वेस्टर्न कोलफील्ड्स लिमिटेड

Western Coalfields Limited

(A Subsidiary of Coal India Limited)

Office of the Area General Manager, Majri Area

PO: Guchna Tr Bhadravati Dist Chandrapur - 442503

पर्यावरण विभाग

Environment Department

संदर्भ संख्या/ Ref. No. वेकोलि/मक्षे/के-प्रापर्यावरण/2023/203

दिनांक/Date : 25.11.2023

प्रति,

Addl. Principal Chief Conservator of Forests,

पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय,

क्षेत्रीय कार्यालय (WCZ),

बजेट फ्लोर, ईस्ट विंग, न्यू सेक्रेटेरियट बिल्डिंग,

सिविल लाइन्स, नागपुर-440001, (महाराष्ट्र)

विषय: Six Monthly Report against compliance of conditions of Environmental Clearance letter for Amalgamated Yekona I & II Opencast Coal Mine Project of Majri Area, WCL (As on 30th September 2023)

संदर्भ: Environment Clearance letter no. J-11015/381/2015-IA.II(M) 01.01.01.2021

महोदय,

Please find enclosed herewith Six Monthly Report against compliance of conditions of environmental Clearance letter for Amalgamated Yekona I & II Opencast Coal Mine Project of Majri Area, WCL (As on 30th September 2023).

This is for your kind information and necessary action please.

धन्यवाद

भवदीय

क्षेत्रीय केन्द्रस्थ अधिकारी (पर्यावरण),

माजरी क्षेत्र

संलग्नक : यथोपरि.

प्रतिलिपि :

- प्रादेशिक अधिकारी, महाराष्ट्र प्रदूषण नियंत्रण बोर्ड, प्रादेशिक कार्यालय, प्रथम तल, पेन्शनर्स टावर, बंदरपुर - 442 501
- क्षेत्रीय महाप्रबंधक, माजरी क्षेत्र
- महाप्रबंधक (पर्यावरण), डब्ल्यू सी एल मुख्यालय, नागपुर
- उप-क्षेत्रीय प्रबंधक, येकोना उपक्षेत्र

WESTERN COALFIELDS LIMITED
MAJRI AREA

AMALG. YEKONA I & II OC MINE

2.75 MTY CAPACITY

EC COMPLIANCE REPORT

AS ON 30TH SEPTEMBER 2023

PART-I

Name of the project	**Amalgamated Yekona -I & II OC Mine**
Location and Address	Office of the Area General Manager, Western Coalfields Limited, Majri Area At + PO. Kuchna, Ta. Bhadrawati, Dist. Chandrapur, Maharashtra 442303
Address for correspondence	Office of the Area General Manager, Western Coalfields Limited, Majri Area At + Po. Kuchna, Ta. Bhadrawati, Dist. Chandrapur, Maharashtra 442303
MoEF's clearance letter no. & date	J-11015/381/2015-IA.II(M) 01st January 2021
Period of status report	As on 30th September 2023
Date of last report submission	29.05.2023
Date of commencement of project work	01.04.202

STATUS OF LAND ACQUISITION:

Type of land	Required as per EMP (Ha)	Actual acquired (Ha) as on 30.09.2023
Forest	Nil	Nil
Agriculture	1620.80	1591.91
Other	58.59	58.3
Total	1679.39	1650.21

STATUS OF LEGAL COMPLIANCES:

a.	Consent under Air (Prevention & Control of Pollution) Act	CTO Renewal granted vide letter no. Format 1.0/CAC/UAN No. MPCB-CONSENT-0000160739/CR/2307001123 dated 18.07.2023 valid upto 31.03.2025 for 2.75 MTY capacity.
b.	Consent under Water (Prevention & Control of Pollution) Act	
c.	Consent under Water (Prevention & Control of Pollution) Cess Act	
d.	Environment (Protection) Act	Environment Clearance obtained vide no. J-11015/381/2015-IA.II(M) dtd 01.01.2021 for 2.75 MTY capacity.
e.	Forest (Conservation) Act	Not applicable.

PART – II
STATUS OF ENVIRONMENT

AIR POLLUTION CONTROL:-

a. No. of ambient air monitoring stations : Five

Monitoring stations have been fixed in consultation with CMPDI RHV, Nagpur. Monitoring has been started from Nov 2015.

b. Name of the locations:

1. Pandurni village
2. PH office
3. Ashti village
4. Dongaon Village
5. Hivara Mazara Village

c. Ambient air quality status for the parameters prescribed by state Pollution Control Board (Average 95% time weighted value):

Sl.No	Location	SPM	RPM	SO2	Nox
1.	PH Office	Enclosed CMPDIL monitoring reports for the period April 2023 to September 2023			
2.	Pandurni Village				
3.	Ashti Village				
4.	Dongaon Village				
5.	Hivara Maja Village				

WATER POLLUTION CONTROL:

a. No. of stations and frequency of monitoring: Four

b. Description of locations: Mine water discharge at Yekona I & Yekona II OC, Workshop ETP and STP

c. Average concentration of major pollutants prescribed by State pollution Control Board (fig. in mg/lt except pH) :

Sl. No	Location	pH	BOD	COD	DO	TSS	O/G
	Mine water discharge Workshop ETP STP	Enclosed CMPDIL monitoring reports for the period April 2023 to September 2023					

NOISE POLLUTION CONTROL:

a. No. of noise monitoring stations:- Three

b. Description of location and dB(A) value:-

Sl.No	Location	DAY	NIGHT
1.	PH office	Enclosed CMPDIL monitoring reports for the period April 2023 to September 2023	

PART-III
STATUS OF IMPLEMENTATION OF PROVISIONS OF EMP

LAND USE STATUS:- All values in Mm³

S. N	Particulars	Yekona I OC		Yekona II OC	
		01.04.23 to 30.09.2023	Prog. As on 30.09.2023	01.04.23 to 30.09.2023	Prog. As on 30.09.2023
1.	Area excavated (Ha)	9.524	43.681	0.555	110.208
2.	OB removed (Mm3) Excl. top soil	1.038	4.090	8.934	32.578
3.	Top soil removed (Mm3)	0.076	3.673	0.776	10.532
4.	OB backfilled (Mm3)	1.038	1.798	Nil	3.416
5.	OB dumped (Mm3)	Nil	2.292	8.934	29.162
6.	Top Soil Dumped	0.076	2.788	0.776	8.409
7.	Top Soil utilised	Nil	0.885	0.00	2.123
8.	Physical reclamation	Nil	Nil	Nil	Nil

Note: Partial Top soil mining in Yekona I OC Area & Yekona II OC Area shown under top soil utilisation

Sl.No	Particulars	As per EMP	Yekona I OC as on 30.09.2023	Yekona II OC as on 30.09.2023	Amalg. Yekona as on 30.09.2023
1.	Area excavated (Ha)	699.70	43.681	110.208	153.889
2.	OB removed (Mm3) Excl. top soil	454.03	4.090	32.578	36.668
3.	Top soil removed (Mm3)	NA	3.673	10.532	14.205
4.	OB backfilled (Mm3)	322.53	1.798	3.416	5.214
5.	OB dumped (Mm3)	133.50	2.292	29.162	31.454
6.	Top Soil Dumped		2.788	8.409	11.197
7.	Top Soil utilised		0.885	2.123	3.008
8.	Area recovered for reclamation	physical reclamation	Nil	Nil	Nil
9.	Area revegetated through afforestation & horticulture on backfilled areas	Biological reclamation	Nil	Nil	Nil

Status of Top Soil & OB:

Year	Mine Quarry	Top Soil		Hard OB		
		In Excavation	In Top Soil Dump	In Excavation	In OB Dump	Backfilled
2020-21	YEKONA I	0.500 Mm³	1.74 Mm³	NIL	1.281 Mm³	NIL
2021-22	YEKONA I	0.286 Mm³	0.267 Mm³	NIL	0.575 Mm³	0.113 Mm³
2022-23	YEKONA I	0.049 Mm³	0.883 Mm³	NIL	0.006 Mm³	0.647 Mm³
2023-24	YEKONA I	NIL	0.076 Mm³	NIL	NIL	1.038 Mm³
2017-18	YEKONA II	0.311 Mm³	0.003 Mm³	NIL	0.094138 Mm³	NIL
2018-19	YEKONA II	0.3890 Mm³	0.198163 Mm³	0.13857 Mm³	0.09942 Mm³	NIL
2019-20	YEKONA II	0.302377 Mm³	0.310226 Mm³	NIL	1.002222 Mm³	NIL
2020-21	YEKONA II	0.021993 Mm³	0.855607 Mm³	NIL	1.255 Mm³	NIL
2021-22	YEKONA II	1.208 Mm³	3.093 Mm³	NIL	6.99 Mm³	NIL
2022-23	YEKONA II	NIL	5.16 Mm³	NIL	10.154 Mm³	3.416 Mm³
2023-24	YEKONA II	NIL	0.776 Mm³	NIL	8.936 Mm³	NIL

PRODUCTION:-

(i) Targeted Capacity :- 2.75 MTY (Area(s) 19KOKA I & II OC)

(ii) Present Capacity :- 1.44 MTY (Actual production 23-24 as on 30.09.23)

AFFORESTRATION :- (figures in '000)

Sl.No	Location	Progressive (as on 30th Sept 2023)
1.	Top Soil Dump	65 000 nos. (26 Ha)
2.	OB Dump	NIL
3.	Embankments	NIL
4.	Green belt along mine boundary	15 000 nos. (6 Ha)
5.	Backfilled areas	NIL
6.	Other areas/ Avenue Plantation	5,000 nos. (2 ha)
	Total	120,000 nos. (48 Ha)

Area under plantation (Progressive) :- 48 Ha

No. of plants per Hectare :- 2500 Nos/Ha

Species planted :- Jamun, Amla, Neem, Karanj, Bahedo, Sisu, Petalam, Safed Siris, Sisoo, Gulmohar, Cassia

REHABILITATION & RESETTLEMENT :-

Sl.No	Particulars	SC	ST	Others
1.	No. of land oustees	1270 nos.		
2.	No. of land oustees rehabilitated	Nos. of employment given = 833		
3.	No. of PAPS/PAFS to be resettled	Monetary Compensation given = 116		
4.	No. of PAPS/PAFS resettled	No Claim = 10		
5.	Area of new site (Ha)			
6.	Status of development	Balance Employment cases = 311		
7.	Civic amenities provided at new resettlement site	Land compensation = Rs 31.08 Crore Monetary Compen.= Rs 32.84 Crore		

Organizational setup at project level :-

(Name and designation of the personnel to be given)

1. Shri Goutam Rai, Sub Area Manager
2. Shri K.G. Dupare, Manager (Mining)/Mine Manager
3. Shri Venkatesh Gorak, Dy. Manager(Civil)/Nodal Officer(Env)

EXPENDITURE :-

CAPITAL(Rs in Lakhs)

Account head	01.04.2023 to 30.09.2023	Progressive (As on 30th September 2023)
Reclamation (HEMM)	Nil	Nil
Air pollution control	Nil	Rs 70.00 lakhs
Water pollution control	Nil	Rs. 58.28 lakhs
Others (CAAQMS, Piezometer, Water meters etc)	0.55	Rs 96.52 Lakhs
TOTAL		**Rs 224.80 Lakhs**

REVENUE (Rs in Lakhs)

Account head	01.04.2023 to 30.09.2023	Progressive (As on 30th September 2023)
Afforestation	Rs 60.45 Lakhs	Rs 170.48 Lakhs
Monitoring	Rs 14.70 Lakhs	Rs 110.15 Lakhs
Statutory expenses	Rs 5.85 Lakhs	Rs 104.28 lakhs
Air pollution control	Rs 2.66 Lakhs	Rs 40.19 Lakhs
Water pollution control	NIL	Rs 12.95 Lakhs
Others	Rs 0.12 Lakhs	Rs 17.97 lakhs
Ground water abstraction charges	NIL	Rs 59.64 Lakhs
TOTAL		**Rs 534.96 Lakhs**

PART –IV

Project : Amalgamated Yekona-II & OC Mine Project

Clearance letter No. : J-11015/361/2015-IA.II(M) **Date : 01.01.2021**

Sl.NO.	Condition	Compliance as on date
4(i)	The Environment Clearances issued vide letter no. vide letter J-11015/175/2006-IA. II(M) Dated 17 October 2006 and J-11015/182/2006-IA. II(M) Dated 17 October, 2006 shall be applicable along with conditions.	Noted and same is being complied. Copy of EC enclosed as annexure 1)
(ii)	The proponent shall obtain Consent to Establish/ Operate from the State Pollution Control Board for the proposed capacity of 2.75MTPA prior to commencement.	CTE granted vide letter no. format 1.0/CAC/UAN no. 0000104491 /CE – 210600139 dated 31.05.2021 CTO Renewal granted vide letter no. Format1.0/CAC/UAN No. MPCB-CONSENT-0000160739/CR/2307001123 dated 19.07.2023 valid upto 31.08.2025 (Copy of CTE, CTO enclosed as annexure 2 & 3)
(iii)	Third party monitoring (by NEERI/CMPR/IIT/NITs) for air quality shall be carried out at identified locations. Both ambient and the process area, to arrive at impact of the proposed expansion at regular interval of 3 years.	Work for 3rd party monitoring of air quality is awarded to VNI Nagpur Work Work Award letter no. WCL/MA/AGM/ENV/2023/167 dated 24.07.2023 for a period of 1 year i.e. from Oct 2023 to Sept 2024. Copy of report for the month of Oct 2023 enclosed (Copy of Work Award letter and monitoring report enclosed as annexure 4 & 5)
(iv)	Top soil should be stored separately at marked area and necessary vegetation shall be maintained to avoid any entrainment of dust.	Top soil is being stored at designated Top Soil dump of Yekona I OC with an area of 17.28 Ha & height of 25 mts. Top Soil dump of Yekona II OC with an area of 30.94 Ha & height of 35 mts. Grass seeding and plantation is done on both top soil dump to avoid fugitive dust from dump. Additionally, a new top soil dump i.e. 3rd top Soil dump of Yekona II OC with an area of 47.1 Ha & height of 30 mts. Photographs of the Top Soil Dumps enclosed as annexure 6)

(v)	PP shall construct embankment leaving 100 mts away from HFL of Wardha river and the same shall be taken prior approval from SCWR	Embankment is constructed as per mining plan in such a way that the flow in water (shifting of HFL) due to construction of embankment will not affect mine as well as nearby villages. Embankment is constructed for Yekona I OC Mine (Length: 2.40 kms, Height: 10 mts (avg.), Width of top: 30 mts and width of bottom: 50 mts) & for Yekona II OC Mine (Length: 4.40 kms, Height: 10 mts (avg.), Width of top: 30 mts and width of bottom: 30 mts)
(vi)	Transportation of coal from coal handling plan shall be through mechanized covered trucks for 3 years. No transportation by trucks after 3 years and proposed railway siding/pipe conveyor system.	Mechanically closed trucks are not provided by any truck maker for coal in India. However, tarpaulin covering is being ensured for all the coal transportation trucks. The work of Railway Siding is awarded to PRCL and same is started and expected to be completed by Dec 2026. (Agreement with PRCL and photographs of site enclosed as annexure 7 & 8)
(vii)	All the villages coming under the zone of influence as in hydrology study shall be provided with suitable water supply along with sanitation facility	Due to availability of waterbodies such as Wardha River in West-South West, Dahiwal nala in North and Irrigation canal towards East direction, there is no scarcity of water in the vicinity. However, borewell is provided in Chandhori village and handpumps are provided in Morda and Yekona village to comply the Water supply arrangements for the villages under zone of influence. (Photographs of the said works enclosed as annexure 9)
(viii)	Commitment made during public consultation process shall be adhere to. As proposed, Rs 45.35 Crore is earmarked for CER activities shall be considered as part of Environment Management Plan, which shall be accomplished within period of 5 years.	CSR Provision as per EIA EMP is of Rs 3.63 Crore is envisaged. The work of providing Borewell in Chandhori village and handpumps in Morda and Yekona village is done as per the commitment made during public hearing.

(ix)	Water quality and bioassay test of Wardha River shall be monitored quarterly and submitted to State Pollution Control Board. No water shall be discharged in river.	Surface Water quality and bioassay test of Wardha River is being monitored quarterly. Report of same is being submitted to MPCB, MOEF Regional offices along with six monthly EC Compliance report. (Copy of Surface water reports of the QE June & Sept 2023 enclosed as annexure 10, and Bio Assay test report for the QE June 2023 and Sept 2023 enclosed as annexure 11)
(x)	Quarterly monitoring of quality of water from bore hole used for drinking purpose shall be conducted and report thereof shall be submitted to SPCB.	Drinking water monitoring is being done on quarterly basis through CMPDIL. (Copy of reports of the sampling of QE June & Sept 2023 enclosed as annexure 12) Report of same is being submitted to MPCB, MOEF Regional offices along with six monthly EC Compliance report.
(xi)	Progressive backfilling of mine and progressive reclamation of OB dump shall be done.	Backfilling is being done as per mining plan. As on 30.09.2023, 1,793 Mm3 of hard OB is being backfilled in the void of Yekona I OC mine and 3.016 Mm3 of hard OB is being backfilled in the void of Yekona II OC mine. Reclamation of Top soil dump of both Yekona I OC mine and Yekona II OC Mine is already been done by plantation and grass seeding
(xii)	To control the production of dust at source, the crusher and in-pit belt conveyors shall be provided with mist type sprinkles.	Most of the Coal crushing is being done by Surface Miner to avoid fugitive emission. Mobile crusher is also being provided with Mist Spray Arrangements for dust suppression at source at Yekona I OC Mine. Also, fixed sprinkers are provided at coal stockyards, Weigh Bridge, Fog Cannons of 100 mtrs throw are also installed at various locations to control dust at source. Photographs of Air pollution control system enclosed as annexure 13

(xiii)	Mitigating measures shall be undertaken to control dust and other fugitive emissions at along the haul roads by providing sufficient fixed type water sprinklers. Adequate corrective measures shall be undertaken to control dust emissions, which would include mechanized sweeping, water sprinkling/mist spraying on haul roads and loading sites, long range misting/fogging arrangement, wind barrier wall and vertical greenery system, green belt, dust suppression arrangement at loading and unloading points, etc.	6 nos. fixed sprinkles are provided at Weigh Bridge of Yekona I OC and 30 nos. fixed sprinklers are provided at coal stockyard & weigh bridge of Yekona II OC. 5 nos. Fog cannon of 100 mts. throw with 320 deg rotation installed at Coal stockyard, weigh Bridge, Mobile Crusher, Coal Transportation road etc. Mist spray arrangement in mobile crusher As on date 320,000 nos. trees over an area of 8 Ha (plain land & Avenue Plantation) is planted as wind barrier and green belt between mine and Yekona village. 300,000 nos. over an area of 40 Ha on Top Soil Dump. FY | Nos. | Area (Ha) 2021-22 | 25,000 Nos. | 8 Ha 2022-23 | 30,000 Nos. | 30 Ha 2023-24 | 45,000 Nos. | 8 Ha Photographs of Tree Plantation enclosed as annexure 14
(xiv)	Continuous monitoring of occupational safety and other health hazards, and the corrective actions need to be ensured.	Regular PME of departmental as well as contractual worker is being done for Occupational and other health hazards. PME during Year 2022 of 81 Deptt. employees and 149 Contractual employees And during 2023 as on Sept 2023, 32 Deptt. employees and 77 Contractual employees working at Amalg. Yekona I & II OC Mine. PME/ME details and record of medical camp is enclosed as annexure 15.
(xv)	The total industrial water demand (peak) in operation phase shall be met by utilizing treated mine discharge water. If required, necessary arrangement shall be made to reuse treated water from STP&ETP to nearby TPP or coal washery for future coal washery by entering suitable agreement. No wastewater (treated or untreated) shall be	Water demand for fire fighting, dust suppression etc is met through mine discharge only. ETP effluent is being reused for gardening purpose. STP will be provided whenever the colony for the mine will be constructed.

	discharged into the river or any other water body.	Photographs of water pollution control system enclosed as annexure 16
(xvi)	PP shall take permission of state public works Department before the proposed diversion of Roads. Road between Nandev village to Warora shall be constructed by project proponent in co-ordination with PWD atleast 7 mts width and tree plantation shall be done along with road (both sides).	The Road between Nandev village to Warora is outside Project Boundary hence, will not be diverted. Portion of Warora – Mochal PWD Road which is within the project boundary, same will be diverted with the permission of PWD Deptt with tree plantation on both sides of road for atleast 7 mts width.
(xvii)	STP for proposed colony shall be constructed within one year of implementation of colony	There is no dedicated colony for this mine, STP for colony will be provided whenever the colony will be constructed
(xviii)	Toe wall of atleast 15 mts to 20 mts height should be constructed along the OB dump to protect Yekona village.	Only Top Soil overburden dump is present against the habitation of Yekona Village. Height of top Soil dump is only 36 mtrs & same is finalised, no further dumping or heightening will be done. Plantation and grass seeding of top soil dump is done, which helped in stabilisation of the dump. The distance between toe of the dump and Yekona village is more than 100 mts and in between tree plantation about 10,000 nos. in width of about 100 mtrs already been done. Also, Garland drain along OB dump and situation pond at the toe of dump is also constructed to arrest the silt, water and dump material. Also, to ascertain the requirement of Toe Wall based on scientific data, the work is awarded to VNIT Nagpur vide Work Award letter no. WCL/MA/AGW/BNV/2023/195 dated 09.08.2023. As per the report submitted by VNIT Nagpur, based on the dump height, remedial measures taken by the mine and other geological parameters assessed during the field investigation, VNIT recommended various additional **measures for further strengthening of dump, same will be implemented on priority basis. However, as per the report, there is no requirement of Toe Wall of 15 to 20 mtrs height.** (Copy of

		preventive measures along Dumpy is enclosed as Annexure 17 and Abstract of report of VNIT Nagpur reg. Tor Kati scientific study enclosed as annexure 18)
(viii)	5 Fog canon shall be installed to reduce the impact of air pollution for nearby yekona village.	5 nos. Fog cannon of 100 mts throw with 300 deg rotation is installed on Coal stockyard, Weigh bridge, Mobile Crusher, Coal transportation road etc. Photographs of Fog Cannon enclosed as annexure 19
(ix)	Water storage ponds shall be constructed of appropriate depth in nearby villages (Pandurni village, Wanoja village, Naydev village and Mohbala village) in collaboration with Gram Panchayats.	Rain water harvesting pond of dimension 50 m x 30 m x 1.2 m near Yekona Village road (at North - North East Boundary of mine) is dug to recharge ground water level. Photographs of Rain Water Harvesting system enclosed as annexure 20 Additional, Water storage pond will be constructed if any nearby village demand for the same.
(xi)	Peripheral tree plantation of local species in nearby village (Panjuni village, Wanoja village, Naydev village and Mohbala village) in collaboration with Gram Panchayats.	120,000 nos. trees of native species over an area of 48 Ha are planted near Yekona Village since FY 2021-22. Out of this 10,000 nos. over an area of 4 Ha as green belt/ wind barrier/ Peripheral tree plantation is near the Yekona village habitation (planted in FY 2021-22). Additional Peripheral Tree Plantation along mine boundary near Panjuni village, Wanoja village, Naydev village and Mohbala village will also be taken up in phased manner
(xii)	Fund allocated in Approved Wildlife conservation plan for schedule I species shall be deposited within six months of issue of EC letter.	Fund of Rs 35 Lakhs allocated for GIB Conservation was deposited to DFO, Chandrapur vide Cheque no. 013366 dated 06.08.2020. Implementation report given by DFO, Chandrapur vide letter no. [illegible] dt 04.05.22 & and [illegible]/33-34/1679 dtd 11.10.2021 (Copy of letters enclosed as annexure 21 & 22)
(xiii)	Green belt along the boundary should be developed on priority basis preferably within first 3 years	120,000nos. trees of native species over an area of 48 Ha are planted near Yekona Village since FY 2021-22. Out of

		ha. 10,000 nos. over an area of 4 Ha as green belt/ windbreaker/ Peripheral tree plantation & near the Yekona village habitation (planned in FY 2021-22). Plantation on top soil dump of Yekona I OC Mine will also act as greenbelt between mine and Warora – Madhali Road and Plantation on top soil dump of Yekona II OC Mine will also act greenbelt/ vertical greenery for Yekona Village. Further green belt around the mine will be strengthened in coming years.
(xxiv)	The recommendation of scientific Study for method of Working, Ultimate Pit Slope, Dump Slope & Monitoring of slope stability conducted by Indian Institute of Technology, Kharagpur shall be complied.	The recommendation of scientific Study for method of Working, Ultimate Pit Slope, Dump Slope & Monitoring of slope stability is being implemented. Abstract of Scientific Study enclosed as annexure 23 Dump Slope Monitoring record enclosed as annexure 24
(xxv)	3-tier Tree plantation with wired fencing shall be project proponent for clearly demarcating adjacent forest land.	3-tier tree plantation with wired fencing for clearly demarcating forest land will be done before the mine working approach near that patch of project.
(xxvi)	Persons of nearby villages shall be given training on livelihood and skill development to make them employable.	Skill Development training is being organised regularly (such as Tailoring, Beauty Parlour, Computer education, Security Guard etc.) for persons living in nearby villages. Work order issued by WCL HQ vide no. WCL/HRD/Skill Dev/2022-23/114 dtd 27.05.2022 for skill development training via CIPET, FDDI, Ashok Leyland driver training institute, ATDC, CI skill development training centres enclosed as annexure 25 Details of expenditure statement enclosed as annexure 26
(xxvii)	Mining shall be carried out only by surface miners for the project (as proposed) and silo loading 11 railway siding through in-pit conveyor should be installed to avoid road transportation in 3 years.	Mining is being done mainly by Surface Miners wherever topography gradient is favourable. Remaining coal excavation is being done through Shovel-dumper combination.

