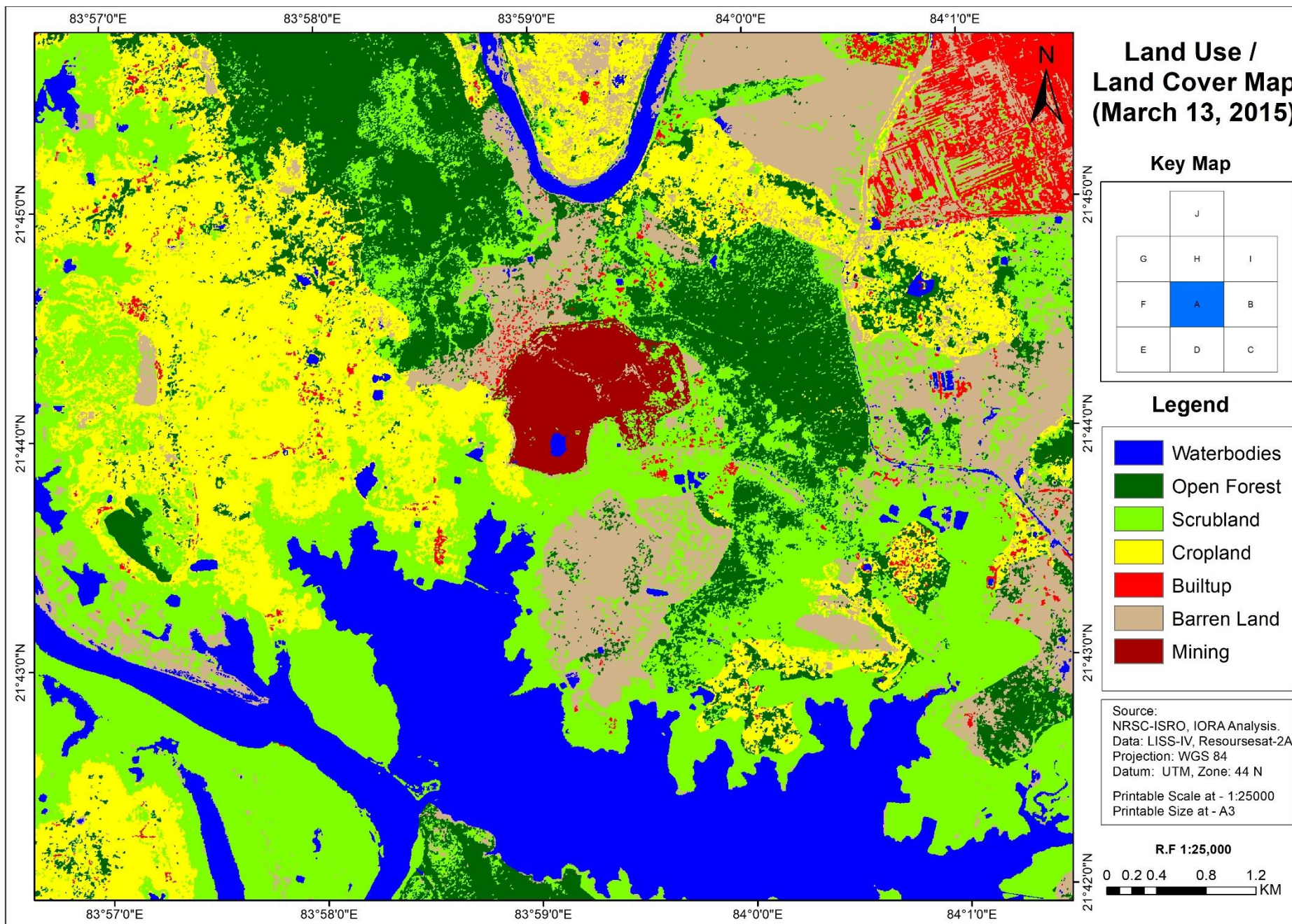
- It is observed that the barren land is increasing by 5.50 Sq. Km between 2015 to 2018; this increase is due to the conversion of cropland, open forest land and scrubland.