		The work of Railway Siding is started and some will be completed by Dec 2024. Coal Transportation upto railway siding will be within the project boundary and some will be done by Tarpaulin covered trucks.
[xxvii]	Efforts shall be made for utilizing alternate sources water, abandoned mines or else whatsoever and thus minimizing the dependability on a single source.	Mine Seepage water is being utilized for all the activities such as fire-fighting, dust suppression etc
[xxix]	Active OB Dump should not be kept barren/open and should be covered by Temporary grass to avoid air born of particles.	Grass seeding is done over the benches, embankment, Top Soil dump & OB Dump
[xxx]	Project proponent to plant 150,000 nos. of native trees with broad leaves along the transportation route in three years to prevent the effect of air pollution. After completion of tree plantation, Number of trees shall be duly endorsed from District Forest Officer.	About 30,000 nos. over an area of 20 Ha is planted on Plain and Top Soil dump along the Coal transportation route. Botanical Plantation will be taken up with 1-2 years. Tree Plantation work is being undertaken by Madhya Pradesh Rajya Van Vikas Nigam Ltd and report of plantation is jointly being signed by officials of MCL and Forest Dept. FY / Nos. / Area (Ha) 2021-22 / 25,000 Nos. / 10 Ha 2022-23 / 30,000 Nos. / 20 Ha 2023-24 / 45,000 Nos. / 18 Ha 2024-25 (proposed) / 50,000 Nos. / 20 Ha
[xxxi]	Project Proponent shall obtain blasting permission from DGMS for conducting mining operation near villages and also explore development of rock breakers of suitable capacity in the project to avoid blasting very near to villages. There shall be no damages caused to habitation/structures due to blasting activity.	As per new DGMS regulation, Blasting is to be done as per the scientific study recommendation for Blasting. Scientific study for Blasting was conducted by CMPDI in October 2020. Abstract of same enclosed as annexure XX Vibration monitoring report enclosed as annexure XX
[xxxii]	The project proponent shall complies with all the statutory requirements and judgment of Hon'ble Supreme Court dated the 2nd August 2017 in Writ petition (Civil) No.114 of 2014 in the matter of Common Cause versus Union of India	There is no case of Illegal Mining in this area. Mining as per valid EC and CTO capacity is being done within the project area. The Coal production from

	and Ors. State Government shall ensure that the entire compensation levied, if any, for illegal mining paid by the project proponent through their respective Department in view compliance of judgment of Hon'ble Supreme Court dated the 2nd August 2017 in writ petition (Civil) No. 114 of 2014 in the matter of common Cause versus Union of India and Ors.	the mine is within the EC and CTO Capacity [illegible] Barrier, RFID based Entry-Exit, CCTV and other surveillance monitoring is being ensured at places such as Coal stockyard, Weigh Bridge etc. in the mine. Further, as the mine is on open cast mining there is no possibility of illegal mining within the project area.
(xxxii)	Project Proponent shall obtain the necessary prior permission from the Central Ground Water Authority (CGWA) in case of intersecting the Ground water table.	CGWA NOC Obtained vide NOC no. CGWA/NOC/MIN/ORIG/2019/6659 dtd 19.11.2019 valid upto 18.11.2021. Renewal application was submitted on 17.11.2021 and Impact Assessment report and modelling report submitted on 30.09.2023. Same was approved vide 67th EAC Meeting dated 24.07.2023. Renewal application for the period 19.11.2023 to 18.11.2025 applied via email on dated 18.11.2023 Copy of last CGWA NOC and approved renewal status enclosed as annexure 29 & 30.
(xxxiv)	Proponent shall appoint an Occupational Health Specialist for Regular and Periodical medical examination of the workers engaged in the Project and maintain records accordingly; also, Occupational health check-ups for workers having some ailments like BP, diabetes, habitual smoking, etc. shall be undertaken once in six months and necessary remedial/ preventive measures taken accordingly. The Recommendations of National Institute for ensuring good occupational environment for mine workers shall be implemented. The prevention measure for burns, malaria and provision of anti-snake venom including all other paramedical safeguards may be	Regular and Periodical medical examination (ME and PME) of the workers (Departmental as well as contractual workers) has been undertaken at Main Area Hospital of WCL Area Hospital & headed by Chief Medical Officer. There is 1 No. PME in-charge and 1 No. PME co-in-charge with appropriate medical qualifications. There are five treating Doctors, in addition, there is 1 No. PME Clerk and 2 Nos assisting category workers. Medicines for burns, malaria and provision of anti-snake venom including

	ensured before initiating the mining activities	or other paramedical safeguards are ensured
(xxiv)	Project Proponent shall follow the mitigation measures provided in office memorandum No.2-11015/37/2014-IA.I (M), dated 29October, 2014, titled "Impact of mining activities on Habitations-issues related to the mining Projects wherein Habitations and villages are the part of mine lease areas or Habitations and villages are surrounded by the mine lease area".	There is no habitation within the Project area. Further, with reference to the OM dtd 29.10.2014, we have been practicing best mine practices such as providing catch drains, garland drains to arrest runoff from the dumps. Photographs of catch drains, garland drains, Bhatan pond enclosed as annexure 31 Adequate rain water harvesting measures are also being taken in and around mine area to recharge the groundwater levels. Regular monitoring of ground water level is also being done in core and buffer zone of the mine. Ground water monitoring report for the period Dec 2022 to August 2023 submitted vide letter no. WCL/MA/ADM/ENV/2023/253 dated 18.11.2023 enclosed as annexure 32 Illumination and sound level of the mine are being monitored regularly inside mine as well as at nearby habitation. Record of illumination and sound monitoring in mine enclosed as annexure 33 Vibration monitoring is also being done to ascertain the impact of blasting. Mobile water tankers are used for dust suppression on haul road and fixed sprinklers are provided for dust suppression on coal transportation road.
(xxv)	The illumination and sound at night at project sites disturb the villages in respect of both human and animal population. Consequent sleeping disorder and stress may affect the health in the villages located close to mining operations. Habitations have a right for darkness and minimal noise levels at night. PPs must ensure that the biological clock of the villages is not disturbed by orienting the floodlights/ masks away from the villages and keeping the noise levels well within the prescribed limits for day light/ night hours.	It is ensured that the biological clock of the villages is not disturbed by orienting the floodlights/ masks away from the villages and keeping the noise levels well within the prescribed limits for day light/night hours. Record of illumination and sound monitoring in nearby village enclosed as annexure 34

[xxvii]	The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered fauna, spotted in the study area. Action plan for conservation of flora and fauna shall be implemented in consultation with the State Forest and Wild life Department. A copy of action plan shall be submitted to the Ministry of Environment, Forest and Climate Change and its Regional Office.	Fund of Rs 35 Lakhs allocated for GB Conservation was deposited to DFO, Chandrapur vide Cheque no. 013364 dated 06.05.2020. Awareness rally in nearby villages in collaboration with forest dept & also organised on 11.02.2021 Implementation report given by DFO, Chandrapur vide letter no. [illegible] dt 04.01.22 and [illegible] dt 11.10.2023
[xxviii]	Hon'ble Supreme Court in an writ petition (s) Civil No. 114/2014 Common Cause vs Union on India & Ors vide its judgement dated 8th January, 2020 has directed the union of India to impose a condition in the mining lease and a similar condition in the environmental clearance and the mining plan to the effect that the mining lease holders shall after ceasing mining operations, undertake re grading the mining area and any other area which may have been disturb due to their mining activities and restore the land to a condition which is fit for growth of forester, flora, fauna etc. Compliance of this condition after the mining activity is over at the cost of the mining lease holders/Project Proponent'. The implementation report of the above said condition shall be sent to the Regional Office of the MoEF&CC.	Gross seeding of embankment, benches is already been done. Also, gross seeding OB dump will be done once dump become inactive. Further, to prevent the soil fertility of top soil stocked at dumps, 1,00,000 nos. of trees planted at Top soil dumps. This acts as vertical green barrier between mine and coal transportation road and prevent soil erosion.

Specific condition with respect area being in CPAs

(i)	CTE/CTO for the project shall be obtained from the SPCB as required under the Air (Prevention and control of pollution) Act,1981 and the water (Prevention of control of Pollution) Act,1974, and the SPCB shall follow the mechanism/protocol issued by the Ministry vide letter no.G-16017/38/2018-CPA dated 24october,2019 while issuing the CTE/CTO for the project, for improvement of environment or environmental quality in the area.	CTE granted vide letter no. format 1.0/CAC/UAN no. 0000104421 /CE – 210520103 dated 31.05.2021 CTO Renewal granted vide letter no. Format1.0/CAC/UAN No. MPCB-CONSENT-0000160709/CR/2007001122 dated 18.07.2022 valid upto 31.03.2025

(ii)	The green belt of at least 5-10 m width shall be developed in more than 40% of the total project area, mainly along the periphery of mine boundary, in downward wind direction, and along road sides etc. Selection of plant species shall be as per the CPCB guidelines in consultation with the State Forest Department.	120,038 nos. trees of native species over an area of 48 Ha are planted near Yekona Village since FY 2021-22. Out of this 10,300 nos. over an are of 4 Ha as green belt/ wind barrier/ Peripheral tree plantation is near the Yekona Village habitation (planted in FY 2021-22) The Width of green belt is more than 50 mts. Plantation on top soil dump of Yekona I OC Mine will also act as greenbelt between mine and Warora - Machali Road and Plantation on top soil dump of Yekona II OC Mine will also act greenbelt/ vertical greenway to Yekona Village Further green belt around the mine will be strengthened in coming years.
(iii)	In addition, the project proponent shall develop greenbelt outside the plant premises such as avenue plantation, plantation in vacant areas, social forestry etc.	Plantation along Coal transportation roads is being done. Bamboo Plantation as Avenue/ Road side plantation will be taken up in phased manner Plants distribution to nearby villages (such as Yekona, Mosda, Chandikhol etc) as steps towards collaboration with nearby villages and increasing green cover in nearby village area is also being done.
(iv)	Monitoring of compliance of EC condition may be submitted with third party audit every year.	Work for same is awarded to NEERI Nagpur vide award letter no. WCL/HQ/ENV/16-J/73481 dated 26.10.2021. Inspection and review of EC Compliance was done by NEERI Team in FY 2022-23. Copy of Abstract of report enclosed as annexure 30
(v)	Fund allocation for Corporate Environment Responsibility (CER) which is atleast 2 times as per OM of 1st May, 2018 may now be considered as 2 times of fund allocated on commitment made during public consultation process for incorporating in CIA-EMP for deliberation of EAC and item-wise details along with time bound action plan shall be prepared and submitted to the Ministry's Regional Office.	The provisions of PS are to be fulfilled for the works under CER. Majority of points under public consultation as related to employment, both direct and in-direct employment is being generated due to the project. Apart from this various activity to be covered under CER are also enclosed. Few such activities such as Medical Camps, Health survey/ check-up, Skill Development training for people in

		nearby villages, development of roads, rain water Harvesting works, Avenue Plantation, providing saplings for plantation in nearby villages are being done under CSR and Environment head
(vi)	Effective fugitive emission control measures should be imposed in the process, transportation, packing etc.	6 nos. fixed sprinkles are provided at Weigh Bridge (Yekona I OC) and 30nos. fixed sprinkler provided at Coal stockyard & weigh Bridge (Yekona II OC) to control fugitive emission 2 nos. 15 KL Mobile water tankers are deployed on Coal transportation road and haul road 2 nos. Fog cannon of 100 mtrs throw with 330 deg rotation use in procurement stage (Supply order issued) out of which 1 no. mist cannon is installed at Coal stockyard Grass seeding over embankment, benches is done 10,000 nos. trees of native species over an area of 4 Ha as green belt/ wind barrier between Yekona I OC mine OB Dump and Yekona Village are planted. Also, 65,000nos. of saplings planted on top Soil dumps for utilisation and conservation of soil. Green belt between mine OB dumps and mine boundary will further strengthened/ developed
(vii)	Transportation of materials by rail/ conveyor belt, wherever feasible.	Study conducted by GMR for installation of Pipe Conveyor between Yekona Mine and GMR power Plant. Work of Railway Siding awarded to IPSCL and same is in progress and will be completed by December 2023
(viii)	A detailed water harvesting plan may be submitted by the project proponent	Roof Top Rain Water Harvesting is installed over office building such as Sub Area Manager Office, Manager Office etc. Photographs of rain water harvesting structures enclosed as annexure 15 Rain water harvesting pond of 35 mtr x 30 mtrs is dug near Yekona Village.

		Pond deepening to nearby villages to increase water recharge and water holding capacity of ponds will done if required in nearby villages
(x)	In case domestic waste water generation is more than 10 KLD, the industry may install STP.	The domestic water requirement of the mine is very less. Only 5 KLD overhead tank is provided for canteen and washroom requirement of the office. Modular STP for mine premises will be provided for canteen and other domestic waste if the effluent generation exceeds 10 KLD.
(x)	Monitoring of compliance of EC conditions may be submitted with third party audit every year	Work for the monitoring of EC conditions is awarded to NEERI Nagpur vide award letter no. WCL/HQ/Ch.V/14-J/73-81 dated 26.10.2021.

4.) The grant of environmental clearance is further subject to compliance of the Standard EC conditions as under:

(A) Statutory Compliance

4(i)	The project proponent shall obtain forest clearance under the provisions of forest (Conservation) Act,1986, in case of the diversion of forest land for non-forest purpose involved in the project.	There is no forest land involved in the project area/ EC Boundary
(ii)	The project proponent shall obtain clearance from the National Board Wildlife, if applicable.	Not Applicable
(iii)	The project proponent shall prepare a site-specific conservation plan/ wildlife management plan and approved by the chief wildlife warden. The recommendations of the approved site-specific conservation plan/wildlife management plan shall be implemented in consultation with the state forest department. The implementation report shall be furnished along with the six monthly compliance report (in case of the presence of schedule-1 species in the study area).	Conservation plan for Schedule-I species i.e. Great Indian Bustard (GIB) has been prepared and approved by PCCF (Wildlife), Nagpur. Fund of Rs.30 lakhs allocated was also deposited to DFO, Chandrapur and some is utilised by Forest Department to implement the activities as per the conservation plan.

(iv)	The project proponent shall obtain consent to establish/operate under the provisions of Air [Prevention & Control of Pollution] Act,1981 and the water (Prevention & Control of Pollution) Act,1974 from the concerned State pollution Control Board/Committee.	CTE granted vide letter no. format 1.0/CAC/UAN no. 0000104401 /CE – 2103001309 dated 31.05.2021 CTO Renewal granted vide letter no. format1.0/CAC/UAN No. MPCB-CONSENT-0000160739/CR/2307061125 dated 18.07.2023 valid upto 31.03.2028
(v)	The project proponent shall obtain the necessary permission from the Central Ground Water Authority.	CGWA NOC Obtained vide NOC no. CGWA/NOC/MIN/OIL&G/2019/6659 dtd 19.11.2019 valid upto 18.11.2021. Renewal application was submitted on 17.11.2021 and Impact Assessment report and modelling report submitted on 30.09.2022. Same was approved vide 67th EAC Meeting dated 24.07.2023 Re-Renewal application for the period 19.11.2023 to 18.11.2025 was also submitted via email dated 18.11.2023 to CGWB/CGWA
(vi)	Solid/hazardous waste generated in the mines needs to addressed as per solid waste management rules,2016/hazardous & other waste management rules,2016.	Hazardous waste generated in the mine is addressed as per hazardous & other waste management rules,2016 Hazardous Waste is being disposed off via Authorised Recycler or CHWTSDF Sulfon. Details of disposal during the period 2022-23 is being filed in Form 4 as Annual Hazardous Waste return 22-23 to MPCB vide UAN No. MPCB-HW_ANNUAL_RETURN-0000059757 on dated 29.06.2023 Annual Hazardous Waste return 22-23 enclosed in annexure 36

(B) Air Quality Monitoring And Preservation

(i)	Continuous ambient air quality monitoring stations as prescribed in the status be established in the core zone as well as in the buffer zone for monitoring of pollutants, namely PM10, PM2.5, SO2, and NOx. Location of the stations shall be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the state pollution	CAAQMS (1 no.) along with MET station is installed in mine core zone and location of same is finalised in consultation with MPCB. Photographs of CAAQMS station enclosed as annexure 37 Apart from this 4 nos. AAQ monitoring stations are also set up for AAQ monitoring on fortnightly basis

	control board. Online ambient air quality monitoring stations may also be installed in addition to the regular monitoring stations as per the requirement and/ or in consultation with the SPCB. Monitoring of heavy metals such as Hg, As, Ni, Cd, Cr, etc to be carried out at least once in six months.	Heavy Metal monitoring is being conducted on half yearly basis through CWPDL (NABL accredited lab). Report of QE June 2023 of heavy metal monitoring enclosed as annexure 38
(f)	The Ambient Air Quality monitoring in the core zone shall be carried out to ensure the Coal Industry Standards notified vide GSR 742 E dated 25th September, 2000 and as amended from time to time by the Central Pollution Control Board. Data on ambient air quality and heavy metals such as Hg, As, Ni, Cd, Cr and other monitoring data shall be regularly reported to the Ministry/ Regional Office and to the CPCB/SPCB.	Monitoring of Ambient Air Quality is being carried out as per GSR 742 (E) dated 25.09.2000. Data on ambient air quality is being monitored on fortnightly basis and heavy metals such as Hg, As, Ni, Cd, Cr is being monitored on half yearly basis and same is being reported to the Ministry/ Regional Office and to the MPCB along with six monthly EC Compliance report. The ambient air quality monitoring stations are established in consultation with officials of Maharashtra Pollution Control Board, Chandrapur. Monitoring reports for the period from April to September 2023 is enclosed as annexure 39. It can be seen that all the parameters are within the prescribed standards.

[PM10] Values of µg/m³

Date	PF Office	Pandavpauni Village	Antri Village	Durgapur Village
APR 23 [1st Fn]	174	72	69	75
APR 23 [2nd Fn]	160	68	62	64
MAY 23 [1st Fn]	185	62	76	69
MAY 23 [2nd Fn]	179	78	68	61
JUNE 23 [1st Fn]	179	65	60	63
JUNE 23 [2nd Fn]	183	75	79	63
JULY 23 [1st Fn]	173	64	60	63
JULY 23 [2nd Fn]	165	76	62	60
AUG 23 [1st Fn]	182	66	50	62
AUG 23 [2nd Fn]	181	70	72	72
SEPT 23 [1st Fn]	185	68	57	50
SEPT 23 [2nd Fn]	183	75	68	60
Std	**350**	**100**	**100**	**100**

[PM2.5] Values of µg/m³

Date	PF Office	Pandavpauni Village	Antri Village	Durgapur Village
APR 23 [1st Fn]	72	36	30	30

		APR 23 (2nd FN)	70	63	54	78
		MAY 23 (1st FN)	64	53	34	56
		MAY 23 (2nd FN)	68	50	42	38
		JUN 23 (1st FN)	62	70	88	55
		JUN 23 (2nd FN)	52	80	40	88
		JUL 23 (1st FN)	57	80	50	38
		JUL 23 (2nd FN)	50	35	32	50
		AUG 23 (1st FN)	50	38	54	32
		AUG 23 (2nd FN)	56	37	34	48
		SEPT 23 (1st FN)	40	33	36	32
		SEPT 23 (2nd FN)	50	44	48	34
		Std	60	60	60	60
(iii)	Transportation of coal, to the extent permitted by road shall be carried out by covered trucks/conveyors. Effective control measures such as regular water/ mist sprinkling/ rain guns etc shall be carried out in critical areas prone to air pollution (with higher values of PM10/PM2.5) such as haul road loading/ unloading and transfer points. Fugitive dust emissions from all sources shall be controlled regularly. It shall be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central/ State Pollution Control Board.	Work of Railway Siding awarded to M/s PRCL. Work of same is started and will be completed by Dec 2025. 4 nos. fixed sprinkler are provided at Weigh Bridge (Yekona I OC) and 30 nos. fixed sprinklers installed at Coal stockyard & Weigh Bridge (Yekona II OC) to control fugitive emission. 2 nos. 15 Kl. Mobile water tankers are deployed on Coal transportation road and haul road. 5 nos. fog cannon of 100 mtrs throw with 320 deg rotation are installed at Coal stockyard, Weigh Bridge, Mobile Crusher, Coal transportation Road etc. Mobile crusher is provided with Mist spray arrangement.			
(iv)	The transportation of coal shall be carried out as per the provisions and route envisaged in the approved Mining Plan or environment monitoring plan. Transportation of the coal through the existing road passing through any village shall be avoided. In case, it is proposed to construct the by-pass road, it should be constructed so that the impact of sound, dust and accidents could be appropriately mitigated.	The transportation of coal is being done by Power Houses and other consumers by themselves.			
(v)	Vehicular emissions shall be kept under control and regularly monitored. All the vehicles engaged in mining and allied activities shall operate only after obtaining 'PUC' certificate from the authorized pollution testing centres.	All the light vehicles namely jeep & trucks etc. having valid PUC certificate for vehicular emission through RTO approved agency are used.			

(vi)	Coal stock pile/ crusher/ feeder and breaker material transfer points shall invariable be provided with dust suppression system. Belt conveyor shall be fully covered to avoid air borne dust. Side cladding all along the conveyor gantry should be made to avoid air borne dust. Drills shall be wet operated or fitted with dust extractors.	4 nos. fixed sprinklers are provided at Weigh Bridge (Yekona I OC) and 30 nos. fixed sprinkers installed at Coal stockyard & Weigh Bridge (Yekona I OC) to control fugitive emission. 2 nos. 15 Kl. Mobile water tankers are deployed on Coal transportation road and Haul road. 5 nos. Mist cannon of 100 mts. throw with 320 deg rotation are in procurement stage (Supply order issued) out of which 1 no. installed at Coal stockyard. Mobile crusher is provided with Mist spray arrangement. Drills are wet operated.
(vii)	Coal handling plant shall be operated with effective control measures w.r.t. various environmental parameters. Environmental friendly sustainable technology should be implemented for mitigating such parameters.	Most of the Coal extraction is through Surface Mine technology which helps in eliminating blasting and crushing of Coal. Remaining coal extraction which is being done through Shovel-dumper combination. Fog Cannon is installed at Mobile crusher to avoid fugitive dust during loading process.

(C) Water Quality Monitoring And Preservation

(i)	The effluent discharge (mine water, workshop effluent) shall be monitored in terms of the parameters notified under the water Act, 1974 Coal Industry Standards vide GSR 742 E dated 25th September, 2000 and as amended from time to time by the Central Pollution Control Board.	Mine Water discharge, Workshop ETP effluent is being monitored vide GSR 742 E dated 25th September, 2000. Copy of Mine Discharge and Workshop Effluent Water quality Monitoring Report for the period April 2023 to September 2023 enclosed as annexure 39. MINE WATER DISCHARGE (Yekona I) Date / pH / COD / TSS / O&G APR 23 (1st FN) 7.47 48.00 38.00 NIL APR 23 (2nd FN) 7.42 50.00 30.00 NIL MAY 23 (1st FN) 7.45 50.00 48.00 NIL MAY 23 (2nd FN) 7.32 40.00 38.00 NIL JUNE 23 (1st FN) 7.54 44.00 30.00 NIL JUNE 23 (2nd FN) 7.35 48.00 42.00 NIL JULY 23 (1st FN) 7.32 38.00 40.00 NIL JULY 23 (2nd FN) 7.30 36.00 46.00 NIL AUG 23 (1st FN) 7.33 44.00 38.00 NIL AUG 23 (2nd FN) 7.33 36.00 34.00 NIL

SEPT 22 (1st FN)	6.04	32.00	39.00	NDL	
SEPT 22 (2nd FN)	5.14	40.00	49.00	NDL	

MINE WATER DISCHARGE (Yakond II)

Date	pH	COD	TSS	OIL&G
APR 22 (1st FN)	7.27	50.00	32.00	NDL
APR 22 (2nd FN)	7.60	30.00	18.00	NDL
MAY 22 (1st FN)	7.55	52.00	40.00	NDL
MAY 22 (2nd FN)	8.36	36.00	32.00	NDL
JUNE 22 (1st FN)	7.76	40.00	49.00	NDL
JUNE 22 (2nd FN)	8.02	40.00	38.00	NDL
JULY 22 (1st FN)	6.86	64.00	40.00	NDL
JULY 22 (2nd FN)	6.90	44.00	36.00	NDL
AUG 22 (1st FN)	6.90	52.00	48.00	NDL
AUG 22 (2nd FN)	6.98	60.00	40.00	NDL
SEPT 22 (1st FN)	7.32	24.00	30.00	NDL
SEPT 22 (2nd FN)	8.26	56.00	36.00	NDL

(f)	The monitoring data shall be uploaded on the company's website and displayed at the project site at a suitable location. The circular No.L-30012/1/2006-IA.II (M) dated 27th May, 2008 issued by Ministry of Environment, Forest and Climate Change shall also be referred in this regard for its compliance.	Complied. All the monitoring reports are being uploaded on westernccl website under SECTION -> DEPARTMENT -> ENVIRONMENT -> ENVIRONMENT QUALITY REPORT. http://www.westernccl.in/index.php/StaticPage/153
(g)	Regular monitoring of ground water level and quality shall be carried out in and around the mine lease area by establishing a network of existing wells constructing new piezometers during the mining operations. The monitoring of ground water levels shall be carried out four times a year i.e. pre-monsoon, monsoon, post-monsoon and winter. The ground water quality shall be monitored once a year, and the data thus collected shall be sent regularly to MoEF/CC/ RO.	Regular monitoring of ground water level and quality is being carried out in and around the mine area. The monitoring is carried out four times in a year pre- monsoon (April-May), monsoon (August), post monsoon (November), and winter (January) and the data thus collected is being sent regularly to Ministry of Environment, Forest and Climate Change and its Regional Office, Central Ground Water Authority and Regional Director, Central Ground Water Board Report of the monitoring (Dec 2022 to Aug in 2023 enclosed)

(iv)	Monitoring of water quality upstream and downstream of water bodies shall be carried out once in six months and record of monitoring data shall be maintained and submitted to the Ministry of Environment, Forest and Climate Change/ Regional Office.	Monitoring of water quality upstream and downstream of water bodies is being carried out half yearly and report of same is also submitted to MPCB & MoEF on regular basis. Copy of latest Surface Water Quality report QE June & September 2020 enclosed.
(v)	Ground water, excluding mine water, shall not be used for mining operations. Rainwater harvesting shall be implemented for conservation and augmentation of ground water resources.	Mine water is being used to fulfil most of the requirements in mining operations such as fire fighting, dust suppression etc. However, wherever the mine water cannot be utilised, there the water from ground water bores is being used. Roof top Rain Water Harvesting is installed over office building such as Sub Area Manager Office, Manager Office etc. Rain water harvesting pond of 50 mtr x 30 mtr is also constructed near Yekona Village. Pond deepening, if required for nearby villages to increase water recharge and water holding capacity of ponds will be done. It helps in augmenting ground water resources.
(vi)	Catch drain/ or garland drains and siltation ponds in adequate numbers and appropriate size shall be constructed around the mine working, coal heaps & OB dumps to prevent run off of water and flow of sediments directly into the river and water bodies. Further, dump material shall be properly consolidated/ compacted and accumulation of water over dumps shall be avoided by providing adequate channels for flow of it into the drains. The drains/ ponds so constructed shall by regularly de-silted particularly before onset of monsoon and maintained properly. Sump capacity should provide adequate retention period to allow proper settling of silt material. The water so collected in the sump shall be utilised for dust suppression and green belt development and other industrial use. Dimension of the retaining wall constructed, if any, at the toe of the OB dumps within the mine to check run-off and siltation should be based on the rainfall data. The plantation of native species to be made	Garland drains of dimension (Length: 4650 mtr, Avg. width: 2.0 mtr, Avg. Depth: 2.00 mtr) is provided around the mine. Catch drain of dimension (Length: 3000 mtr, Avg. width: 2.0 mtr, Avg. Depth: 2.00 mtr) provided around OB dumps. Desilting of catch drains and garland drain is done every year before onset of monsoon departmentally. The catch drains provided all around the OB Dumps acts as an arrester against any flow of silt and sediments into the nearby fields/ nalla. As such specifically, at present there is no requirement of retaining wall at the toe of the dump. Moreover, grass seeding has been placed over the slopes which further protects the flow of silt and sediments.

	between toe of the dump and adjacent field/ habitation/ water bodies.	
(vi)	Adequate groundwater recharge measures shall be taken up for augmentation of ground water. The project authorities shall meet water requirements of nearby village(s) after due treatment conforming to the specific requirements(standards).	Roof top Rain Water Harvesting is installed over office building such as Sub Area Manager Office, Manager Office etc. Rain water harvesting pond of 50 mtr x 30 mtr is constructed near Yekona Village. Pond deepening, if required for nearby villages to increase water recharge and water holding capacity of ponds will be done. It helps in augmenting ground water resources. Due to availability of waterbodies such as Wardha River in West-South West, Dahiwal nala in North and irrigation canal towards East direction, there is no scarcity of water in the vicinity. If any water requirement issue at nearby village came to the notice, project authority will take all necessary measures to fulfil the requirement
(vii)	Industrial waste water generated from CHP, workshop and other waste water, shall be properly collected and treated so as to conform to the standards prescribed under the standards prescribed under water Act, 1974 and Environment (Protection) Act,1986 and the rules made there under, and as amended from time to time. Adequate ETP/STP needs to be provided.	ETP of 150 KLD capacity with Oil Skimmer is constructed for treating the effluent generated from washing of HEMM. At present most of the workers of this mine are residing at Warora/ Bhadrawati Town. There is no new/ dedicated colony constructed for this mine. STP of suitable capacity will be constructed along with the construction of new quarters for the workers of Ambalg, Yekona OC mine.
(ix)	The water pumped out from the mine, after siltation, shall be utilised for industrial purpose viz. watering the mine area, roads, green belt development etc. The drains shall be regularly desilted particularly after monsoon and maintained properly.	Pumped out mine water is used for firefighting, dust suppression etc. After treatment it is being released in local nala from where villagers are further utilise it for their farming needs.
(x)	The surface drainage plan including surface water conservation plan for the area of influence affected by the said mining operations, considering the presence of	A detailed report on marine eco-system has been prepared. Copy of same submitted along with 3s Monthly EC Compliance report of March 2022

	river/ rivulet/pond/lake etc. shall be prepared and implemented by the project proponent. The surface drainage plan and/or any diversion of natural water course shall be as per the approved Mining Plan/EIA/EMP report and with due approval of the concerned State/Govt Authority. The construction of embankment to prevent any danger against inrush of surface water into the mine should be as per the approved Mining Plan and as per the permission of DGMS or any other authority as prescribed by the law.	(Copy of Riverine ecosystem conservation plan enclosed as annexure 40) The Mining activity is strictly carried out as per the approved Mining Plan and with due permission of DGMS. The same will continue to be operated as per the rules.
(d)	The project proponent shall take all precautionary measures to ensure riverine/riparian ecosystem in and around the coal mine up to a distance of 5 km. A riverine/riparian ecosystem conservation and management plan should be prepared and implemented in consultation with the irrigation/water resources department in the state government.	Riverine/ riparian ecosystem conservation and management plan is prepared (Copy of same is already submitted to your good office along with EC Compliance report of March 2022) and implemented in consultation with the irrigation/water resources department in the state government.

D) Noise And Vibration Monitoring And Prevention

(i)	Adequate measures shall be taken for control of noise levels as per Noise Pollution Rules, 2000 in the work environment. Workers engaged in blasting and drilling operations, operation of HEMM, etc. shall be provided with personal protective equipments (PPE) like ear plugs/muffs in conformity with the prescribed norms and guidelines in this regard. Adequate awareness programmes for usen to be conducted. Progress in usage of such accessories to be monitored.	Deployment of Surface Miner help in avoiding Blasting in Coal. Adequate measures namely proper maintenance of HEMM and controlled blasting is being done so as to control noise levels below 85 dB(A). The workers engaged in noisy environment are provided with ear plugs/muffs. Noise monitoring stations are established for monitoring the noise level data and regularly monitored. Noise Monitoring report for the period April to September 2023 enclosed as annexure 39.

Noise results dB(A)

Date	SSM (PIT OFFICE)	
	Day	Night
APR 23 (1st PM)	59.30	58.30
APR 23 (2nd PM)	59.50	58.10
MAY 23 (1st PM)	57.80	56.50
MAY 23 (2nd PM)	58.50	57.40
JUNE 23 (1st PM)	59.30	58.20
JUNE 23 (2nd PM)	62.30	61.60
JULY 23 (1st PM)	58.50	57.40
JULY 23 (2nd PM)	56.40	54.90
AUG 23 (1st PM)	56.50	54.10
AUG 23 (2nd PM)	54.70	53.50
SEPT 23 (1st PM)	59.50	58.50

		SPM 30 (PM 10)	55.00	58.70
		SO2	75.00	79.99

(f)	Controlled blasting techniques shall be practised in order to mitigate ground vibrations, fly rocks, noise and air blast etc., as per the guidelines prescribed by the DGMS.	Controlled blasting is being done as per DGMS guidelines with cord relay and shock tubes. Blasting is being done as per the recommendation of Scientific study conducted by CMPDI, in Oct 2020
(g)	The noise level survey shall be carried out as per the prescribed guidelines to access noise exposure of the workmen at vulnerable points in the mine premises, and report in this regard shall be submitted to the ministry/ RO on six-monthly basis.	Noise level survey shall be carried out as per the DGMS guidelines to access noise exposure of the workmen at vulnerable points in the mine premises.

(E) Mining Plan

(i)	Mining shall be carried out under strict adherence to provisions of the Mines Act 1952 and subordinate legislations made there under as applicable.	Mining is carried out as per the provisions of the Mines Act 1952
(ii)	Mining shall be carried out as per the approved mining plan(including Mine Closure Plan) abiding by mining laws related to coal mining and the relevant circulars issued by Directorate General Mines Safety (DGMS).	All the activities are being done as per Approved Mining Plan. DGMS circulars are being strictly followed. Mine Closure Plan will be implemented as the mine will reach in final stage of operation.
(iii)	No mining shall be carried out in forest land without obtaining Forestry Clearance as per Forest (Conservation) Act 1980.	There is no forest land involved in the project area/ ML Boundary
(iv)	Efforts should be made to reduce energy and consumption by conservation, efficiency improvements and use of renewable energy.	Steps for installation of Renewable energy in mine premises is being taken. Renewable energy such as roof top solar power installation at the AGM office and building of Kendriya Vidhyalay is also implemented.

[F] Land Reclamation

(i)	Digital survey of entire lease hold area/ core zone using Satellite Remote Sensing survey shall be carried out at least once in three years for monitoring land use pattern and report in 1:50,000 scale or as notified by Ministry of Environment, Forest and Climate Change (MOEFCC) from time to time shall be submitted to MOEFCC/Regional Office (RO).	Land use pattern of the mine is studied every year through Satellite Imagery. Monitoring of same has been done by CMPDIL in 2022. Report of same is uploaded on WCL Website. https://www.westerncoal.in/?cmt=edu/2023
(ii)	The final mine void depth should preferably be as per the approved Mine Closure Plan, and in case it exceeds 40 m, adequate engineering interventions shall be provided for sustenance of aquatic life therein. The remaining area shall be backfilled and covered with thick and close top soil. Post-mining land be rendered usable for agricultural/ forestry purposes and shall be diverted. Further action will be treated as specified in the guidelines for preparation of Mine Closure Plan issued by the Ministry of coal dated 27th August 2009 and subsequent amendment.	Adequate care will be taken to sustain aquatic life or the void depth will be more than 40 mts as per mine closure plan once the mine is closed. Backfilled area will be reclaimed by plantation or other useful purposes. Mine closure plan/ guidelines will be followed.
(iii)	The entire excavated area, backfilling, external OB dumping (including top soil) and afforestation plan shall be in conformity with the "during mining"/"post mining" land use pattern which is an integral part of the approved Mining Plan and the EIA/ EMP submitted to the Ministry. Progressive compliance status vis-a-vis the post mining land use pattern shall be submitted to the MOEFCC/RO.	Total 21,17,550 nos. of saplings will be planted in 347.02 ha till mine closure. As on date, 120,000 nos. of trees planted over an area of 18 Ha in mine **Yearwise Actual Plantation as on Date** 2021-22 = 10,000 Nos. over an area of 4 Ha (PLAIN) & 15,000 Nos. over an area of 6 Ha (TOP SOIL DUMP) 2022-23 = 50,000 Nos. over an area of 20 Ha (TOP SOIL DUMP) 2023-24 = 35,000 Nos. over an area of 14 Ha (TOP SOIL DUMP) and 10,000 Nos. over an area of 4 Ha on Plain Land/ Avenue Plantation
(iv)	Fly ash shall be used for external dump of overburden, backfilling or stowing of mine as per provisions contained in clause (j) and (l) of	There is no provision of Fly Ash backfilling or using fly ash for mixing in external dump in approved mining plan

	subparagraph (ii) of fly ash notification issued vide SO 2804 (E) dated 3rd November,2009 as amended from time to time. Efforts shall be made to utilize gypsum generated from Flue Gas Desulfurization (FGD)(any) along with fly ash for external dump of overburden, backfilling of mines. Compliance report shall be submitted to Regional Office of MoEF&CC, CPCB and SPCB.	As per the CL guidelines, fly ash for backfilling will be utilised at the end of mine life, if required when the mine gets abandoned.
(v)	Further, it may be ensured that as per the time schedule specified in mine closure plan it should remain live till the point of utilization. The topsoil shall temporarily be stored at earmarked site (s) only and shall not be kept unutilized. The topsoil shall be used for land reclamation and plantation purposes. Active OB dumps shall be stabilized with native grass species to prevent erosion and surface run off. The other overburden dumps shall be vegetated with native flora species. The excavated area shall be backfilled and afforested in line with the approved Mine Closure Plan. Monitoring and management of rehabilitated areas shall continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the ministry of Environment, forest and Climate Change/ Regional Office.	14.205 Mm³ Top soil has been excavated till 30.09.2023 and is being stored in the earmarked site (Yelanal I OC: Top Soil Dump area: 12.28 Ha, height: 35 mts, bench: 3) & (Yelanal II OC: Top Soil Dump 1: area: 50.91 Ha, height: 36 mts, bench: 3 and : Top Soil Dump 2: area: 47.1 Ha, height: 28 mts, bench: 3). Top soil dump of Yelanal I OC mine and top soil dump near Yelanal Village of Yelanal II OC Mine are covered with tree plantation being near to the village site and to improve the stability, hence, top soil stored at these dumps are being considered as utilised. Rest will be utilized as per the plantation programme. 36.665 Mm³ OB (excl. top soil) has been excavated till 30.09.2023 and is being stocked at the earmarked dump site only (Yelanal I OC: Hard OB Dump area: 26.20 Ha, height: 30 mts, bench: 3) & (Yelanal II OC: Hard OB Dump, area: 71.79 Ha, height: 72 mts, bench: 5). Regarding Monitoring and management of rehabilitated areas, it is submitted that the same in respect of external OB dump is yet to start as the dump is active. But other vegetation / plantation, the monitoring and management will be continued till it becomes self sustaining. Compliance against this condition is a part of Six monthly EC Compliance report which is submitted to RO, MoEF&CC regularly and will continue to be submitted.
(vi)	The project proponent shall make necessary alternative arrangements, if grazing land is involved on core zone, in consultation with the State	Not Applicable, as no separate land is acquired for grazing land. However, designated patch of land, nearby the village and along the mine

	government to provide alternate areas for livestock grazing, if any. In this context, the project proponent shall implement the directions of Hon'ble Supreme Court with regard to acquiring grazing land.	boundary has been identified and left out for livestock grazing.

(G) Green Belt

(i)	The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered/endemic flora/fauna, if any, spotted/reported in the study area. The Action plan in this regard, if any, shall be prepared and implemented in consultation with the State forest and Wildlife Department.	Conservation plan for Scheduled species i.e. Great Indian Bustard (GIB) has been prepared and approved by PCCF (Wildlife), Nagpur. Fund of Rs 35 lakhs allocated was also deposited to DFO, Chandrapur and same is being spent to implement the activities as per the conservation plan. Implementation report given by DFO, Chandrapur vide letter no 397-ardevmnrs/21-22/600 dtd 04.01.22 & 441-ardevmnrs/23-24/1679 dtd 11.10.2023
(ii)	Greenbelt consisting of 3-tier plantation of width not less than 7.5 m shall be developed all along the mine lease area as soon as possible. The greenbelt comprising a mix of native species (endemic species should be given priority) shall be developed all along the major approach/ coal transportation roads.	120,000 nos. trees of native species over an area of 48 Ha are planned near Yekona Village since FY 2021-22. Out of this 10,000 nos. over an area of 4 Ha as green belt/ wind barrier/ Peripheral tree plantation is near the Yekona village habitation (planted in FY 2021-22). The width of green belt is minimum 50 mts. Plantation on top soil dump of Yekona I OC Mine will also act as greenbelt between mine and Warora - Madhali Road and Plantation on top soil dump of Yekona II OC Mine will also act greenbelt/ vertical greenery for Yekona Village. Further green belt around the mine will be strengthened in coming years.

(H) Public Hearing and Human Health Issues

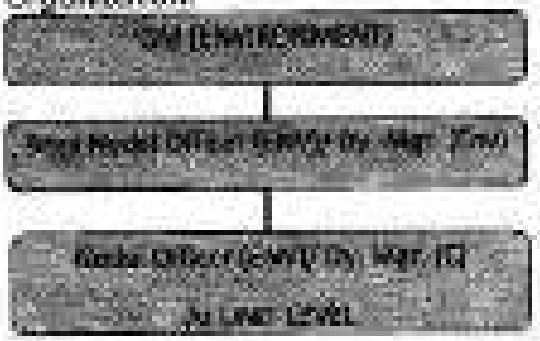
(i)	Adequate illumination shall be ensured in all mine locations (as per DGMS standards) and monitored weekly. The report on the same shall be submitted to the ministry & it's RO on six-monthly basis.	Adequate illumination is being done in all mine locations.

(ii)	The project proponent shall undertake occupational health survey for initial and periodical medical examination of the personnel engaged in the project and maintain records accordingly as per the provisions of the Mines Rules, 1955 and DGMS circulars. Yearly regular periodic health check up 20% of the personnel identified from workforce engaged in active mining operations shall be subjected to health check-up for occupational diseases and hearing impairment time to time.	Complied Regular and Periodical medical examination (IME and PME) of the workers (Departmental as well as contractual workers) has been undertaken at Mojri Area Hospital of WCL. Area Hospital is headed by Chief Medical Officer. Health check-up to detect for occupational diseases and hearing impairment is also being done.
(iii)	Personnel (including outsourced employees) working in core zone shall wear protective respiratory devices and shall also be provided with adequate training and information on safety and health aspects.	Personnel (including outsourced employees) working in mine is provided with protective respiratory devices and adequate training and information on safety and health aspects. It also provided at GVTC Mojri on induction in mining activity as well as on regular basis till they work in mines of WCL Mojri Area.
(iv)	Implementation of the action plan on the issues raised during the public hearing shall be ensured. The project proponent shall undertake all the tasks/measures as per the action plan submitted with mandatory provisions during the public hearing. Land oustees shall be compensated as per the norms laid down in the R&R policy of the company/State Government/Central Government, as applicable.	Majority of points under public consultation are related to employment. Both direct and in-direct employment is being generated due to the project. Borewell is provided in Charunkhali village and handpumps are provided in Mandla and Tekond village. Activities such as Medical Camps, Health survey/ check-up, Skill Development training for people in nearby villages, development of roads, Rain Water Harvesting works, Avenue Plantation, providing saplings for plantation in nearby villages are being done under CSR and Environment Head. Land oustees shall be compensated as per the norms laid down in the CIL R&R policy.
(v)	The project proponent shall follow the mitigation measures provided in the Ministry's OM No.F-11015/57/2014-IA.I (M) dated 29th October, 2014 titled 'Impact of mining activities on habitations-issues related to the mining projects wherein habitations and	There is no habitation within the Project area/ near project area as on date. Further, with reference to the OM dtd 29.10.2014, we have been practicing best mine practices such as providing catch drains, garland drains to arrest runoff from the dumps. Adequate rain

	villages are the part of mine lease areas or habitations and villages are surrounded by the mine lease area.	water harvesting measures are also being taken in and around mine area to recharge the groundwater level. Regular monitoring of ground water level is also being done in core and buffer zone of the mine. Illumination and sound level of the mine are being monitored inside mine as well as at nearby habitation. Designated patch of land nearby village and along the mine boundary is left out for livestock grazing. Vibration monitoring is also being done to ascertain the impact of blasting. Mobile water tankers are used for dust suppression on haul road and fixed sprinklers are provided for dust suppression on coal transportation road.