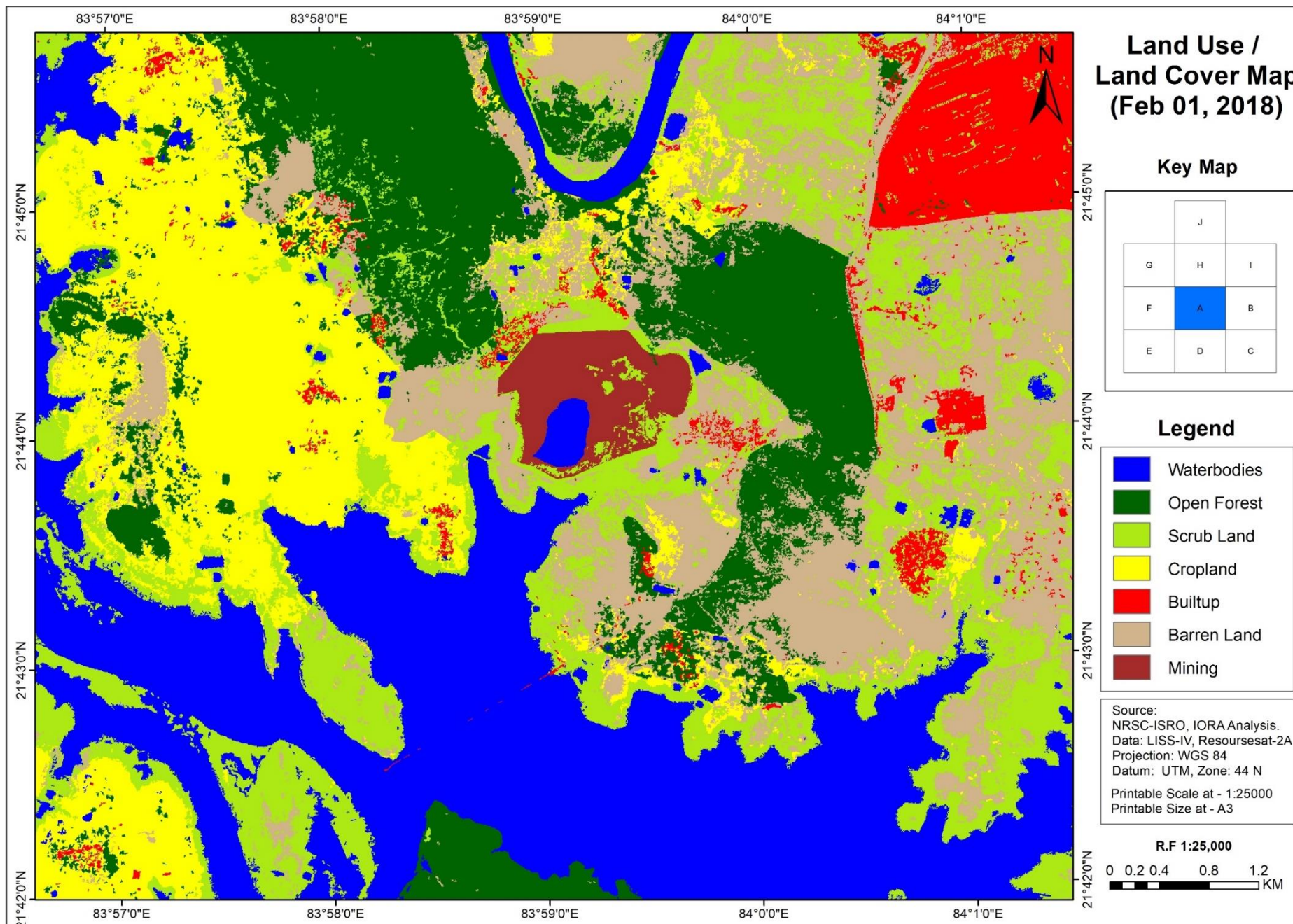
- It is observed that the water bodies are increased by 18.92 Sq. Km between 2015 to 2018; this increase is mainly due to submergence of scrubland around reserves and open forest.
- It is observed that the built-up area is increasing by 2.64 Sq. Km between 2015 to 2018; this increase is due to commercial activities and capturing scrubland for construction purposes.
- It is observed that in the mining area the water (SUMP) is increased. This may be due to no mining activities in the area in late 2017.
- It is observed that the open forest area is decreased by 12.04 Sq. Km between 2015 to 2018; this may be associated with the conversion of commercial use of the open forest and plantation.