(I). Corporate Environment Responsibility

(i)	The project proponent shall comply with the provisions contained in the Ministry's OM vide F.No.22-65/2017-IA.III dated 1st May 2018, as applicable, regarding Corporate Environment Responsibility.	Borewell is provided in Chanukhori village and handpumps are provided in Wardia and Tekana village. Activities such as Medical Camps, Health survey/ check-up, Skill Development training for people in nearby villages, development of roads, Rain Water Harvesting works, Avenue Plantation, providing saplings for plantation in nearby villages are being done under CSR and Environment Head. However, as the project is currently already operational, works taken up in nearby village are accounted in CSR Head.
(ii)	The company shall have a well laid down environmental policy duly approve by the Board of Directors. The environmental policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infringements/ deviations/ violation of the environmental/	Coal India Limited has its well laid down environmental policy duly approve by the CIL Board. The Environment Policy prescribes for standard operating process/ procedures to bring into focus any infringements/deviation/violation of the

	forest/ wildlife norms/ conditions the company shall have defined system of reporting infringements/ deviations/ violation of the environmental/ forest/ wildlife norms/ conditions and/ or shareholders/stake holders.	environmental or forest norms/conditions. The company has a well laid down system of reporting of non-compliances/ violations of environmental norms to the board of Directors of the company and/or shareholders or stakeholders at large.
(ii)	A separate Environmental Cell both at the project and company head quarter level with qualified personnel shall be set up under the control of senior Executive, who will directly to the head of the organization.	Environment Cell exists at HO, Area & project level. GM (Environment) directly reports to the head of the Organization. 
(iv)	Action plan for implementing RMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environment protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the Six Monthly Report Compliance Report.	The year wise funds earmarked for environmental protection measures are kept in separate account and not diverted for any other purpose.
(v)	Self environmental audit shall be conducted annually. Every three years third party environmental audit shall be carried out.	Environmental Audit Cell has been formulated to ensure implementation of all the EC Conditions vide letter no. WCL/HQ/ENV/30-B & 254/71-81 dated 18.09.2017.

(J) Miscellaneous

(i)	The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising it at least in two local newspapers of the District	Advertisement given in following 2 Newspapers :- 1) Chandrapur Samachar (Marathi) dated 06.01.2021 2) Mahavidharbha (Hindi) dated 06.01.2021

	or State, of which one shall be in the vernacular language within seven days and in addition this shall also be displayed in the project proponent's website permanently.	
(ii)	The copies of the environmental clearance shall be submitted by the project proponent to the heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the Government who in turn has to display the same for 30 days from the date of receipt.	Copies of the environmental clearance is submitted to the heads of local bodies and Municipal Bodies and relevant offices of the Government between 02.01.21 to 05.01.21 and submission to Panchayat offices on 19.01.2021 due to panchayat election in January 2021.
(iii)	The project proponent shall upload the status of compliance of the stipulated environment clearance conditions, including result of monitored data on their website and update the same on half-yearly basis.	Compliance of the stipulated environment clearance conditions, including result of monitored data are uploaded on WCL website regularly (http://www.wclonline.co.in/Specsite/270).
(iv)	The project proponent shall monitor the criteria pollutants level namely; PM10, SO2, NOx (ambient levels) or critical sectoral parameters, notified for the projects and display the same at a convenient location for disclosure to the public and put on the website of the company.	Pollutants level namely; PM10, PM2.5, CO, SO2, NOx data being monitored at CAAQMS and same is displayed at LED Board installed at CAAQMS Station. Moreover, Ambient AAQ monitoring in core and buffer zone. Data of same is displayed on manual handwritten board installed at Manager Office. CAAQMS data also displayed by LED Display Board at CAAQMS Entrance also
(v)	The project proponent shall submit six monthly report on the status of the compliance of the stipulated environmental conditions on the website of the ministry of environment, forest and Climate Change or environment clearance portal.	Six monthly EC Compliance reports are uploaded on MoEF Website/ portal regularly. Same can also be accessed from Company's webpage showing Environmental compliance
(vi)	The project proponent shall follow the mitigation measures provided in the Ministry's OM No. J-11013/57/2014-IA. II (M) dated 29th October,2014. Effect/ Impact of mining activities or habitations-towns related to the mining projects wherein habitations and villages are the part of mine lease areas or habitations and villages are surrounded by the mine leases area.	There is no habitation within the Project area/ near project area working as on date. Further, with reference to the OM dtd 29.10.2014, we have been practicing best mine practices such as providing catch drains, garland drains to arrest runoff from the dumps. Adequate rain water harvesting measures are also being taken in and around mine area to recharge the groundwater levels. Regular monitoring of ground water level is also being done in core and buffer zone of the mine. Illumination and sound level of the mine are being monitored inside mine as well as at nearby habitation.

		Designated patch of land near village and along the mine boundary is left out for livestock grazing. Vibration monitoring is also being done to ascertain the impact of blasting. Mobile water tankers are used for dust suppression on haul road and fixed sprinklers are provided for dust suppression on coal manpenkation road.
[vii]	The project proponent shall submit the environmental statement for each financial year in Form-V to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company.	Environment Statement (Amalg. Yekona I&II OC mine) for 2022-23 has been submitted to MPCB vide UAN No. 56705 on dated 09.09.2023 as prescribed under the Environment (Protection) Rules 1986, as amended subsequently. same is also been uploaded on the Company's website along with the status of compliance of EC conditions
[viii]	The project authorities shall inform to the Regional Office of the MoEF&CC regarding commencement of mining operations.	Information regarding commencement of mining operations of Amalg. Yekona I & II OC Mine is given to the Regional Office of the MOEF&CC vide e-mail dated 27.11.2021
[ix]	The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government.	Noted and is being complied
[x]	The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report, commitment made during Public Hearing and also that during their presentation to the Expert Appraisal Committee.	Noted and is being complied
[xi]	No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forest and Climate Change.	Noted
[xii]	Concealing factual data or submission of false/ fabricated data may result in revocation of this environmental clearance and attract action under the provisions of Environment (Protection) Act, 1986.	Noted
[xiii]	The ministry may revoke or suspend the clearance, if implementation of any of the above condition is not satisfactory.	Noted
[xiv]	The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.	Noted

(xv)	The regional office of this ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data/ information/ monitoring reports.	Noted
(xvi)	The above conditions shall 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, Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and the public liability Insurance Act, 1991 along with their amendments and rules and any other orders passed by the Hon'ble supreme court of India/ High courts and any other court of law relating to the subject matter.	Noted
5.	The proponent shall abide by all the commitment and recommendations made in the EIA/ EMP report and also that during presentation to the EAC. All the commitments made on the issues raised during public hearing shall also be implemented in letter and spirit.	Noted
6.	The proponent shall obtain all necessary clearance/ approvals that may be required before the start of the project. The Ministry or any other competent authority may stipulate any further condition for environmental protection. The Ministry or any other competent authority may stipulate any further condition for environmental protection.	Noted and complied
7.	Any appeal against this environmental clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under section 16 of the National Green Tribunal Act,2010.	Noted
8.	The coal company/ project proponent shall be liable to pay the compensation against the illegal mining, if any, and as levied by the respective State Government/ or any point of time, in terms of the decree dated 2nd August, 2017 of Hon'ble Supreme Court in WPC(Civil) No.114/2014 in the matter of	There is no illegal mining in the jurisdiction of WCL Majri Area. The production is within the permitted EC & CTO Capacity

	"Common Cause Vs Union of India & others.	
9.	The concerned State Government shall ensure no mining operations to commence till the entire compensation for illegal mining, if any, is paid by the project proponent through their respective Department of mining & Geology, in strict compliance of the judgment of Hon'ble Supreme Court.	There is no illegal mining in the jurisdiction of WCL Majri Area. The production is within the permitted EC & CTO Capacity
10.	The environmental compliance shall not be operational till such time the project proponent complies with the above said judgment of Hon'ble Supreme Court, as applicable, and other statutory requirements.	Noted.

Sub Area Manager
For Area Mg. Yekona I & II OC Mine
Area Mg. Yekona Sub Area

ANNEXURE 1

No. F-11015/01/2015-IA-II (M)
Government of India
Ministry of Environment, Forest & Climate Change
Impact Assessment Division
*****

Indira Paryavaran Bhawan,
Jorbagh Road, N Delhi – 3
Email: R.Bokolia@nic.in Tel: 01124695301

Dated: 1st January, 2021

To,

The General Manager (Environment),
M/s Western Coalfields Ltd
Coal Estate, 9th Floor, Civil Lines,
Nagpur – 1 (Maharashtra)
Email: gmenvironment.wclimit@yahoo.in

Sub: Amalgamated Yekona I & II OC (Phase-I) with increase in production capacity from 1.1 MTPA to 2.75 MTPA (Normative) of M/s Western Coalfields Limited and increase in land area from 680.06 ha to 1679.39 ha located in Tehsil Warora, District Chandrapur (Maharashtra) - For Environmental Clearance – reg.

Sir,

This has reference to your online proposal No. IA/MH/CON/135434/2019 dated 7th January, 2020, submitted to this Ministry for grant of Environmental Clearance (EC) in terms of the provisions of the Environment Impact Assessment (EIA) Notification, 2006 under the Environment (Protection) Act, 1986 for Amalgamated Yekona I & II OC (Phase-I) with increase in production capacity from 1.0 MTPA to 2.75 MTPA (Normative) of M/s Western Coalfields Limited and increase in land area from 680.06 ha to 1679.39 ha located in Tehsil Warora, District Chandrapur (Maharashtra).

2. The project/activity is covered under category 'A' of Item 1(a) 'Mining of Minerals' in Schedule to the EIA Notification, 2006.

3. The proposal was considered by the Expert Appraisal Committee (EAC) in its 53rd meeting held on 28th February, 2020, 55th meeting held on 29th May, 2020, 7th EAC meeting held on 17-18 August, 2020 and 8th EAC meeting held on 27th October, 2020. The details of the project, as per the documents submitted by the project proponent, and also as informed during the meeting, are reported to be as under: -

(i) The existing Yekona-I OC and Yekona-II OC mines have been granted environmental clearance vide letter EC vide letter J-11015/175/ 2006-IA.II(M) Dated-17 October, 2006(production capacity- 0.40 MTPA within ML area of 255.50 ha) and letter J-11015/182/2006-IA.II(M) Dated-17 October, 2006 (production capacity- 0.60 MTPA within ML area of 414.56ha) respectively.

EC for Amalgamated Yekona I & II of M/s Western Coalfields Limited

(i) The existing mines are proposed to be amalgamated with increasing in Capacity from 1.0 MTPA to 2.75 MTPA (Normative) and3.44 MTPA (Peak) & expansion in Lease Area from 680.06 ha to 1679.39 ha in Phase-I

(ii) The proposal was granted ToR vide MoEF&CC vide letter no J-11015/381/2015.IA-II (M) dated 06.06.2016 for Amalgamated Yekona I & II OC involving increase in production capacity from 1.00 MTPA to 3.44 MTPA (peak) and increase in ML area from 680.06 ha to 1701.32 ha based on the Approved Project Report. MoEF&CC accorded approval for extension of validity of ToR dated 6th June, 2016 for Amalgamated Yekona I & II OC for a period of 1 year i.e. up to 6th June, 2020 vide MoEF&CC letter no J-11015/381/2015.IA-II (M) dated 21.06.2019.

(iv) The project area is covered under Survey of India Topo Sheet No 55L/13 & 55L/9 and is bounded by the geographical coordinates ranging from Latitudes N 20° 13' 39" to 21° 16' 14" N and longitudes E 79° 58'25" to 79° 59' 24" E

(v) Coal linkage of the project was for Thermal power plants of MAHAGENCO & Miscellaneous consumers. There is no Joint venture involved

(vi) Project does not fall in the Critically Polluted Area (CPA), where the MoEF&CC's vide its OM dated 13th January, 2016 has imposed moratorium on grant of environment clearance

(vii) Employment generation: Required Manpower for the project is 257 Nos(Departmental)

(viii) This project will thus bridge the gap (to the extent of the peak production capacity of the project) between demand & supply of non – coking coal for power plants & other bulk consumer

(ix) The Project Report (including Mining Plan) of Amalgamated Yekona I & II OC was duly approved by CIL Board for normative capacity of 2.75 MTPA and peak capacity of 3.44 MTPA within area of 1701.32 ha in its 319th meeting held on 12.08.2015 as communicated by Company Secretary, CIL vide its letter no. CIL: XRD/04112/2015/10975 dated 26.08.2015

(x) Total mining lease area is increased from 680.06 ha to 1679.39 ha. The Mining Plan (including Mine Closure plan) of Amalgamated Yekona I & II OC Mine Phase-I of Majri Area was duly approved by WCL Board for Phase-I in its 315th meeting held on 27th & 28th September, 2019 vide its letter no. WCL/BD/SECT/BM-315/2019/958 dated 17.10.2019

(xi) RO, MoEF&CC, Nagpur made site visit of Yekona I & II OC mine for monitoring status of compliance of EC conditions on 26.05.2019. The Certified Compliance Report was issued by the Regional Office of MoEF&CC, Nagpur vide letter no. EC/10/RON/2019-NGP/5822 dated 19.08.2019. Subsequently, Action Taken Report on the period compliances has been submitted to RO MoEF&CC vide letter no. 170 dated 23.08.2019

(xii) The Phase-I of Project is only an interim arrangement for working without inclusion of forest land. However, as the forestry clearance is obtained, the mine will continue as per the approved Project Report with total ML Area of 1701.32 ha. Beside EC will be secured covering the total area of 21.00 ha (total surrounding 1701.32 ha as per TOR) in Phase-II. Accordingly, the breakup of land use during mining, post mining land use, Stage-wise land use reclamation and Stage-wise plantation programme are detailed below for total ML area of 1701.32 ha

(xiii) Pre-mining land use for Amalgamated Yekona I & II OC (Phase-I)

ANN 1

S.N.	LAND USE	Within ML Area (ha)	Outside ML Area (ha)	Total
1	Agricultural land	1570.31	50.49	1620.80
2	Forest land	--	--	--
3	Waste land/Govt. land	58.59	-	58.59
4	Grazing land	--	--	--
5	Surface water bodies	--	--	--
6	Settlements	--	--	--
7	Others (specify)	--	--	--
	Total	**1628.90**	**50.49**	**1679.39**

For Amalgamated Volume I & II OC

Sl.No.	LAND USE	Within ML Area (ha)	Outside ML Area (ha)	Total
1	Agricultural land	1590.63	50.49	1641.11
2	Forest land	0.62	--	0.62
3	Waste land/Govt. land	59.59	-	59.59
4	Grazing land	--	--	--
5	Surface water bodies	--	--	--
6	Settlements	--	--	--
7	Others (specify)	--	--	--
	Total	**1650.83**	**50.49**	**1701.32**

Land Use During Mine:

Sl. No	Particulars	Area (ha)
1.	Quarry/ excavated Area (including existing quarry)	689.20
2.	External OB dump	500.02
3.	Nalla Diversion and existing Nallah Irrigation Canal	58.53
4.	Residential Colony (Approximately)	10.00
5.	Roads, Road diversion and Services due to roads (Approximately)	30.00
6.	Infrastructure and service roads (Approx.)	130.00
7.	Flood protection embankment	64.57
8.	Land for relocation of Manki village	8.30
9.	Railway siding and its Approach road	30.00
10.	Bunding / Safety zone along quarries and external dump	270.00
11.	Rationalization of boundary	141.38
	Total	**1791.52**

Post Mining Land Use details:

S.N.	Land use during mining	Land use (ha)				
		Plantation	Water Body	Public use	Undisturbed	Total
1	External OB Dump	520.02	--	--	--	520.02
2	Top soil dump	--	--	--	--	--
3	Excavation	352.01	337.20	--	--	689.20

4	Roads	5.00	--	25.00	–	30.00
5	Built up area	70.00	–	122.37	–	192.37
5a	Nala and Cross Diversion	–	58.55	–	–	58.55
6	Green Belt	Included in S. No. 4, 5 & 7				
7	Undisturbed Area	100.00	–	–	311.38	411.38
	Total	847.62	295.52	147.37	311.38	1701.32

(xiv) Total geological reserve reported in the mine lease area is78.62 MT with 67.65 Mt mineable reserve. Extractable reserves are 57.85 Mt. Percent of extraction is 73.58 %

(xv) There is one composite seam with multiple sub sections. Sequence of Coal Seams in the Yekona-I OC and Yekona-II OC blocks are given below. Sequence of Coal Seams in Yekona-I Block:

(xvi) Grade of Coal GCV – 4910kcal/kg. OB stripping ratio 1: 7.82 m^3/t

(xvii) Mining operations undertaken by opencast method with shovel dumper Combination and Surface Miner.

(xviii) Life of mine: 25 years

(xix) The project will have two nos. internal dumps in an area of 352.00 ha with Maximum height of 90 m above ground level and quantity of 322.53 Mm^3 of OB. A total seven nos of external OB dumps are envisaged including 4 temporary stumps to be extended within total area of 320.02 ha and upto the height of 90 m above ground level and quantity of 120.50 Mm^3 of OB (including embankment). 2.42 $Mm3$ OB will be utilized in construction of Embankment.

(xx) Total quarry area is 689.20 ha. Backfilled quarry area of 352.02 ha shall be reclaimed with plantation. Final mine void will be created in an area of 337.20ha with a maximum depth of 150 m. Final mine void will be converted into water body.

(xxi) Transportation of coal in pits by dumpers, from surface to Railway sidings by tippers. The coal will be transported to Thermal power plants of MAHAGENCO and to Miscellaneous Consumers. Railway Siding is proposed for the project.

(xxii) Reclamation Plantaffforestation plan is for 847.62 ha.It includes 320.02 ha of external OB dump, 352.00 ha of Internal dump, 100 ha on undisturbed land and 5 ha along roads & infrastructure.

(xxiii) No forest land has been reported in the Phase-I of the project.

(xxiv)No National Parks, Wildlife Sanctuaries and Eco-Sensitive Zones have been reported with 10 km boundary of the project. The presence of Schedule-I species Great Indian Bustard has been reported within the study area.

(xxv) The ground water level has been reported to be varying between 7.75 to 10.64 m during pre-monsoon and between 4.65 to 8.18 m during post-monsoon (core zone). Total water requirement for the project is 810 KLD.

(xxvi)CGWA NOC: NOC from CGWA has been secured for abstraction of ground water vide its letter CGWA/NOC/MON/ORIG/2019/5085 dated 19.11.2019.

(xxvii) Public Hearing has been conducted on 14.03.2019 for proposed conversion of Amalgamated Yekona I & II OCP at Mine Manager Office Premises, Yekona OC, WCL, Tal. Warora, Dist. Chandrapur. The minutes of meeting was received from Maharashtra Pollution Control Board vide letter MPCB/SRO/C/3939/2019 dated 23.07.2019. The ATR

against issues raised during public hearing along with the fund provision and timeline are provided in Chapter-7 of the EIA-EMP report.

(xxviii)The CTE for the Yekona I-OC has been granted by Maharashtra Pollution Control Board vide consent no PO/ROP/P/CC-330 dated 13.03.2008. However, mining activities could not be started due to delay in physical possession of land. The application for CTO of Yekona-I OC has been made by Project Proponent on 18.02.2019 for the period of 01.04.2019 to 31.03.2020 (Application no - UAN No. 67298). The application under consideration at Maharashtra Pollution Control Board. The mining operations in Yekona-I OC are likely to be commenced before March'20.

(xxxix)Mining operations has been started by 26th October 2017 within the Yekona –II OC in accordance with the CC dated 06.10.2006. The Yekona – II OC mine has been granted CTE by Maharashtra Pollution Control Board vide consent no BO/ROP/P/CC-328 dated 13.03.2006 for production capacity of 0.60 MTPA. CTO for Yekona-II OC mine for production capacity of 0.60 MTPA within ML area of 414.56 ha was granted by MPCB vide consent order no-PO/JD(A)/CTO/EIC No. CTO-1781-15/CCC-6289 dated 12.05.2016 with validity till 31.08.2020.

(xxx) A seasonal nullah flowing in the eastern boundary of the mine will be diverted along the mine boundary. An irrigation canal passing through the project area will also be diverted along the southern boundary of OCP.

(xxxii)NOC from CGWA has been accorded for abstraction of ground water vide its letter CGWA/NOC/MIN/OBJ/2019/0689 dated 15.11.2019.

(xxxi) Baseline for Ambient Air Quality has been generated from Oct' 2016 to Dec' 2016 in the Post monsoon season. The results were found to be within prescribed limits. The regular environment monitoring is being done continuously in the core and buffer zone of the project. In continuation with regular environmental monitoring, monitoring at five locations as baseline frequency i.e twice a week has been started from Jan'2020 and will be continued for twelve weeks. Additional three stations have also been added from Feb'2020.

(xxxii)No court cases, violation cases are pending against the project of the PP pertaining to environment.

(xxxiv) The project does not involve violation of the EIA Notification, 2006 and amendment issued thereunder. No excess production of coal from the sanctioned capacity has been noticed in Yekona-I and Yekona-II OC mines since grant of EC in 2006.

(xxxv) The project involved 797 project affected families. A Capital provision of Rs. 41.1938 crores has been made in approved Project Report for resettlement of Manki Village.

(xxxvi)Total capital cost of the project is Rs. 745.8513 Crores. Capital cost on Environment management plan is Rs 97.89 Lakhs. Revenue cost on EMP will be 6 Rs/annu. CSR cost will be utilized in the 15 Km radius of the project which will add to the overall socio-economic development of the area. The commissioning of the project will create direct & indirect employment.

4. The Sectoral Expert Appraisal Committee in its 3rd meeting held on 27th October, 2020 has recommended the proposal for grant of Environment Clearance. Based on recommendations of the EAC, the Ministry of Environment, Forest and Climate Change hereby accords approval for Amalgamated Yekona I & II OC (Phase-I) with increase in production capacity from 1.2 MTPA to 2.75 MTPA (Normative) of M/s Western Coalfields Limited and increase in land area from 680.36

3a to 1679.39 ha located in Tehsil Warora, District Chandrapur (Maharashtra), under the provisions of Environment Impact Assessment Notification, 2006 and subsequent amendments/circulars thereto subject to the compliance of the following terms & conditions / specific conditions as stated below:-

(i) The Environmental Clearances issued vide letter no. mentioned letter J-11015/75/2006-IA.II(M) Dated-17 October, 2006 and letter J-11015/182/2006-IA.II(M) Dated 13th December, 2006 stated shall be applicable along with this conditions.

(ii) The project proponent shall obtain Consent to Establish/Operate from the State Pollution Control Boards for the proposed capacity of 5.75MTPA prior to commencement.

(iii) Third party monitoring by NEERI/CIMFR/IIT/NIT(s) for air quality shall be carried out at identified locations both ambient and the process area, to arrive at impact of the proposed expansion at regular interval of 5 years.

(iv) Top soil should be stored separately at marked area and necessary vegetation shall be maintained to avoid any containment of dust.

(v) PP shall construct embankment leaving 100 mtrs away from HFL of Wardha river and the same shall be taken prior approval from DGMS.

(vi) Transportation of coal from Coal Handling Plant shall be through mechanized covered trucks for 3 years. No transportation by trucks after 3 years and proposed railway siding/pipe conveyor system.

(vii) All the villages coming under the zone of influence as in hydrology study shall be provided with suitable water supply alongwith sanitation facility.

(viii) Commitment made during public consultation process shall be adhere to. As proposed, Rs. 45.35 Crore is earmarked for CER activities shall be considered as part of Environment Management Plan, which shall be accomplished within period of 5 years.

(ix) Water quality and Biomass test of Wardha River shall be monitored quarterly and submitted to State Pollution Control Board. No water shall be discharged in river.

(x) Quarterly monitoring of quality of water from bore hole used for drinking purpose shall be conducted and report thereof shall be submitted to SPCB.

(xi) Progressive backfilling of mine and progressive reclamation of OB dump shall be done.

(xii) To control the production of dust at source, die crusher and in pit belt conveyors shall be provided with mist type sprinkler.

(xiii) Mitigating measures shall be undertaken to control dust and other fugitive emissions all along the roads by providing sufficient fixed type water sprinklers. Adequate corrective measures shall be undertaken to control dust emissions, which would include mechanized sweeping, water sprinkling/mist spraying on haul roads and loading sites, long range misting/fogging arrangements, wind barrier wall and vertical greenery system, green belt, dust suppression arrangement at loading and unloading points, etc.

(xiv) Continuous monitoring of occupational safety and other health hazards, and the corrective actions need to be ensured.

(xv) The total industrial water demand (peak) in operation phase shall be met by utilizing treated mine discharge water. If require, necessary arrangement shall be made to reuse treated water from STP & ETP to nearby TPP or coal washery or future coal washery by entering suitable agreement. No wastewater (treated or untreated) shall be discharged into the river or any other water body.

(xvi) PP shall take permission of State Public Works Department before the proposed diversion of Road. Road between Nirdoy village to Wereni shall be constructed by project proponent in co-ordination with PWD atleast 7 mtr width and tree plantation shall be done along with road (both sides).

(xvii) STP for proposed colony shall be constructed within one year of implementation of colony.

(xviii) The wall of atleast 15 mtr to 20 mtr height should be constructed along the OB dump to protect yekona village.

(xix) 5 Fog canon shall be installed to reduce the impact of air pollution for nearby sukana village.

(xx) Water storage ponds shall be constructed at appropriate depth in nearby village (Pandurni Village, Wanoja Village, Naydoy Village and Mohbeda Village) in collaboration with Gram Panchayats.

(xxii) Peripheral tree plantation of local species in nearby village (Pandurni Village, Wanoja Village, Naydoy Village and Mohbeda Village) in collaboration with Gram Panchayats.

(xxiii) Fund allocated in Approved Wildlife conservation plan for schedule I species shall be deposited within six months of issue of EC letter.

(xxiii) Green belt along the mine boundary should be developed on priority basis preferably within first 5 years.

(xxiv) The recommendation of Scientific Study for Method of Working, Ultimate Pit Slope, Dump Slope & Monitoring of Slope Stability conducted by Indian Institute of Technology, Kharagpur shall be complied.

(xxv) 3- tier tree plantation with wind breaking shall be by project proponent for closely demarcating forest land adjacent forest land.

(xxvi) Persons of nearby villages shall be given training on livelihood and skill development to make them employable.

(xxvii) Mining shall be carried out only by surface miners for the project (as proposed) and site loading till railway siding through in pit conveyor should be installed to avoid road transportation in 5 years.

(xxviii) Efforts shall be made for utilizing alternate sources of surface water, abandoned mines or else wherever and thus minimizing the dependability on a single source.

(xxix) Active OB Dump should not be kept barren/open and should be covered by temporary grass to avoid air born of particles.

(xxx) Project proponent to plant 100,000 nos. of native trees with broad leaves along the transportation route in three years to prevent the effect of air pollution. After completion of tree plantation, number of trees shall be duly endorsed from District Forest Officer.

(xxxi) Project Proponent shall obtain blasting permission from DGMS for conducting mining operation near villages and also explore deployment of rock breakers of suitable capacity in the project to avoid blasting very near to villages. There shall be no damages caused to habitation/structures due to blasting activity.

(xxxii) The Project Proponent shall comply with all the statutory requirements and judgment of Hon'ble Supreme Court dated the 2nd August 2017 in Writ Petition (Civil) No. 114 of 2014 in the matter of Common Cause versus Union of India and Ors. State Government shall ensure that the entire compensation levied, if any, for illegal mining paid by the Project Proponent through their respective Department in strict compliance of judgment of Hon'ble Supreme Court dated the 2nd August 2017 in Writ Petition (Civil) No. 114 of 2014 in the matter of Common Cause versus Union of India and Ors.

(xxxiii) Project Proponent shall obtain the necessary prior permission from the Central Ground Water Authority (CGWA) in case of intersecting the Ground water table.

(xxxiv) Proponent shall appoint an Occupational Health Specialist for Regular and Periodical medical examination of the workers engaged in the Project and maintain records accordingly; also Occupational health check-ups for workers having some ailments like BP, diabetes, habitual smoking, etc. shall be undertaken once in six months and necessary remedial/preventive measures taken accordingly. The Recommendations of National Institute for creating good occupational environment for mine workers shall be implemented. The prevention measure for dust, malaria and provision of anti snake venom including all other preventive safeguards may be ensured before initiating the mining activities.

(xxxv) Project Proponent shall follow the mitigation measures provided in Office Memorandum No. 2-11013/57/2014-IA.II (M), dated 20th October, 2014, titled "Impact of mining activities on Habitations Issues related to the mining Projects wherein Habitations and villages are the part of mine lease areas or Habitations and villages are surrounded by the mine lease area".

(xxxvi) The illumination and sound at night at project site disturb the villages in respect of both human and animal population. Consequent sleeping disorders and stress may affect the health in the villages located close to mining operations. Habitations have a right for darkness and minimal noise levels at night. PPs must ensure that the biological clock of the villages is not disturbed; by orienting the floodlights/ masks away from the villagers and keeping the noise levels well within the prescribed limits for day/ night hours.

(xxxvii) The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered fauna, if any, spotted in the study area. Action plan for conservation of flora and fauna shall be implemented in consultation with the State Forest and Wildlife Department. A copy of action plan shall be submitted to the Ministry of Environment, Forest and Climate Change and its Regional Office.

(xxxviii) Hon'ble Supreme Court in an Writ Petition(s) Civil No. 114/2014, Common Cause vs Union of India & Ors vide its judgement dated 8th January, 2020 has directed the Union of India to impose a condition in the mining lease and a similar condition in the environmental clearance and the mining plan to the effect that the mining lease holders shall, after ceasing

mining operations, undertake re-grading the mining area and any other area which may have been disturbed due to their mining activities and restore the land to a condition which is fit for growth of fodder, flora, trees etc. Compliance of this condition after the mining activity is over at the cost of the mining lease holder/Project Proponent. The implementation report of the above said condition shall be seen to the Regional Office of the MoEFCC.

Specific condition with respect area being in CPAs

(i) CTE/CTO for the project shall be obtained from the SPCB as required under the Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974, and the SPCB shall follow the mechanism/protocol issued by the Ministry vide letter no. Q-160/7/58/2018-CPA dated 24th October, 2019 while issuing the CTE/CTO for the project, for improvement of environmental quality in the area.

(ii) The green belt of at least 5-10 m width shall be developed in more than 40% of the total project area, mainly along the periphery of mine boundary, in downward wind direction, and along road sides etc. Selection of plant species shall be as per the CPCB guidelines in consultation with the State Forest Department.

(iii) In addition, the project proponent shall develop greenbelt outside the plant premises such as avenue plantation, plantation in vacant areas, social forestry etc.

(iv) Monitoring of compliance of EC conditions may be submitted with third party audit every year.

(v) Fund allocation for Corporate Environment Responsibility (CER) which is about 2 times as per OM of 1st May, 2018 may now be considered as 2 time of fund allocated on commitment made during public consultation process for incorporating in EIA/EMP for deliberation of EAC and non-raise details along with time bound action plan shall be prepared and submitted to the Ministry's Regional Office.

(vi) Effective fugitive emission control measures should be implemented in the process, transportation, packing etc.

(vii) Transportation of materials by rail/conveyor belt, wherever feasible.

(viii) A detailed water harvesting plan may be submitted by the project proponent.

(ix) In case, domestic waste water generation is more than 10 KLD, the industry may install STP.

(x) Monitoring of compliance of EC conditions may be submitted with third party audit every year.

4.4 The grant of environmental clearance is further subject to compliance of the Standard EC conditions as under:

(a) Statutory compliance

(i) The project proponent shall obtain forest clearance under the provisions of Forest (Conservation) Act, 1980, in case of the diversion of forest land for non-forest purpose involved in the project.

(iv) The project proponent shall obtain clearance from the National Board for Wildlife, if applicable.

(v) The project proponent shall prepare a Site-Specific Conservation Plan / Wildlife Management Plan and approved by the Chief Wildlife Warden. The recommendations of the approved Site-Specific Conservation Plan/Wildlife Management Plan shall be implemented in consultation with the State Forest Department. The implementation report shall be furnished along with the six-monthly compliance report (in case of the presence of schedule-I species in the study area).

(vi) The project proponent shall obtain Consent to Establish/Operate under the provisions of Air (Prevention & Control of Pollution) Act, 1981 and the Water (Prevention & Control of Pollution) Act, 1974 from the concerned State pollution Control Board/ Committee.

(vii) The project proponent shall obtain the necessary permission from the Central Ground Water Authority.

(viii) Solid/hazardous waste generated in the mines needs to adhere in accordance to the Solid Waste Management Rules, 2016/Hazardous & Other Waste Management Rules, 2016.

(b) **Air quality monitoring and preservation**

(i) Continuous ambient air quality monitoring stations as prescribed in the status be established in the core zone as well as in the buffer zone for monitoring of pollutants, namely PM_{10}, $PM_{2.5}$, SO_2 and NO_x. Location of the stations shall be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board. Online ambient air quality monitoring stations may also be installed in addition to the regular monitoring stations as per the requirement and/or in consultation with the SPCB. Monitoring of heavy metals such as Hg, As, Ni, Cd, Cr, etc. to be carried out at least once in six months.

(ii) The Ambient Air Quality monitoring in the core zone shall be carried out to ensure the Coal Industry Standards notified vide GSR 742 (E) dated 25th September, 2000 and as amended from time to time by the Central Pollution Control Board. Data on ambient air quality and heavy metals such as Hg, As, Ni, Cd, Cr and other monitoring data shall be regularly reported to the Ministry/Regional Office and to the CPCB/SPCB.

(iii) Transportation of coal, to the extent permitted by road, shall be carried out by covered trucks/conveyors. Effective control measures such as regular water mist sprinkling/anti gas ex shall be carried out in critical areas prone to air pollution (with higher values of PM_{10}/$PM_{2.5}$) such as haul road, loading/unloading and transfer points. Fugitive dust emissions from all sources shall be controlled regularly. It shall be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central/State Pollution Control Board.

(iv) The transportation of coal shall be carried out as per the provisions and norms envisaged in the approved Mining Plan or environment monitoring plan. Transportation of the coal

through the existing road passing through any village shall be avoided. In case, it is proposed to construct a 'bypass' road, it should be so constructed so that the impact of sound, dust and accidents could be appropriately mitigated.

(v) Vehicular emissions shall be kept under control and regularly monitored. All the vehicles engaged in mining and allied activities shall operate only after obtaining 'PUC' certificate from the authorized pollution testing centres.

(vi) Coal stock piles/ash/fuel and crusher material transfer points shall invariably be provided with dust suppression system. Belt-conveyors shall be fully covered to avoid air borne dust. Side cladding all along the conveyor gantry should be made to avoid air borne dust. Drills shall be wet operated or fitted with dust extractors.

(vii) Coal handling plant shall be operated with effective control measures w.r.t. various environmental parameters. Environmental friendly sustainable technology should be implemented for mitigating such parameters.

(c) Water quality monitoring and preservation

(i) The effluent discharge (mine water, workshop effluent) shall be monitored in terms of the parameters notified under the Water Act, 1974 Coal Industry Standards vide GSR 742 (E) dated 25th September, 2000 and as amended from time to time by the Central Pollution Control Board.

(ii) The monitoring data shall be uploaded on the company's website and displayed at the project site at a visible location. The circular No.J-20013/1/2006-IA.II (M) dated 27th May, 2009 issued by Ministry of Environment, Forest and Climate Change shall also be referred in this regard for its compliance.

(iii) Regular monitoring of ground water level and quality shall be carried out in and around the mine lease area by establishing a network of existing wells and constructing new piezometers during the mining operations. The monitoring of ground water levels shall be carried out four times a year i.e. pre-monsoon, monsoon, post-monsoon and winter. The ground water quality shall be monitored once a year, and the data thus collected shall be sent regularly to MoEF/CCB/SCZA.

(iv) Monitoring of water quality upstream and downstream of water bodies shall be carried out once in six months and record of monitoring data shall be maintained and submitted to the Ministry of Environment, Forest and Climate Change/Regional Office.

(v) Ground water, excluding mine water, shall not be used for mining operations. Rainwater harvesting shall be implemented for conservation and augmentation of ground water resources.

(vi) Catch water garland drains and siltation ponds in adequate numbers and appropriate size shall be constructed around the mine working, coal heaps & OB dumps to prevent run off of water and flow of sediments directly into the river and water bodies. Further, dump material shall be properly consolidated/ compacted and accumulation of water over dumps

shall be avoided by providing adequate channels for flow of silt into the drains. The drains/ ponds so constructed shall be regularly desilted particularly before onset of monsoon and maintained properly. Sump capacity should provide adequate retention period to allow proper settling of silt material. The water so collected in the sump shall be utilised for dust suppression and green belt development and other industrial use. Dimension of the retaining wall constructed, if any, at the toe of the OB dumps within the mine to check run-off and siltation should be based on the rainfall data. The plantation of native species to be made between toe of the dump and adjacent field/habitation/water bodies.

(vii) Adequate groundwater recharge measures shall be taken up for augmentation of ground water. The project authorities shall meet water requirement of nearby village(s) after due treatment conforming to the specific requirements (standards).

(viii) Industrial waste water generated from CHP, workshop and other waste water, shall be properly collected and treated so as to conform to the standards prescribed under the standards prescribed under Water Act 1974 and Environment (Protection) Act, 1986 and the Rules made there under, and as amended from time to time. Adequate ETP/STP needs to be provided.

(ix) The water pumped out from the mine, after siltation, shall be utilised for industrial purpose viz. watering the mine area, roads, green belt development etc. The drains shall be regularly desilted particularly after monsoon and maintained properly.

(x) The surface drainage plan including surface water conservation plan for the area of influence affected by the coal mining operations, considering the presence of river/nala/pond/lake etc. shall be prepared and implemented by the project proponent. The surface drainage plan and/or any diversion of natural water courses shall be as per the approved Mining Plan/EIA/EMP report and with due approval of the concerned State/Std Authority. The construction of embankment to prevent any damage against inrush of surface water into the mine should be as per the approved Mining Plan and as per the permission of DGMS or any other authority as prescribed by the law.

(xi) The project proponent shall take all precautionary measures to ensure riverine/riparian ecosystem in and around the coal mine up to a distance of 5 km. A riverine/riparian ecosystem conservation and management plan should be prepared and implemented in consultation with the irrigation / water resource department in the state government.

(d) **Noise and Vibration monitoring and prevention**

(i) Adequate measures shall be taken for control of noise levels as per Noise Pollution Rules, 2000 in the work environment. Workers engaged in blasting and drilling operations, operation of HEMM, etc shall be provided with personal protective equipments (PPE) like ear plugs/muffs in accordance with the prescribed norms and guidelines in this regard. Adequate awareness programme for users to be conducted. Progress in usage of such accessories to be monitored.

(ii) Controlled blasting techniques shall be practiced in order to mitigate ground vibrations, fly rocks, noise and air blast etc., as per the guidelines prescribed by the DGMS.

(iii) The noise level survey shall be carried out as per the prescribed guidelines to assess noise exposure of the workmen at vulnerable points in the mine premises and report in this regard shall be submitted to the Ministry/RO on six-monthly basis.

(c) Mining Plan

(i) Mining shall be carried out under strict adherence to provisions of the Mines Act 1952 and subordinate legislations made there-under as applicable.

(ii) Mining shall be carried out as per the approved mining plan (including Mine Closure Plan) abiding by mining laws related to coal mining and the relevant circulars issued by Directorate General Mines Safety (DGMS).

(iii) No mining shall be carried out in forest land without obtaining Forestry Clearance as per Forest (Conservation) Act, 1980.

(iv) Efforts should be made to reduce energy and fuel consumption by conservation, efficiency improvements and use of renewable energy.

(d) Land reclamation

(i) Digital Survey of entire lease hold area/core zone using Satellite Remote Sensing survey shall be carried out at least once in three years for monitoring land use pattern and report in 1:50,000 scale or as notified by Ministry of Environment, Forest and Climate Change(MoEF&CC) from time to time shall be submitted to MoEFCC/Regional Office (RO).

(ii) The final mine void depth should preferably be as per the approved Mine Closure Plan and in case it exceeds 40 m, adequate engineering interventions shall be provided for sustenance of aquatic life therein. The remaining pit shall be backfilled and covered with thick and alive top soil. Post-mining land be restored usable for agriculture/forestry purposes and shall be diverted. Further action will be treated as specified in the guidelines for Preparation of Mine Closure Plan issued by the Ministry of Coal dated 27th August, 2009 and subsequent amendments.

(iii) The entire overburden dump, backfilling, external OB dumping (including top soil) and afforestation plan shall be in conformity with the 'during mining'/'post mining' land-use pattern, which is an integral part of the approved Mining Plan and the EIA/EMP submitted to this Ministry. Progressive compliance status vis-a-vis the post mining land use pattern shall be submitted to the MoEFCC/RO.

(iv) Fly ash shall be used for external filling of overburden, backfilling or stowing of mine as per provisions contained in clause (i) and (x) of subparagraph (8) of fly ash notification issued vide SO 2804 (E) dated 3rd November, 2009 as amended from time to time. Efforts shall be made to utilize gypsum generated from Flue Gas Desulfurization (FGD), if any.

[illegible]

along with fly ash for external dump of overburden, backfilling of mines. Compliance report shall be submitted to Regional Office of MoEF&CC, CPCB and SPCB.

(v) Further, it may be ensured that as per the time schedule specified in mine closure plan it should remain live till the point of utilization. The topsoil shall temporarily be stored at earmarked site(s) only and shall not be kept unutilized. The top soil shall be used for land reclamation and plantation purposes. Active OB dumps shall be stabilized with native grass species to prevent erosion and surface run off. The other overburden dumps shall be vegetated with native flora species. The excavated area shall be backfilled and afforested in line with the approved Mine Closure Plan. Monitoring and management of stabilised areas shall continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the Ministry of Environment, Forest and Climate Change' Regional Office.

(vi) The project proponent shall make necessary alternative arrangements, if grazing land is involved in core zone, in consultation with the State government to provide alternate areas for livestock grazing, if any. In this context, the project proponent shall implement the directions of Hon'ble Supreme Court with regard to acquiring grazing land.

(g) Green Belt

(i) The project proponent shall take all precautionary measures during mining operations for conservation and protection of endangered/endemic flora/fauna, if any, spotted/reported in the study area. The Action plan in this regard, if any, shall be prepared and implemented in consultation with the State Forest and Wildlife Department.

(ii) Greenbelt consisting of 5 tier plantation of width not less than 7.5 m shall be developed all along the mine lease area as soon as possible. The green belt comprising a mix of native species (endemic species should be given priority) shall be developed all along the major approach/ coal transportation roads.

(h) Public hearing and Human health issues

(i) Adequate illumination shall be ensured in all mine locations (as per DGMS standards) and monitored weekly. The report on the same shall be submitted to this ministry & it's RO on six-monthly basis.

(ii) The project proponent shall undertake occupational health survey for initial and periodical medical examination of the personnel engaged in the project and maintain records accordingly as per the provisions of the Mines Rules, 1955 and DGMS circulars. Besides regular periodic health check-up, 20% of the personnel identified from workforce engaged in active mining operations shall be subjected to health check-up for occupational diseases and hearing impairment, if any, as recorded time to time.

(iii) Personnel (including outsourced employees) working in core zone shall wear protective respiratory devices and shall also be provided with adequate training and information on safety and health aspects.

(iv) Implementation of the action plan on the issues raised during the public hearing shall be ensured. The project proponent shall undertake all the tasks/measures as per the action plan submitted with budgetary provisions during the public hearing. Land owners shall be compensated as per the norms laid down in the R&R policy of the company/State Government/Central Government, as applicable.

(v) The project proponent shall follow the mitigation measures provided in this Ministry's OM No.J-11015/732/2014-IA.II (M) dated 20th October, 2014, titled 'Impact of mining activities on habitations-issues related to the mining projects wherein habitations and villages are for part of mine lease areas or habitations and villages are surrounded by the mine lease area'.

(i) Corporate Environment Responsibility

(i) The project proponent shall comply with the provisions contained in this Ministry's OM vide F.No.22-65/2017-IA.III dated 1st May 2018, as applicable, regarding Corporate Environment Responsibility.

(ii) The company shall have a well laid down environmental policy duly approved by its Board of Directors. The environmental policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infringements/deviations/violation of the environmental/forest/wildlife norms/conditions. The company shall have defined system of reporting infringements/deviations/violation of the environmental/forest/wildlife norms/conditions to the shareholders/stake holders.

(iii) A separate Environmental Cell both at the project and company head quarter level, with qualified personnel shall be set up under the control of senior Executive, who will directly to the head of the organization.

(iv) Action plan for implementing EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the Six Monthly Compliance Report.

(v) Self environmental audit shall be conducted annually. Every three years third party environmental audit shall be carried out.

(j) Miscellaneous

(i) The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising it at least in two local newspapers of the District or State, of which one shall be in the vernacular language within seven days and in addition this shall also be displayed in the project proponent's website permanently.

(ii) The copies of the environmental clearance shall be submitted by the project proponents to the Heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the Government who in turn has to display the same for 30 days from the date of receipt.

(iii) The project proponent shall upload the status of compliance of the stipulated environmental clearance conditions, including results of monitored data on their website and update the same on half yearly basis.

(iv) The project proponent shall monitor the criteria pollutants level namely; PM$_{10}$, SO$_2$, NOx (ambient levels) or critical sectoral parameters, indicated for the projects and display the same at a convenient location for disclosure to the public and put on the website of the company.

(v) The project proponent shall submit six-monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the ministry of Environment, Forest and Climate Change at environment clearance portal.

(vi) The project proponent shall follow the mitigation measures provided in this Ministry's OM No.Z-11011/3/2014-IA.II (M) dated 20th October, 2014 titled 'Impact of mining activities on habitations-issues related to the mining projects where habitations and villages are the part of mine lease area or habitations and villages are surrounded by the mine lease area'.

(vii) The project proponent shall submit the environmental statement for each financial year to PCBs-V in the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company.

(viii) The project authorities shall inform to the Regional Office of the MoEFCC regarding commencement of mining operations.

(ix) The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government.

(x) The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report, commitment made during Public Hearing and also that during their presentation to the Expert Appraisal Committee.

(xi) No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forests and Climate Change.

(xii) Concealing factual data or submission of false/fabricated data may result in revocation of this environmental clearance and attract action under the provisions of Environment (Protection) Act, 1986.

(xiii) The Ministry may revoke or suspend the clearance if implementation of any of the above conditions is not satisfactory.

(xiv) The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.

(xv) The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer(s) of the Regional Office by furnishing the requisite data / information/monitoring reports.

(xvi) The above conditions shall 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, Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders passed by the Hon'ble Supreme Court of India / High Courts and any other Court of Law relating to the subject matter.