- It is observed that cropland is decreased by 6.22 Sq. Km between 2015 to 2018; the reduction in the area of cropland is majorly due to conversion of cropland to permanent fellow land.
- It is observed that scrubland is decreased by 8.69 Sq. Km between 2015 to 2018; the reduction in the area of scrubland is majorly due to increase in water bodies and build up area.

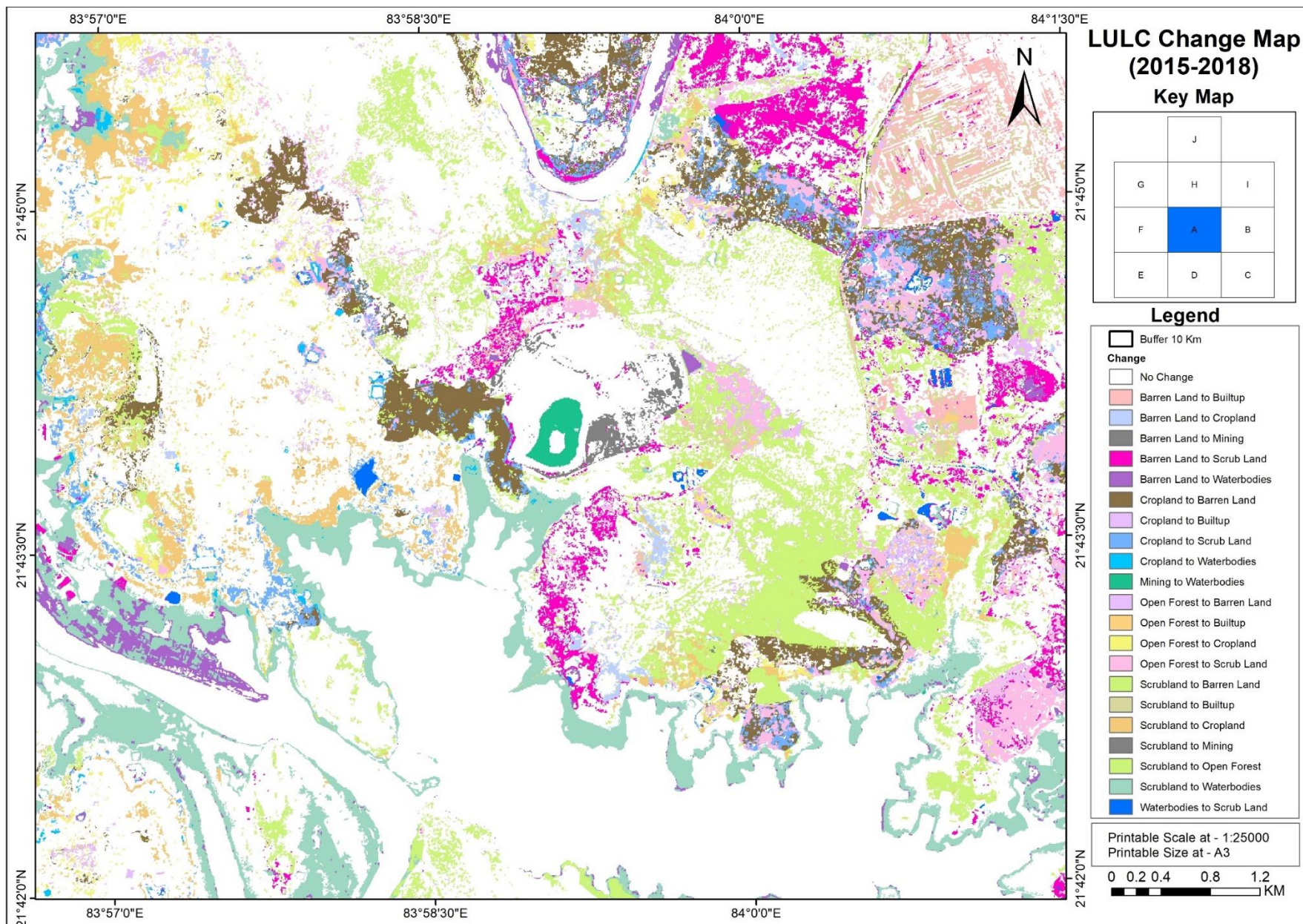
Annexure-I for reference mapping











Annexure-II for reference mapping