5. The proponent shall abide by all the commitments and recommendations made in the EIA/EMP report and also that during presentation to the EAC. All the commitments made on the issues raised during public hearing shall also be implemented in letter and spirit.

6. The proponent shall obtain all necessary clearances/approvals that may be required before the start of the project. The Ministry or any other competent authority may stipulate any further condition for environmental protection. The Ministry or any other competent authority may stipulate any further condition for environmental protection.

7. Any appeal against this environmental clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.

8. The coal company/project proponent shall be liable to pay the compensation against for illegal mining, if any, and as decided by the respective State Governments at any point of time, in terms of the orders dated 2nd August, 2017 of Hon'Ble Supreme Court in WP (Civil) No.114/2014 in the matter of Common Cause Vs Union of India & others.

9. The concerned State Government shall ensure no mining operations to commence till the entire compensation for illegal mining, if any, is paid by the project proponent through their respective Department of Mining & Geology, in strict compliance of the judgment of Hon'ble Supreme Court.

10. This environmental clearance shall not be considered till such time the project proponent complies with the above said judgment of Hon'ble Supreme Court, as applicable, and other statutory requirements.

(Manoj Kumar Shah)
Scientist D

Copy to:

1. The Secretary, Ministry of Coal, Shastri Bhawan, New Delhi

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ANN 1

2. The Principal Secretary, Department of Environment, Government of Maharashtra, 15th Floor, New Admn. Bldg. Madam Cama Road, Mantralaya, Mumbai – 32 (Maharashtra)
3. The Additional PCCF (Central), Ministry of Environment Forest and Climate Change, Regional Office (Western Central Zone), Ground Floor, East Wing, New Secretariat Building Civil Lines, Nagpur-1 (Maharashtra)
4. The Chairman, Central Ground Water Authority, Ministry of Water Resources, Curzon Road Barracks, A-2, W-3 Kasturba Gandhi Marg, New Delhi
5. The Chairman, Central Pollution Control Board, CBD-cum Office Complex, East Arjun Nagar, Delhi - 32
6. The Chairman, Maharashtra State Pollution Control Board, Kalpataru Point, 3rd & 4th Floor, Sion, Matunga Scheme Road No. 5, Opp. Cine Planet Cinema, Near Sion Circle, Sion (E), Mumbai - 2
7. The District Collector, Chandrapur, Government of Maharashtra
8. Monitoring File/Guard File 9. PARIVESH Portal

(Mithu Kumar Shah)
Scientist D

ANNEXURE 2a

MAHARASHTRA POLLUTION CONTROL BOARD

Tel: 24010706/24010337
Fax: 24024516
Website: http://mpcb.gov.in
Email: cac.cell@mpcb.gov.in

Kalpataru Point, 3rd and 4th floor, Opp. Cine Planet Cinema, Near Sion Circle, Sion (E), Mumbai-400022

RED/L-5.1 (R22)
Ref: Format 0/CAC/UAN No.0000000000 - 0000000000

To,
M/s Western Coalfields Limited,
Amalgamated Yekona I & II Open Cast Mine,
Post-Paoljuni, Tal-Warora, Dist-Chandrapur.

Sub: Consent to Establish for expansion of amalgamated Yekona I & II Open cast mine under RED category.

Ref: 1. Earlier consent granted by Board to M/s Western Coal Fields Ltd. vide no EC/PCC/PCC/19 in AR No.0000000000 dated 31.01.2023 valid up to 31.03.2030

2. Earlier consent granted by Board to M/s Western Coal Fields Ltd. vide WA/CC/CIA/CE/EC No.CH 2981 15/0/CC 6769 dated 13.05.2016 valid up to 31.03.2030

3. Minutes of Consent Appraisal committee meeting held on 27.03.2023.

Your application No.MPCB-CONSENT-0000000000 Dated 27.12.2020

For grant of Consent to Establish under Section 25 of the Water (Prevention & Control of Pollution) Act, 1974 & under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981 and Authorization under Rule 6 of the Hazardous & Other Wastes (Management & Transboundary Movement) Rules 2016 is considered and the consent is hereby granted subject to the following terms and conditions and as stated in the schedule I, II, III & IV annexed to this order:

1. The consent to establish is granted for a period up to commissioning of the unit or up to 3 year whichever is earlier.
2. The capital investment of the project is Rs.167.2233 Cro. (As per undertaking submitted by pp.)
3. Consent is valid for the manufacture of:

Sr. (b)	Product	Maximum Quantity	MOM
Products			
1	Coal	2.75	MTPA

4. Conditions under Water (P&CP), 1974 Act for discharge of effluent:

Sr. No	Description	Flow/Day (In Cmd)	Standards to	Discharge Path
1.	Trade effluent	300	As per Schedule-I	Recycled/used for coal suppression and fire fighting.

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Sr No	Description	Permitted	Standards to	Disposal
2.	Domestic effluent	4	As per Scheduled	On land for gardening

5. Conditions under Air (P& CP) Act, 1981 for air emissions:

Sr No.	Stack No.	Description of stack / source	Number of stack	Standards to be achieved
		NIL		

6. Non-Hazardous Wastes:

Sr No	Type of Waste	Quantity	UoM	Treatment	Disposal
1	Overburden	[illegible]	m3/month	Landfill	Backfilling and Reclamation of land

7. Conditions under Hazardous & Other Wastes (M & T M) Rules 2016 for treatment and disposal of hazardous wastes:

Sr No	Category No/ Type	Quantity	UoM	Treatment	Disposal
1	5.2 Waste or residue containing oil	2.4	Ton/Y	Incineration	CHWTSDF
2	35.3 Chemical sludge from waste water treatment	24	Ton/Y	Landfill	CHWTSDF
3	5.1 Used or spent oil	40	KL/A	Recycle	Authorised Recycler

8. The Board reserves the right to review, amend, suspend, revoke the consent and the same shall be binding on the industry.

9. This consent should not be considered as exemption from obtaining necessary NOC/permission from any other Competent authorities.

10. The applicant shall comply with the conditions of the Environmental Clearance granted by MoEF&CC, Govt. of India vide letter no. [illegible] dated 01.01.2021 for Amalgamated mine of [illegible].

11. PP shall submit the EC as per Coal Mine Policy and ensure compliance of EC conditions and Consent to operate conditions.

12. PP shall carry out over burden dump management as per CPCB guidelines.

13. PP shall carry out plantation as per EC condition [illegible] and [illegible].

14. PP shall obtain NOC from CGWA within 03 months.

15. The applicant shall obtain Consent to Operate from Maharashtra Pollution Control Board before actual commencement of the Unit/Activity.

For and on behalf of the
Maharashtra Pollution Control Board

(Ashok Shrigondekar)
Member Secretary

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ANNT2 Type text here

Received Consent fee of –

Sr.No	Amount(Rs.)	Transaction/Ch.No.	Date	Transaction Type
1	1434040.00	MPCB-24-2014	31/12/2009	NEFT

Copy to:

1. Regional Officer, MPCB, Chandrapur and Sub Regional Officer, MPCB, Chandrapur – They are requested to ensure the compliance of the consent conditions
2. Chief Accounts Officer, MPCB, Sion, Mumbai
3. CAC desk – for record & website up-dation purpose.

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SCHEDULE-I

Terms & conditions for compliance of Water Pollution Control

1. a) As per the application submitted by industry, ETP having capacity 250 CMD is proposed to provide for treatment of oil/oily effluent and Proposed to provide HDPE settling/collection tank of capacity 100 cu.m for treatment of brine water.

b) The Applicant shall operate the effluent treatment plant (ETP) to treat the trade effluent so as to conform the following standards prescribed by the Board or under EP Act, 1986 and Rules made there under from time to time, whichever is stringent:

Sr.No	Parameters	Limiting concentration not to exceed in mg/L except for pH
(1)	pH	5.5 to 9.0
(2)	Oil & Grease	10
(3)	BOD (3 days 27°C)	30
(4)	COD	250
(5)	Total Suspended solids	100
(6)	Total Dissolved solids	2100

c) The treated effluent shall be recycled for secondary purposes to the maximum extent and remaining shall be discharged on land for gardening within premises after conforming above standards. In no case, effluent shall find its way to outside premises.

2. a) As per your application, you have provided Sewage Treatment Plant of capacity capacity 5 CMD for the treatment of 4 CMD of sewage.

b) The Applicant shall operate the sewage treatment system to treat the sewage so as to achieve the following standards:

Sr.No	Parameters	Standards	
1	BOD (3 days 27°C)	Not to exceed	30 mg/l
2	COD	Not to exceed	100 mg/l
3	SS	Not to exceed	50 mg/l

c) The treated sewage shall be recycled for secondary purposes to the maximum extent and remaining shall be discharged on land for gardening within premises after conforming above standards. In no case, sewage shall find its way to outside factory premises.

3. The Board reserves its rights to review plans, specifications or other data relating to plant and to the installation of waterworks for the purification and/or of the system for the disposal of sewage or trade effluent or in connection with the grant of any consent conditions. The Applicant shall not do prior consent of the Board to take steps to establish the unit or extensions any treatment and disposal system or alterations or addition thereto.

4. The industry shall ensure replacement of pollution control system or its parts after expiry of its expected life as defined by manufacturers so as to ensure the overall efficiency and safety of the operation thereof.

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ANN 2a

5. The Applicant shall comply with the provisions of the Water (Prevention & Control of Pollution) Act, 1974 and as amended by installing water meter and other provisions as outlined in the consent.

Sr. No.	Purpose for water consumed	Water consumption quantity (CMD)
1.	Industrial Cooling, spraying in mine pits or boiler feed	900.00
2.	Domestic purpose	30.00
3.	Processing whereby water gets polluted & pollutants are easily biodegradable	100.00
4.	Processing whereby water gets polluted & pollutants are not easily biodegradable and are toxic	0.03
5.	Gardening	240

6. The Applicant shall provide Specific Water Pollution control system as per the conditions of EP Act, 1986 and rules made there under from time to time/ Environmental Clearance/ CRZ guidelines.

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SCHEDULE-II

Terms & conditions for compliance of Air Pollution Control:

1. As per your application, you have proposed to provide the Air pollution control (APC) system and also to install following stack to consume the following fuel pattern:

Stack No.	Stack Attached To	APC System	Height in Mtrs.	Type of Fuel	Quantity & UOM	S%	SO2 (kg/day)
NA	NA	NA	-	-	-	-	-

2. The Applicant shall provide Specific Air Pollution control equipments as per the conditions of EP Act, 1986 and rule made there under from time to time environmental clearance/ CREP guidelines.

3. The applicant shall operate and maintain above mentioned air pollution control system so as to achieve the emission standards to the following standards:

Parameters	Standards	
Total Particulate Matter	Not to exceed	30 mg/Nm3

4. The Applicant shall obtain necessary prior permission for providing additional control equipment with necessary specifications and operation thereof or alteration or replacement/substitution will lead to the consent to operate or operation of new pollution control equipment.

5. The Board reserves its right to vary all or any of the conditions in the consent, if due to any technological improvement or otherwise such variation (including the change of any control equipment, either in whole or in part) is necessary.

6. Control Equipments:

   a. Coal handling plant shall be provided with dust collector & automatic mist type water sprinkler system.

   b. Scientific spraying of water on all working areas, dumps and stock piles with the help of appropriate dust suppression system.

   c. Material shall be properly covered during transportation.

   d. The applicant shall carry out tree plantation along road side, around dumps or compulsory afforestation as per proposal approved by Forest Department. The tree plantation programme shall be taken up well in advance of the actual mining activity, so that green belt of sufficient width & height is developed before mining activities and surrounding environment.

   e. Black topped metal roads shall be maintained and well maintained to prevent dust formation.

   f. Overloading of dumpers shall be avoided to prevent spillages.

   g. Correct type & quantity of explosives shall be used to avoid excess dust formation & vibration in the surrounding area.

   h. The slope of the over burden shall have slope not more than 28° to the horizontal. The overburden shall be properly covered by vegetation for stable bases.

   i. Material transportation shall be done by installing conveyors wherever possible or mechanically covered closed trucks shall be used for transportation.

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7. Standards for Ambient Air Pollutants:

The Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM), Sulphur dioxide (SO_2) and Oxides of Nitrogen (NO_x) concentration in downwind direction considering predominant wind direction, at a distance of 500 metres from the following dust generating sources shall not exceed the standards specified in the table given below:

Dust Generating Sources:

Loading or unloading, Haul Road, coal transportation road, Coal handling plant (CHP), Railway Siding, Blasting, Drilling, Overburden dumps, or any other dust generating external sources like coke oven (hard as well as soft), briquette making, energy mix etc.

Pollutant	Time weighted average	Concentration in Ambient Air
Suspended Particulate Matter (SPM)	Annual Average	360 µg/m³
	24 hours	500 µg/m³
Respirable Particulate Matter Size less than 10 µm (RPM)	Annual Average	180 µg/m³
	24 hours	250 µg/m³
Sulphur Dioxide (SO_2)	Annual Average	80 µg/m³
	24 hours	120 µg/m³
Oxides of Nitrogen as NO_x	Annual Average	80 µg/m³
	24 hours	120 µg/m³

i. In case of any residential or commercial or industrial place falls within 500 metres of any dust generating sources, the National Ambient Air Quality Standards notified vide MoEFCC GSR notification dated 16.11.2009 as amended shall be made applicable.

ii. The applicant shall provide minimum three ambient air quality monitoring stations within mining area which should be monitored for SPM, RSPM, SO_2, NO_x, HC, CO etc. The Annual Ambient Air Plan of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval, shall conform to the National Ambient Air Quality Standards prescribed under Air (Prevention and Control of Pollution) Act, 1981 and Environment (Protection) Act, 1986. The records of results of monitoring data shall be made available for inspection to the officers of the Board.

8. The applicant shall take adequate measures for control of noise levels from its operations as follows:

Sr. No	Location	Permissible Noise [In dB (A)]	Desired minimum thickness of green belt (m)
1.	Along Road side	85 (Commercial Area)	30
2.	In colonies	55 (Residential Area)	20
3.	Near Opencast Mines	75 (Industrial Area)	10
4.	Near CHPS	75	30
5.	Near Shaft	75	30
6.	Near Mine exhaust fan	75	5-30

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9. Other conditions

i Whenever due to any accident or other unforeseen act or event, such event is apprehended to occur in excess of prescribed limit, such information shall be forthwith reported to Board, concerned Police station, office of Deputy/Joint of Health services, Dept. of Industries, Inspectorate of Factories & Local Body. In case of failure of pollution control equipments, the production process connected to it shall be stopped.

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SCHEDULE-III

Details of Bank Guarantees

Sr. No.	Location (CGO/ CGO -CGE)	Amt of BG Required	Submission Period	Purpose of BG	Completion Period	Validity Date
1	CGE Expansion	Rs 5.0 Lakh	15 days	[illegible]	Project Activity	[illegible]
2	CGE Expansion	Rs 25.0 Lakh	15 days	[illegible]	6 Months	31.12.2021
3	CGE Expansion	Rs 5.0 Lakh	15 days	Coal Handling Plant (CHP) and Bunkering Unit built in enclosures with provided with Dust Collector and Automatic Water Sprinkler	2 Months	31.12.2021
4	CGE Expansion	Rs 5.0 Lakh	15 days	Emptying mechanical sweepers which are equipped with suction and vacuum for cleaning the coal dust from road	2 Months	31.12.2021
5	CGE Expansion	Rs 5.0 Lakh	30 days	[illegible]	2 Months	31.12.2021
6	CGE Expansion	Rs 5.0 Lakh	30 days	[illegible]	2 Months	[illegible]
7	CGE Expansion	Rs 5.0 Lakh	15 days	Technical CRACKING	2 Months	31.12.2021

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ANN 2a

Sr. No.	Consent (CTO/CTE/CAC/CCI)	Amount of BG Imposed	Submission Period	Purpose of BG	Compliance Period	Validity Date
1	CTE Expansion	Rs 5 lakh	15 days	Over burden (OB) should be stacked at earmarked dumpsites only and should not be kept active for long period. Proper revegetation of OB should be carried out so that the area of stack will come down to 25% Days before shall be deposited by way of bank draft.	Regular Activity	31.10.2021
2	CTE Expansion	Rs 5 lakh	15 days	Towards compliance of consent conditions and environment Clearance conditions	Regular Activity	31.10.2021

The above Bank Guarantee(s) shall be submitted by the applicant in favour of Regional Officer of the respective Regional Office within 15 days from the date of issue of consent.

BG Forfeiture History

Type	Consent (CTO/CAC/CCI)	Amount of BG Imposed	Submission Period	Purpose of BG	Amount of BG Forfeiture	Reason of BG Forfeiture
NA						

BG Release details

Sr.No.	Consent (CTO/CAC/CCI)	BG Imposed	Purpose of BG	Amount of BG Released
NA				

SCHEDULE-IV
General Conditions

1. The applicant shall provide facility for collection of environmental samples and samples of trade and sewage effluents, air emissions and hazardous waste to the Board staff at the terminal or designated points and shall pay to the Board for the same as referred in this behalf.
2. If the MLCC plant is broken/ overflowing chemicals, in such cases industry shall not discharge their treated effluent into MLCC drain, it shall be sent to CETP for further treatment.
3. Industry should monitor effluent quality, stack emissions and ambient air quality periodically.
4. The applicant shall provide ports in the chimney(s) and facilities such as ladder, platform etc. for monitoring the air emissions and the same shall be open for inspection/ sound for use of the Board's staff. The chimney(s) being attached to various sources of emission shall be designated by numbers such as S-1, S-2, etc. and these shall be permanently displayed to facilitate identification.
5. Where air due to any accident or other unforeseen act or event, such emissions occur or is apprehended to occur in excess of standards laid down, such information shall be forthwith reported to Board, concerned Police Station, office of Directorate of Health Services, Department of Explosives, Inspectorate of Factories and Local Body. In case of failure of pollution control equipment, the product or process connected to it shall be stopped.
6. The applicant shall provide an alternate electric power source sufficient to operate all pollution control facilities installed to maintain compliance with the terms and conditions of the consent. In the absence, the applicant shall stop, reduce or otherwise control production to statutory norms or the conditions of this consent.
7. The MPCB shall submit to the Board, the 30th day of September every year, the Environmental Statement Report for the financial year ending 31st March in the prescribed Form V as per the provisions of rule 14 of the Environment (Protection) (Second Amendment) Rules, 1992.
8. The industry shall recycle/reprocess/reuse/recover Hazardous Waste as per the provisions contained in the HOWM&TM Rules 2016, which can be recycled/reprocessed/ reused/ recovered and any waste which has to be incinerated shall go to incinerator and waste which can be used for land filling and which can be recycled/ reprocessed etc. should go for that purpose. In order to achieve this, an action plan should be submitted.
9. The industry should comply with the Hazardous & Other Wastes (M & TM) Rules, 2016 and submit the Annual Returns as per Rule 6(2) & 2020 of Hazardous & Other Wastes (M & TM) Rules, 2016 for the preceding year April to March in Form-4 by 30th June of every year.
10. An inspection book shall be opened and made available to the Board's officers during their visit to the applicant.
11. The applicant shall make an application for renewal of the consent at least 60 days before the date of the expiry of the consent.
12. Industry shall strictly comply with the Water (Prevention & Control of Pollution) Act, 1974, Air (Prevention & Control of Pollution) Act, 1981 and Environmental Protection Act, 1986 and industry specific standard under EP Rules, 1986 which are available at MPCB website (www.mpcb.gov.in).
13. The industry shall constitute an Environmental cell with qualified staff/service/agency to see the day to day compliance of consent conditions towards Environment Protection.

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14. Separate drainage system shall be provided for collection of trade and sanitary effluents. Trap manholes shall be provided at the end of the collection system with arrangement to regularly clean the flow. No effluent shall be allowed in the public drains downstream of the terminal manholes. No effluent shall find its way other than in designed and provided collection system.

15. Neither storm water nor discharge from other premises shall be allowed to mix with the effluent from the factory.

16. The applicant shall install a separate meter showing the consumption of energy for operation of domestic and industrial effluent treatment plant and air pollution control system. A register showing consumption of chemicals used for treatment shall be maintained.

17. Conditions for D.G. Set:

a) Noise from the D.G. Set should be controlled by providing an acoustic enclosure or by making the room acoustically.

b) Industry shall provide acoustic enclosure for control of noise. The acoustic enclosure/acoustic treatment of the room should be designed for minimum 25 dB(A) insertion loss or for meeting the ambient noise standards, whichever is on higher side. A suitable exhaust muffler with insertion loss of 25 dB(A) shall also be provided. The noise level of insertion loss will be done at different points at 3.5 meters from acoustic enclosure/room and then average.

c) Industry should ensure that no bring noise nuisance due to DG set, in case the noise level exceeds, either outward noise requirements properly siting and control enclosure.

d) Installation of DG Set must be strictly in consideration with recommendations of DG Set manufacturer.

e) A proper chimney and provision for easy sampling facilities for DG set should be set and installed in consultation with the DG manufacturer which would help to prevent noise pollution of DG set from disturbing neighbour.

f) D.G. Set shall be operated only in case of power failure.

g) The applicant should not create any nuisance in the surrounding area due to operation of D.G. Set.

h) The applicant shall comply with the notification of MoEFCC, Govt. of India [Protection second Amendment rules vide GSR 371(E) dated 14.05.2013] and its amendments regarding noise limit for generator sets run with diesel.

18. The industry should not create any nuisance in surrounding area.

19. The industry shall take adequate measures for control of noise from its own sources within the premises as well as ambient air quality conforming to respective standards. Equivalent noise level shall not exceed 75 dB(A) during day time and 70 dB(A) during night time. Day time is considered as between 6 a.m. and 10 p.m. and night time is considered between 10 p.m. and 6 a.m.

20. The applicant shall maintain good housekeeping.

21. The applicant shall bring minimum 33% of the available open land under green coverage/plantation. The applicant shall submit a yearly statement by 30th September every year to available open plot area, number of trees surviving as on 31st March of the year and number of trees planted by September and

22. The non-hazardous solid waste arising in the factory premises, percentage, to be disposed of scientifically so as not to cause any nuisance / pollution. The applicant shall take necessary permission from civic authorities for disposal of solid waste.

23. The applicant shall not change or alter the quantity, quality, the rate of discharge, temperature or the mode of the effluent/emissions or hazardous waste or control equipment provided for without prior written permission of the Board. The industry will not carry out any activity for which Consent to establish prior consent of the Board.

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https://blockchain.ecmpcb.in/docs/ecf521a91ff357afd3dbbdf0d9ad11a8767ed86e2f3f61c2903815b719b626ac

N 2a

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25. The industry shall ensure that fugitive emissions from the activity are controlled so as to maintain clean and tidy environment in and around the factory premises.

26. The industry shall submit official e-mail address and any change will be duly informed to the MPCB.

27. The industry shall achieve the National Ambient Air Quality standards prescribed vide Government of India, Notification dtd. 18.11.2009 as amended.

For and on behalf of the
Maharashtra Pollution Control Board.

Ashok Shingare IAS
Member Secretary

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MAHARASHTRA POLLUTION CONTROL BOARD

Tel: 24010706/24010437
Fax: 24023516
Website: http://mpcb.gov.in
Email: cac-cell@mpcb.gov.in

Kalpataru Point, 2nd and 4th floor, Opp. Cine Planet Cinema, Near Sion Circle, Sion (E), Mumbai-400022

RED/L.S.I (R35)
No:- Format1.0/CAC/UAN No.MPCB-CONSENT-0000160739/CR/2307001123

Date: 18/07/2023

To,
M/s Western Coalfields Limited,
Amalgamated Yekona I & II Open Cast Mine,
Post-Panjurni,Tal-Warora, Dist-Chandrapur.

Your Service is Our Duty

Sub: Renewal of consent with increase in CI under RED category.

Ref:
1. Earlier consent granted by Board to M/s Yekona-I & Yekona-II open cast mine vide no.Format1.0/CAC/UAN-105075/CO-2110000179 dated 05.10.2021 valid up to 31.03.2023.
2. Minutes of Consent Appraisal Committee meeting held on 03.07.2023

Your application No.MPCB-CONSENT-0000160739 Dated 29.01.2023

For: grant of Consent to Operate under Section 26 of the Water (Prevention & Control of Pollution) Act, 1974 & under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981 and Authorization under Rule 6 and Rule 18(7) of the Hazardous & Other Wastes (Management & Transboundary Movement) Rules 2016 is considered and the consent is hereby granted subject to the following terms and conditions and as detailed in the schedule I, II, III & IV annexed to this order:

1. **The consent to renewal is granted for a period up to 31/03/2025**
2. **The capital investment of the project is Rs.434.7186 Crs. (As per Balance Sheet submitted by industry Existing CI-Rs.167.3233 Cr + increase in CI-Rs.267.3953 Cr=Total CI-Rs.434.7186 Cr)**
3. **Consent is valid for the manufacture of:**

Sr No	Product	Maximum Quantity	UOM
Products			
1	Coal	2.75	MTPA

4. **Conditions under Water (P&CP), 1974 Act for discharge of effluent:**

Sr No	Description	Permitted (in CMD)	Standards to	Disposal Path
1.	Trade effluent	3450	As per Schedule-I	Recycle/Reused for dust suppression and fire fighting.
2.	Domestic effluent	4	As per Schedule-I	On land for gardening

5. **Conditions under Air (P& CP) Act, 1981 for air emissions:**

Sr No.	Stack No.	Description of stack / source	Number of Stack	Standards to be achieved
NA				

6. **Non-Hazardous Wastes:**

Sr No	Type of Waste	Quantity	UoM	Treatment	Disposal
1	Overburden	150000	m3/month	Landfill	Backfilling and Reclamation of Land

7. **Conditions under Hazardous & Other Wastes (M & T M) Rules 2016 for Collection, Segregation, Storage, Transportation, Treatment and Disposal of hazardous waste:**

Sr No	Category No./ Type	Quantity	UoM	Treatment	Disposal
1	5.2 Wastes or residues containing oil	2.4	Ton/Y	Incineration	CHWTSDF
2	35.3 Chemical sludge from waste water treatment	24	Ton/Y	Landfill	CHWTSDF
3	5.1 Used or spent oil	40	KL/A	Recycle	Authorised Recycler

8. The Board reserves the right to review, amend, suspend, revoke the consent and the same shall be binding on the industry.
9. This consent should not be construed as exemption from obtaining necessary NOC/permission from any other Government authorities
10. The applicant shall comply with the conditions of the Environmental Clearance granted by MoEF&CC, GoI vide letterJ-11015/381/2015-IA.II(M) dated 01.01.2021 for Amalgamated mine of Yekona-I & II.
11. PP shall carry out over burden dump management as per CPCB guidelines.
12. PP shall carry out plantation as per EC condition before ensuing monsoon.
13. PP shall provide Tyre wash system at entry and exit of mine within 3 months period and submit the BG of Rs.5.0 Lakh towards compliance of same.
14. PP shall provide 5 Nos Mist cannon water spray at coal stock yard, CHP and Weigh bridge area within 3 months and submit the BG of Rs.5.0 Lakh towards compliance of same. Till completion of this PP shall use existing water sprinkling system continually.
15. PP shall extend the existing BG of Rs.25.0 Lakh towards O & M of Pollution control system and towards compliance of consent and EC conditions for the period up to 31.03.2027.
16. PP shall submit the valid NOC from CGWA within 3 months.
17. PP shall submit the BG as per BG regime of the mines.

18. The applicant shall make an application for renewal of consent 60 days prior to date of expiry of the consent.

. This consent is issued as per communication letter dated 03/11/2022 which is approved by competent authority of the board.

Received Consent fee of -

Sr.No	Amount(Rs.)	Transaction/DR.No.	Date	Transaction Type
1	5908312.00	MPCB-DR-17286	17/02/2023	RTGS
2	534780.00	MPCB-DR-18492	12/04/2023	RTGS

Balance amount of Rs. 1969427 will be considered at the time of next renewal of consent.

Copy to:

1. Regional Officer, MPCB, Chandrapur and Sub-Regional Officer, MPCB, Chandrapur
- They are directed to ensure the compliance of the consent conditions.
2. Chief Accounts Officer, MPCB,Sion, Mumbai
3. CAC desk - for record & website up-dation purpose.

SCHEDULE-I

Terms & conditions for compliance of Water Pollution Control:

1. A] As per the application submitted by industry, ETP having capacity 100 CMD is proposed to provide for treatment of workshop effluent and Propose to provide RCC sedimentation tank of capacity 810 m3 for treatment of Mine water.

   B] The Applicant shall operate the effluent treatment plant (ETP) to treat the trade effluent so as to achieve the following standards prescribed by the Board or under EP Act, 1986 and Rules made there under from time to time, whichever is stringent:

Sr.No	Parameters	Limiting concentration not to exceed in mg/l, except for pH
(1)	pH	5.5 to 9.0
(2)	Oil & Grease	10
(3)	BOD (3 days 27°C)	30
(4)	COD	250
(5)	Total Suspended solids	100
(6)	Total Dissolved solids	2100

   C] The treated effluent shall be recycled for secondary purposes to the maximum extent and remaining shall be discharged on land for gardening within premise after confirming above standards. In no case, effluent shall find its way to outside factory premises.

2. A] As per your application, you have provided Sewage Treatment Plant of designed capacity 5 CMD for the treatment of 4 CMD of sewage.

   B] The Applicant shall operate the sewage treatment system to treat the sewage so as to achieve the following standards.

Sr.No	Parameters	Standards (mg/l)	
1	BOD (3 days 27°C)	Not to exceed	30 mg/l
2	COD	Not to exceed	100 mg/l
3	SS	Not to exceed	50 mg/l

   C] The treated sewage shall be recycled for secondary purposes to the maximum extent and remaining shall be discharged on land for gardening within premise after confirming above standards. In no case, sewage shall find its way to outside factory premises.

3. The Board reserves its rights to review plans, specifications or other data relating to plant setup for the treatment of waterworks for the purification there of & the system for the disposal of sewage or trade effluent or in connection with the grant of any consent conditions. The Applicant shall obtain prior consent of the Board to take steps to establish the unit or establish any treatment and disposal system or an extension or addition thereto.

4. The industry shall ensure replacement of pollution control system or its parts after expiry of its expected life as defined by manufacturer so as to ensure the compliance of standards and safety of the operation thereof.

5. The Applicant shall comply with the provisions of the Water (Prevention & Control of Pollution) Act, 1974 and as amended, by installing water meters and other provisions as contained in the said act:

Sr. No.	Purpose for water consumed	Water consumption quantity (CMD)
1.	Industrial Cooling, spraying in mine pits or boiler feed	600.00
2.	Domestic purpose	10.00
3.	Processing whereby water gets polluted & pollutants are easily biodegradable	100.00
4.	Processing whereby water gets polluted & pollutants are not easily biodegradable and are toxic	0.00
5.	Gardening	240

6. The Applicant shall provide Specific Water Pollution control system as per the conditions of EP Act, 1986 and rule made there under from time to time/ Environmental Clearance/ CREP guidelines.

SCHEDULE-II

Terms & conditions for compliance of Air Pollution Control:

1. As per your application, you have provided the Air pollution control (APC) system and erected following stack (s) to observe the following fuel pattern:

Stack No.	Source	APC System provided/proposed	Stack Height(in mtr)	Type of Fuel	Sulphur Content(in %)	Pollutant	Standard
0	NA		0.00	-	-	NA	-

2. The Applicant shall provide Specific Air Pollution control equipments as per the conditions of EP Act, 1986 and rule made there under from time to time/ Environmental Clearance / CREP guidelines.
3. The Applicant shall obtain necessary prior permission for providing additional control equipment with necessary specifications and operation thereof or alteration or replacement/alteration well before its life come to an end or erection of new pollution control equipment.
4. The Board reserves its rights to vary all or any of the condition in the consent, if due to any technological improvement or otherwise such variation (including the change of any control equipment, other in whole or in part is necessary).
5. Control Equipments
   a. Coal handling plant shall be provided with dust collector & automatic mist type water sprinkler system.
   b. Scientific spraying of water on all working area, dump area, stock piles with the help of appropriate dust suppression system.
   c. Minerals shall be properly covered during transportation.
   d. The applicant shall carry out tree plantation along road side, around dumps or compulsory afforestation as per proposal approved by Forest Department. The tree plantation programme shall be taken up well in advance of the actual mining activity, so that green belt of sufficient width & height is developed between mining area/road and surrounding environment.

e. Black topped metal roads shall be provided and well maintained to prevent dust formation.

f. Overloading of dumpers shall be avoided to prevent spillages.

g. Correct type & quantity of explosive shall be used to avoid excess dust formation & vibration in the surrounding area.

h. The slope of the over burden shall have slope not more than 28° to the horizontal. The overburden shall be properly covered by vegetation for stabilization.

i. Minerals transportation shall be done by installing conveyors wherever possible & mechanically covered closed trucks shall be used for transportation.

6. Standards for Ambient Air Pollutants:

The Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM), Sulphur dioxide (SO_2) and Oxides of Nitrogen (NO_x) concentration in downwind direction considering predominant wind direction, at a distance of 500 metres from the following dust generating sources shall not exceed the standards specified in the table given below:

Dust Generating Sources:

Loading or unloading, Haul Road, coal transportation road, Coal handling plant (CHP), Railway Sliding, Blasting, Drilling, Overburden dumps, or any other dust generating external sources like coke ovens (hard as well as soft), briquette industry, nearby road etc.

Pollutant	***Time weighted average***	***Concentration in Ambient Air***
Suspended Particulates Matter (SPM)	Annual Average	360 µg/m^3
	24 hours	500 µg/m^3
Respirable Particulate Matter (size less than 10 µm) (RPM)	Annual Average	180 µg/m^3
	24 hours	250 µg/m^3
Sulphur Dioxide (SO_2)	Annual Average	80 µg/m^3
	24 hours	120 µg/m^3
Oxides of Nitrogen as NO_x	Annual Average	80 µg/m^3
	24 hours	120 µg/m^3

i. In case of any residential or commercial or industrial place falls within 500 metres of any dust generating sources, the National Ambient Air Quality Standards notified vide MOEFCC GOI notification dtd 16.11.2009 as ammended shall be made applicable.

ii. The applicant shall provide minimum three ambient air quality monitoring stations within mining area which should be monitored for SPM, RSPM, SO_2, NOx, HC, CO etc. The Annual Arithmetic Mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval shall conform to the National Ambient Air Quality Standards prescribed under Air (Prevention and Control of Pollution) Act, 1981 and Environment (Protection) Act, 1986. The records of results of monitoring done shall be made available for inspection to the officers of the Board.

7. The applicant shall take adequate measures for control of noise levels from its own sources as follows:

Sr. No	***Location***	***Permissible Norms [in dB (A)]***	***Desired minimum thickness of green belt (m)***
1.	Along Road side	65 (Commercial Area)	20
2.	In colonies	55 (Residential Area)	20
3.	Near Opencast Mines	75 (Industrial Area)	10
4.	Near CHPs	75	30
5.	Near Shaft	75	20
6.	Near Mine exhaust fan	75	> 50

8. Other conditions:

   i Whenever due to any accident or other unforeseen act or even, such emissions occur or is apprehended to occur in excess standards laid down, such information shall be forthwith reported to Board, concerned Police station, office of Directorate of Health services, Dept. of explosives, Inspectorate of Factories & Local Body. In case of failure of pollution control equipments, the production process connected to it shall be stopped.

SCHEDULE-III

Details of Bank Guarantees:

Sr. No.	***Consent (C2E/ C2O /C2R)***	***Amt of BG Imposed***	***Submission Period***	***Purpose of BG***	***Compliance Period***	***Validity Date***
1	C2R	Rs.5.0 Lakh	15 days	Catch drain and situation ponds of appropriate size should be constructed to arrest silt and sediment flow from soil, OB and mineral dumps. Water so collected should be utilized for watering of the mining area, roads green belt developers etc.	Regular Activity	31.03.2027
2	C2R	Rs.5.0 Lakh	15 days	Coal transportation shall be done by mechanically closed trucks. Overloading of shall be avoided to prevent spilleges. 10% of total fleet available to be replaced every six month	6 Months	31.03.2027
3	C2R	Rs.5.0 Lakh	15 days	Coal Handling Plant (CHP) & loading / unloading area will be provided with Dust Collector and Automatic Water Sprinkler.	2 Months	31.03.2027
4	C2R	Rs.5.0 Lakh	15 days	Deploying mechanized sweepers which are automated suction sweeper for cleaning the coal dust from road.	3 Months	31.03.2027
5	C2R	Rs.5.0 Lakh	15 days	Adoption and installation of tyre wash system to mining transportation at entry and exit point of mining area.	3 Months	31.03.2027

Sr. No.	Consent (C2E/ C2O /C2R)	Amt of BG Imposed	Submission Period	Purpose of BG	Compliance Period	Validity Date
6	C2R	Rs.5.0 Lakh	15 days	Use of toppers/binders/surfactants on the top surface of coal pile on trucks carrying coal on road to minimize spillage during transportation	3 Months	31.03.2027
7	C2R	Rs.5.0 Lakh	15 days	Over burden (OB) should be stacked at earmarked dumpsites only and should not be kept active for long period. Proper terracing of OB should be carried out so that the overall slope will come down to 28°. Over Burden shall be disposed by way of backfilling.	Regular Activity	31.03.2027
8	C2R	Rs.25.0 Lakh	15 days	Towards compliance of consent conditions and Environment Clearance conditions	Regular Activity	31.03.2027
9	C2R	Rs.25.0 Lakh	15 days	To provide 5 Nos Mist cannon water spray at coal stock yard, CHP and Weigh bridge area within 3 months	3 months	31.03.2027

The above Bank Guarantee(s) shall be submitted by the applicant in favour of Regional Officer at the respective Regional Office within 15 days from the date of issue of Consent.

BG Forfeiture History

Srno.	Consent (C2E/C2O/C2R)	Amount of BG imposed	Submission Period	Purpose of BG	Amount of BG Forfeiture	Reason of BG Forfeiture
NA						

BG Return details

Srno.	Consent (C2E/C2O/C2R)	BG imposed	Purpose of BG	Amount of BG Returned
NA				

SCHEDULE-IV

General Conditions:

1. The applicant shall provide facility for collection of environmental samples and samples of trade and sewage effluents, air emissions and hazardous waste to the Board staff at the terminal or designated points and shall pay to the Board for the services rendered in this behalf.
2. If the MIDC pipeline is broken/ overflowing chamber, in such cases industry shall not discharge their treated effluent into MIDC drain, it shall be sent to CETP by tanker.
3. Industry should monitor effluent quality, stack emissions and ambient air quality monthly/quarterly.

4. The applicant shall provide ports in the chimney/(s) and facilities such as ladder, platform etc. for monitoring the air emissions and the same shall be open for inspection to/and for use of the Board's Staff. The chimney(s) vents attached to various sources of emission shall be designated by numbers such as S-1, S-2, etc. and these shall be painted/ displayed to facilitate identification.
5. Whenever due to any accident or other unforeseen act or even, such emissions occur or is apprehended to occur in excess of standards laid down, such information shall be forthwith Reported to Board, concerned Police Station, office of Directorate of Health Services, Department of Explosives, Inspectorate of Factories and Local Body. In case of failure of pollution control equipment, the production process connected to it shall be stopped.
6. The applicant shall provide an alternate electric power source sufficient to operate all pollution control facilities installed to maintain compliance with the terms and conditions of the consent. In the absence, the applicant shall stop, reduce or otherwise, control production to abide by terms and conditions of this consent.
7. The firm shall submit to this office, the 30th day of September every year, the Environmental Statement Report for the financial year ending 31st March in the prescribed Form-V as per the provisions of rule 14 of the Environment (Protection) (Second Amendment) Rules, 1992.
8. The industry shall recycle/reprocess/reuse/recover Hazardous Waste as per the provision contain in the H&OW(M&TM) Rules 2016, which can be recycled/processed/ reused/ recovered and only waste which has to be incinerated shall go to incineration and waste which can be used for land filling and cannot be recycled/ reprocessed etc. should go for that purpose, in order to reduce load on incineration and landfill site/environment.
9. The industry should comply with the Hazardous & Other Wastes (M & TM) Rules, 2016 and submit the Annual Returns as per Rule 6(5) & 20(2) of Hazardous & Other Wastes (M & TM) Rules, 2016 for the preceding year April to March in Form-IV by 30th June of every year.
10. An inspection book shall be opened and made available to the Board's officers during their visit to the applicant.
11. The applicant shall make an application for renewal of the consent at least 60 days before the date of the expiry of the consent.
12. Industry shall strictly comply with the Water (P&CP) Act, 1974, Air (P&CP) Act,1981 and Environmental Protection Act,1986 and industry specific standard under EP Rules 1986 which are available on MPCB website(www.mpcb.gov.in).
13. The industry shall constitute an Environmental cell with qualified staff/personnel/agency to see the day to day compliance of consent condition towards Environment Protection.
14. Separate drainage system shall be provided for collection of trade and sewage effluents. Terminal manholes shall be provided at the end of the collection system with arrangement for measuring the flow. No effluent shall be admitted in the pipes/sewers downstream of the terminal manholes. No effluent shall find its way other than in designed and provided collection system.
15. Neither storm water nor discharge from other premises shall be allowed to mix with the effluents from the factory.
16. The applicant shall install a separate meter showing the consumption of energy for operation of domestic and industrial effluent treatment plants and air pollution control system. A register showing consumption of chemicals used for treatment shall be maintained.
17. Conditions for D.G. Set
    a) Noise from the D.G. Set should be controlled by providing an acoustic enclosure or by treating the room acoustically.

b) Industry should provide acoustic enclosure for control of noise. The acoustic enclosure/ acoustic treatment of the room should be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on higher side. A suitable exhaust muffler with insertion loss of 25 dB (A) shall also be provided. The measurement of insertion loss will be done at different points at 0.5 meters from acoustic enclosure/room and then average.

c) Industry should make efforts to bring down noise level due to DG set, outside industrial premises, within ambient noise requirements by proper sitting and control measures.

d) Installation of DG Set must be strictly in compliance with recommendations of DG Set manufacturer.

e) A proper routine and preventive maintenance procedure for DG set should be set and followed in consultation with the DG manufacturer which would help to prevent noise levels of DG set from deteriorating with use.

f) D.G. Set shall be operated only in case of power failure.

g) The applicant should not cause any nuisance in the surrounding area due to operation of D.G. Set.

h) The applicant shall comply with the notification of MoEFCC, India on Environment (Protection) second Amendment Rules vide GSR 371(E) dated 17.05.2002 and its amendments regarding noise limit for generator sets run with diesel.

18. The industry should not cause any nuisance in surrounding area.
19. The industry shall take adequate measures for control of noise levels from its own sources within the premises so as to maintain ambient air quality standard in respect of noise to less than 75 dB (A) during day time and 70 dB (A) during night time. Day time is reckoned in between 6 a.m. and 10 p.m. and night time is reckoned between 10 p.m. and 6 a.m.
20. The applicant shall maintain good housekeeping.
21. The applicant shall bring minimum 33% of the available open land under green coverage/ plantation. The applicant shall submit a yearly statement by 30th September every year on available open plot area, number of trees surviving as on 31st March of the year and number of trees planted by September end
22. The non-hazardous solid waste arising in the factory premises, sweepings, etc. be disposed of scientifically so as not to cause any nuisance / pollution. The applicant shall take necessary permissions from civic authorities for disposal of solid waste.
23. The applicant shall not change or alter the quantity, quality, the rate of discharge, temperature or the mode of the effluent/emissions or hazardous wastes or control equipment provided for without previous written permission of the Board. The industry will not carry out any activity, for which this consent has not been granted/without prior consent of the Board.
24. The industry shall ensure that fugitive emissions from the activity are controlled so as to maintain clean and safe environment in and around the factory premises
25. The industry shall submit official e-mail address and any change will be duly informed to the MPCB.
26. The industry shall achieve the National Ambient Air Quality standards prescribed vide Government of India, Notification dtd. 18.11.2009 as amended.

This certificate is digitally & electronically signed.

ANNEXURE 3

वेस्टर्न कोलफील्ड्स लिमिटेड

Western Coalfields Limited

(A Subsidiary of Coal India Limited)

Environment Department

क्षेत्रीय महाप्रबंधक कार्यालय, माजरी क्षेत्र

Office of the Area General Manager, Majri Area

P.O.: Junona, Tal: Bhadravati, Dist: Chandrapur – 442503

Tel: 07175 250006 Fax – 07175 250608

पत्र संख्या/Ref. No. WCL/Majri/Environment/2023/167 दिनांक/Date: 24.07.2023

प्रति,

निदेशक/एस. एन. मुखर्जी

मेसर्स अन्नाइनी रोड, आनंद नगर,

नागपुर – [illegible]

GSI No. – [illegible]

PAN No. – AAATV[illegible]C

विषय: Letter of Acceptance for conducting "Ambient Air Quality (AAQ) and fugitive dust monitoring of Expansion of New Majri UG to OC Mine, Tahsil – Bhadravati, District – Chandrapur, and Amalgamated Yekona I & II OC Mine, Tahsil – Warora, District – Chandrapur, Maharashtra"

संदर्भ: 1. Our inquiry via email dated 15.01.2023
2. Your offer letter dated 18.01.2023
3. Your revised offer dated 12.04.2023

महोदय,

With reference to the above, we are pleased to inform you that your quoted rate for the subjected work have been accepted by the Management for award of the work as per the details given below and for which this letter of acceptance is being issued in your favour on terms & conditions as tendered with following scope of work:-

1. To conduct the Ambient Air Quality (AAQ) and fugitive dust monitoring of expansion of New Majri UG to OC Mine, Tahsil – Bhadravati, District – Chandrapur, and Amalgamated Yekona I & II OC Mine, Tahsil – Warora, District – Chandrapur, Maharashtra

2. To submit the compliance report in hard copy (5 nos.) on monthly basis

Financial Impact :

S.No.	Description of work	No. of samples	Rate (Rs.)	Total Amount (Rs.)
1	AAQ Sampling Charges of Monitoring (Parameters such as SPM, PM10, PM2.5, SO2, NOx) (including chemicals consumables, etc.)	192	7000.00	1344000.00
2	Fugitive Sampling Charges of Monitoring (Parameters such as SPM, PM10, PM2.5) (including chemicals, consumables, etc.)	16	7000.00	112000.00
3	Miscellaneous charges Transportation, Vehicle charges, electricity charges on day basis for being stay in village house/ school/ panchayat, Report preparation and hard copy of reports, Accommodation charges, etc.) (The building and electricity charges for 96 samples in buffer zone (i.e., stations in villages only).	208 (192 + 16)	6808.00	1416064.00
	Total			2872064.00
	GST @ 18% extra			516972.00
	Grand total			3389036.00

AAQ monitoring and fugitive dust monitoring shall be done as per the following schedule :

1A) Ambient Air Quality monitoring at Dept. of New Main UG to OC Mine No. of Monitoring station = 4 stations (Core/ buffer Zone), 24 hours sample, Monitoring frequency = Fortnightly i.e. 24 samples/station in a year as per GSR 742 E

TOTAL AAQ SAMPLES IN A YEAR FOR NEW MAIN UG TO OC MINE = 2 Samples/ month/ station x 12 months x 4 stations = 96 samples in 1 yr

1B) Process Air Quality (fugitive emission) monitoring at Dept. of New Main UG to OC Mine No. of Monitoring station = 2 stations (Coal stockyard/ railway siding/ weigh bridge), 24 hours sample, Monitoring frequency = Quarterly i.e. 4 samples/station in a year

TOTAL PROCESS AREA SAMPLES IN A YEAR FOR NEW MAIN UG TO OC MINE = 1 Sample/ quarter/ station x 4 Quarters x 2 stations = 8 samples in 1 yr

2A) Ambient Air Quality monitoring at Amalg. Tokona I & II OC Mine No. of Monitoring station = 4 stations (Core/ Buffer Zone), 24 hours sample Monitoring frequency = Fortnightly i.e. 24 samples/station in a year as per GSR 742 E

TOTAL AAQ SAMPLES IN A YEAR FOR AMALGAMATED TOKONA I & II OC MINE = 2 Samples/ month/ station x 12 months x 2 stations = 96 samples in 1 yr

2b) Process Air Quality (Fugitive emission) monitoring at Amalg. Yekona I & II OC Mine No. of monitoring station = 2 stations (Coal stockyard/ railway siding/ weigh bridge) 24 hours sample Monitoring frequency = Quarterly i.e. 4 samples/station in a year.

TOTAL PROCESS AREA SAMPLES IN A YEAR FOR AMALGAMATED YEKONA I & II OC MINE = 1 Sample/ quarter/ station x 4 Quarters x 2 stations = 8 samples in 1 yr.

Total samples to be taken AAQ (Core/ Buffer) for both the mines = 99 x 2 = 197 samples in 1 year. Fugitive samples = 8 x 2 = 16 samples in 1 yr

Engineer In-charge :

Engineer In-Charge for this work will be Sub Area Engineer (Civil), New Majri Sub Area for the work of New Majri UG to OC Mine and Sub Area Engineer (Civil), Yekona Sub Area for the work of Amalgamated Yekona I & II OC Mine.

Payment of Bills :

You shall submit bill along with 3 hard copies of analysis report on monthly basis.

Terms and Conditions

A. Bill shall be submitted to the engineer in-charge for each mine separately as per the actual quantities executed/ monitoring done in each mine on monthly basis.
B. Paying Authority will be Area Finance Manager, WCL Majri Area.
C. Payment for the work shall be done through EFT against the pre-receipted quadruplicate (04 copies) bill.
D. LPC is not applicable for the said work.
E. Accommodation and local transportation in Majri Area shall not be provided by the Mine Management.

The Letter of acceptance is being issued to you in duplicate. Please return the duplicate copy duly signed on all pages as a token of your acceptance.

क्षेत्रीय अधिकारी (पर्यावरण),
मजरी क्षेत्र

प्रतिलिपि :

- क्षेत्रीय महाप्रबंधक, मजरी क्षेत्र
- उप क्षेत्रीय प्रबंधक, नए मजरी उपक्षेत्र/ पर्यावरण प्रभारी
- क्षेत्रीय वित्त प्रबंधक, मजरी क्षेत्र: EC No. EB/MAJGM/7542/MP/11/354/2023-24 Dt. 24/07/2023 for Rs. 14,36,812.00 excluding GST for New Majri UG to OC Mine and EC No. EB/MAJGM/7543/MP/11/355/2023-24 Dt. 24/07/2023 for Rs. 14,36,812.00 excluding GST for Amalgamated Yekona I & II OC Mine
- प्रभारी अधिकारी (विधि), मजरी क्षेत्र
- उप क्षेत्रीय अभियंता (सिविल), नए मजरी उपक्षेत्र/ पर्यावरण प्रभारी

VISVESVARAYA NATIONAL INSTITUTE OF TECHNOLOGY, NAGPUR

DEPARTMENT OF CIVIL ENGINEERING

NO.: CIVIL/CEC-493/DHL-55/Yekona I & II (OC-23)/ 0800

November 22, 2023

22 NOV 2023

To,

The Area Nodal Officer (Environment)
Office of the Area General Manager, Majri Area
Post: - Kuchna, Tehsil: - Bhadravati
District: Chandrapur – 442301,

Subject: Ambient Air Quality monitoring at Amalgamated Yekona I & II OC Mine, Tehsil: - Warora, District: - Chandrapur, Maharashtra.

Reference: ~~[illegible]~~/2023/167 dated 27.07.2023.

Dear Sir,

Please find herewith, the results of Ambient Air Quality monitoring at Amalgamated Yekona I & II OC Mine, Tehsil: - Warora, District: - Chandrapur, Maharashtra in the month of October 2023 accordingly.

A) CORE ZONE

Sr. No.	Location	Date of Sampling		Concentration (24 hourly basis µg/m³)					Environment condition (Rainy/Windy/Calm/Clear Sky)
		From	To	SPM	PM_{10}	$PM_{2.5}$	NO_x	SO_2	
				Standard for Coal Mines (As per EPR 742 (E), dated 25th September 2008)					
				500	250	–	120	120	
1	Mahakoli Contractor Camp	02/10/2023	12/10/2023	326	168	40	13	21	Clear sky
2	Sub Area Manager Office	03/10/2023	11/10/2023	334	157	39	9	18	Clear sky
3	Mahakoli Contractor Camp	02/10/2023	10/10/2023	340	151	37	13	18	Clear sky
4	Sub Area Manager Office	03/10/2023	11/10/2023	380	155	45	10	18	Clear sky

B) BUFFER ZONE

Sr. No.	Location	Date of Sampling		Concentrations (24 hourly Mean µg/m³)					Environmental condition (Rain/Wind/Cloud/Clear sky)
		From	To	SPM	PM_{10}	$PM_{2.5}$	NO_2	SO_2	
				NAAQS (CPCB) Standard dated 18th November 2009					
				—	100	60	80	80	
1	Parjhara Village	12/10/2021	13/10/2021	114	88	29	5	13	Clear sky
2	Bahj Mawar Mandi Village	12/10/2021	13/10/2021	121	94	28	6	12	Clear sky
3	Parjhara Village	12/10/2021	13/10/2021	125	93	32	6	12	Clear sky
4	Bahj Mawar Mandi Village	12/10/2021	13/10/2021	132	99	30	6	13	Clear sky

(Dilip H. Labaya)
Professor & Coordinator

(Dr. Yashwant R. Kalpana)
Professor & Head, CED

(Dr. (Mrs.) Madhuri A. Chaudhari)
Professor & Dean (R&C)

NOTE: The report has been generated on the basis of ambient sampling done on the locations mentioned at actual field conditions. The results have been analysed as per CPCB guidelines for ambient air quality monitoring, IS 5182 Part -2 (for SO_2), IS 5182 Part – 4 (for Suspended Particulate Matters, PM_{10} and $PM_{2.5}$) and IS 5182 Part – 6 (for NO_2). This report shall not form a document in any dispute/litigation.

AMALGAMATED YEKONA I & II OC MINE

TOP SOIL DUMP

Top Soil Dumps of Amalg. Yekona I & II OC Mine are stabilized with Grass Seeding, and Tree Plantation of various species.

AMALGAMATED YEKONA I & II OC MINE

TOP SOIL DUMP

ANNEXURE 5

WESTERN COALFIELDS LIMITED
OFFICE OF THE GENERAL MANAGER(CIVIL)
COAL ESTATE, CIVIL LINES,
NAGPUR

AGREEMENT NO. 07 OF 2022-23.

NAME OF WORK : "Consultancy Services and Construction of Railway Siding at Amalgated Yokona I & II OC Mine of Majri Area" on nomination basis as per Memorandum of Understanding (MOU) terms and conditions entered between CIL (Coal India Limited) and M/s IPRCL (M/s Indian Port Rail & Ropeway Corporation Limited) dated 05.03.2020.

AGENCY: M/s Indian Port Rail & Ropeway Corporation Limited (IPRCL)
4th Floor, Kiman Bhawan, Mumbai Port Trust Building,
M.P. Road, Mazgaon (E),
Mumbai – 400010
email- [illegible]

AWARDED VALUE: Rs. 93,74,46,451.71 (Rupees eighty three seventy four lakh forty six thousand four hundred fifty one and paise seventy one only) including GST @18%

WORK ORDER REF.: [illegible] Date : 07.05.2022.

B.C.NO: Rs. 43.69 Crores only vide D.O. No. PAW/CL/GM/RC/CIVIL (RAILWAY SIDING)/MAJRI AREA/[illegible] dated 31.03.2022.

DATE OF COMMENCEMENT: 07.06.2022

DATE OF COMPLETION : 06.11.2023

ATTESTED
Manager (Civil)

WESTERN COALFIELDS LTD.
OFFICE OF THE GENERAL MANAGER (CIVIL)
COAL ESTATE, CIVIL LINES, NAGPUR 1.

AGREEMENT DETAILS OF WORK

We hereby tender for the execution for the Western Coalfields Limited of the work specified in the under written memorandum at rates specified therein within a period of 18 Months from 07.05.2022 in accordance with the specifications, design, drawing and other documents attached to this and subject to the annexed conditions of contract and with such materials as are provided for by, and in all other respects in accordance such conditions as far as applicable.

MEMORANDUM

1.	NAME OF WORK	Consultancy Services and Construction of Railway Siding at Amalgated Yokona I & II OC Mine of Majri Area" on nomination basis as per Memorandum of Understanding (MOU) terms and conditions entered between CIL (Coal India Limited) and M/s IPRCL (M/s Indian Port Rail & Ropeway Corporation Limited) dated 05.03.2020.
2.	ESTIMATED COST	Rs. 80,74,46,451.71 (Rupees eighty crore seventy four lakh forty six thousand four hundred fifty one and paise seventy one only) including GST @18%
3.	AGREEMENT VALUE	Rs. 80,74,46,451.71 (Rupees eighty crore seventy four lakh forty six thousand four hundred fifty one and paise seventy one only) including GST @18%
4.	DATE OF COMMENCEMENT	07.06.2022
5.	DATE OF COMPLETION	06.11.2023

GENERAL MANAGER (CIVIL)
WCL Nagpur

008

5

[illegible]

[illegible]

To

[illegible]

[illegible]	:	[illegible]
[illegible]	:	(i) [illegible] (ii) [illegible] (iii) [illegible] (iv) [illegible]

[illegible]

1. [illegible]

2. [illegible]

[illegible]

[illegible]

ANN 5

6911

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[illegible]

[illegible]

Sl. No.	Description	Amount (Rs.)
a)	[illegible] Electrical, Mechanical [illegible] Cost Changes and Insurance @ 18% GST	[illegible]
b)	Consultancy Fee as per [illegible]	[illegible]
	TOTAL	[illegible]

[illegible]

Sl. No.	Description	Total Cost (Rs.)
1	Consultancy Engineering	[illegible]
2	Permission/NOCs	[illegible]
3	Civil & Allied	[illegible]
a	Drainage	[illegible]
b	Water & Sanitation	[illegible]
c	Site Facilities (Office & Store, Workshop, etc.)	[illegible]
	Total Cost of Civil Work	[illegible]
4	GST Payable	[illegible]
5	Electrical Fixtures	[illegible]
6	Mechanical Charges	[illegible]
7	Total cost of Civil, GST and Electrical including taxes	[illegible]
8	Add Contingencies @ 5%	[illegible]
C	Total	[illegible]

Note, 8 % charges

a	Electrical Cost Charges for Civil Work @ 4%	[illegible]
b	Electrical, Mechanical Cost work @ [illegible]	[illegible]
c	[illegible]	[illegible]
d	GST @ 18%	[illegible]

Contd. p/3

GENERAL MANAGER (CWR)
for WCL Ltd. Nagpur

ANN 5

[illegible]	Total Cost inclusive of GST	[illegible]
1	[illegible]	[illegible]
	GST @ 18% on [illegible] fees	[illegible]
	[illegible] fees including GST	[illegible]
	[illegible]	[illegible]

Note: The [illegible]

5. That the total period of completion is [illegible] months from the [illegible]

6. That pursuant to the above referred letter, a formal agreement shall be entered into between M/s [illegible] & M/s [illegible] [illegible]

Stage-I: [illegible] Survey and Feasibility Study Report [illegible] (Zero Point) The Total Period of the estimated cost of work. This shall be based on rough estimate or approximate estimate to be obtained by M/s [illegible].

Stage-II: [illegible] Final Location Survey and Detailed Project Report [illegible] (Zero Point) of the estimated cost of work. This shall be based on [illegible] estimate to be obtained by M/s [illegible].

Stage-III: [illegible] Project Management Consultancy [illegible] (Zero Point) of the awarded value / final [illegible] value, whichever is less.

7. That [illegible] Consultancy (PMC) will be as below:

[illegible]

Sl. No.	Deliverables	[illegible]
1.	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

2	Survey of the alignment as approved in discussion plan and plan details and drawing along with draft DPR and its acceptance by WCL	50% of Plant Fee Percent (0.50%) of Estimated Project Cost
3	On submission of Feasibility Report after incorporation of comments of WCL	50% of Plant Fee Percent (0.50%) of Estimated Project Cost
4	On receipt of approval from Railway	25% of Plant Fee Percent (0.50%) of Estimated Project Cost

Stage-II (Applied Project Report (DPR))

S. No.	Deliverables	Fee in 0.80% (One Percent) of the Project Cost for project less than or equal to Rs. 100 Crores
1.	Final location survey and center line pegging of approved alignment and submission of draft DPR to WCL incorporating the observations received on PFR from WCL & Railways	20% of Fee Percent (0.20%) of Estimated Project Cost
2	On receipt of approval on the draft DPR from WCL, preparation of DPR and submission to WCL and Railways	30% of Fee Percent (0.30%) of Estimated Project Cost
3	On receipt of acceptance of DPR from Railways and submission of Final/Revised DPR, if sought for by Railways, incorporating the observations	50% of Fee Percent (0.50%) of Estimated Project Cost

Stage-III (Detailed Engineering & Project Management Consultancy (PMC))

S. No.	Deliverables	PMC fee 3.00% (percent) of Estimated Value of Executed Value, subject to a minimum fee of Rs. 100 Crores
1	Detailed Engineering and Tender Documents including alignment & design of bridges, culverts, influenced by the Technical investigations	10% of PMC fee adjustable on Estimated value or Final executed value, whichever is lower.
2	Co-ordination with other Railways/Stakeholders	10% of PMC fee adjustable on Estimated value or final executed value, whichever is lower
3	Project supervision including certification of Bill and quality control, monitoring of Contract	80% of PMC fee adjustable on Estimated value or final executed value, whichever is lower.
4	On completion of work and closing of Contracts	100% of PMC fee adjustable on Estimated value or final executed value, whichever is lower.

Contd...p/5

GENERAL MANAGER (CWF)
NICL Rajni, Bilaspur

ANN 5

Note: If ESI and other laws only partly applicable shall be payable in addition to their cost of execution of work.

(ii) In case of increase in scope of work / additional work involving design & supervision this shall be paid for practicals @ percentage as mentioned above in NCW. However, for increase in executed value of work due to only the variations only, where engineering, soil design is not involved, no additional fee shall be paid.

4. That M/s IRCL shall incorporate the penalty clause in Contractor's Agreement.

5. That WCL is liable to recover from fees due to M/s IRCL, a sum equal to 1.00% of consultancy fee for the part of work so delayed per week of delay or part thereof towards non-fulfilment of milestone performance. The total fees by M/s IRCL, under this clause shall be subjected to maximum of 10% of the fee for the part of work delayed.

Payment Schedule

(1) 20% → release

(2) when 50% of 20% exhausted & utilization Certificate

(3) Release 20% balance

→ Interest received → Credited to WCLQ

12. In lieu of M/s IRCL, WCL will release to transfer to specified bank account of any scheduled bank 10% of the contract value value against submission of bank guarantee of equivalent amount, to enhance the work activities towards carrying out the works of project by the contractors / sub-contractors / agencies / vendors engaged by M/s IRCL for and on behalf of WCL for the projects. Interest accruing to such funds in the specified Escrow Account / specific account shall be credited to WCL and get adjusted proportionately as herein after provided. The expenditure incurred thereafter towards carrying out the works of the project shall be adjusted from the Escrow account the balance in the Escrow A/c held with IRCL shall submit the adjustment statements. Further instalment as per contractual conditions will be paid / released to M/s IRCL to enable the total amount 20% of the contract value. The procedure for release of fund shall be repeated whenever 50% of the total amount paid to M/s IRCL is utilized and utilization certificate issued by M/s IRCL. The utilization certificate should be supported by relevant documents including statement of actual expenditure / payments made to the vendors / suppliers / agencies / contractors / sub-contractors / agencies / vendors engaged by M/s IRCL for the project. The release of subsequent payment is subject to the actual physical progress as per the SOD in the ratio of 50% of the total amount to be paid for this purpose. Utilization certificate duly supported by relevant supporting documents as per prevailing rules of the contractors / sub-contractors / agencies / vendors from time to time and WCL. On the completion of project, M/s IRCL shall furnish full expenditure statement showing the details of full payment made to the contractors / sub-contractors / agencies / vendors engaged by M/s IRCL for the project and accepted by authenticated Accountants in case of final bills.

13. That M/s IRCL shall be responsible for rectification of defects, if any, during defect liability period of 12 months after completion of work.

14. M/s IRCL will be responsible for audit observations, CTE observations, Contractor's claim and arbitration, if any.

Contd. p/2

GENERAL MANAGER (CMPL)
WCL Hqrs. Nagpur

ANN 5

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[illegible]

15. For the [illegible] Agreement, following documents are to be submitted to M/s [illegible]:

(a) [illegible]
(b) [illegible]
(c) [illegible]
(d) [illegible]
(e) Copy of PAN Card
(f) Copy of GST Registration Certificate
(g) Any other documents as [illegible]

It is requested to return a signed copy of this LOA/LAO to the undersigned within 15 (fifteen) days from the date of issue of this letter.

For further information, please contact Area General Manager ACL, Jagdpur Area.

[illegible]

GENERAL MANAGER (KAN)
ACL, NAGPUR

Copy to:

1. [illegible] : ACL, Nagpur
2. [illegible] : ACL, Nagpur
3. [illegible] : ACL, Nagpur
4. [illegible] : ACL HQ, Nagpur
5. [illegible] : ACL HQ, Nagpur
6. [illegible] : ACL HQ, Nagpur
7. [illegible] : ACL HQ, Nagpur
8. [illegible] : ACL HQ, Nagpur
9. [illegible] : ACL HQ, Nagpur – [illegible] to publish in the website

Contd...2/-

GENERAL MANAGER (KAN)
ACL, NAGPUR

वेस्टर्न कोलफील्ड्स लिमिटेड
Western Coalfields Limited

(A Miniratna Company)

(भारत सरकार की अनुषंगी कंपनी)

(A Subsidiary of Coal India Limited)

कार्यालय महाप्रबंधक कार्यालय माजरी क्षेत्र/Office of Area General Manager, Majri Area

सिविल अभियांत्रिकी विभाग/Civil Engineering Department, Amalgamated [illegible]

[illegible] FAX: 07176-285032 [illegible]

पो.ओ. [illegible] P.O. Majri Col., - Civil Lines, Coal Estate [illegible]

संदर्भ संख्या/Ref.No.: [illegible] 593 दिनांक/Date: - 30/11/2023

प्रति,

[illegible] इंजीनियर (सिविल),

वेस्टर्न [illegible]

विषय/Subject: Consultancy Services and Construction of Railway Siding at Amalgamated Yelona I & II OC Mine of Majri Area. By M/s IPRCL

संदर्भ/Ref.:- Agreement No. 07 of 2022-23 dated 28.11.2022.

महोदय

With reference to the above, this is to convey herein the certification of budget for the subject work. The budget certification given by Sr. Manager (Finance), WCL [illegible] vide BC. No. FA / WCL / CAP / BC / RAILWAY SIDING / 2022-23 / MAJRI AREA / [illegible] 41 dated 21.11.2023 for Rs. 10,14,09,390/-.

भवदीय

[illegible]

विभागाध्यक्ष (सिविल)

वेकोलि, माजरी क्षेत्र

प्रतिलिपि:-

[illegible] प्रबंधक ([illegible]), माजरी क्षेत्र

ANN 5

WESTERN COALFIELDS LIMITED
Office of the Sub Area Manager
Sub-Area, Mahal Area
Ballarpur, Dist. Chandrapur
PIN - Chandrapur (MS) 442901

[illegible]

[illegible]

प्रति,

[illegible]

महोदय,

विषय : [illegible] " [illegible] (Construction) services and construction of Railway siding at Ambagaman Village in [illegible] of Mahal Area".

संदर्भ : [illegible] of 2022-23 dtd. 28.11.2022

महाशय,

Please find enclosed here with bill for Release amount at interest amount of approved nominated rate for the above said work in favour of M/s PRCL(Indian Port Rail & Ropeway Corporation LTD). for further needful action at your end.

Thanking you

भवदीय,

उप क्षेत्रीय प्रबंधक(खनिज)
वेस्टर्न कोल फील्ड

संलग्न (Enclosed) :-

1.एल.सी. नंबर :- YSA/C/42/2022-2023

2.बिल कॉपी :- 4 nos

Recd
[illegible] 7/01/23

ANN 5

BILL

M/S.IPRCL(M/S.INDIAN PORT RAIL & ROPEWAY CORPORATION LTD.)

Name of work :Consultancy services and construction
of Railway siding at Amalgamated Yelowal) &B OC
Size of Major Area.
Name of Agency :- M/s Indian Port Rail & Ropeway Corporation Limited(IPRCL)
Work order no.:- MSP/WCL/Civil work order/2022/14 dated 07.06.2022
MOU Parties :- Coal India Limited and IPRCL on dated 8.3.2020
Agmt No. & Date : Agmt No.07 of 2022-23 dtd.28.11.2022
SC No/FA/WCL/CAP/SC/Civil/Railway siding/Major Area/140/V25 dtd 21.03.2022 for
Awarded value : Rs.93,74,48,481.71 Rs.40.00 crore
Bill Ref. : 1st on Alc. bill
Date of commencement :-07.06.2022 Date of completion of the work : 06.11.2023

DESCRIPTION OF WORK	QUANTITIES OF WORKS			Rate	Unit	AMOUNT		
	Paid for last	Since last	Total upto date			Paid for last	Since last	Total upto date
Release 20% as a imprest of approved estimated cost to IPRCL	20% of approved estimated cost Rs.93,74,48,481.71						18,749,696.30	
Total							Rs.18,749,696.30	

Rs.18,749,696.30

ANN 5

Signature of Contractor

Date:-

Certified that the foregoing calculations are correct and have been ascertained by actual measurement in the Proven Register (Voucher)/Cash Book and recorded at page No.81 to 86 of MB No. 1140/Civil/Elec respectively. Contractor's measurement has been accepted and that the work has been satisfactorily performed.

Measurements Accepted

Signature of Contractor

Sub Area Engineer(Civil)

Overseer(Civil)

SAM/YSA

Signature of Contractor

Certified that there are no claims outstanding against the contractor for the work on MMV and material lying house rent water charges, Electric energy supply etc. Further to certify that the work is satisfactorily completed.

Certified that the work has been completed to the satisfaction of Administration & No dues claims

Sub Area Engineer(Civil)

Overseer(Civil)

Certified that I have no claims outstanding against the Administration for the work and the claim pertaining through the bill is in full and final settlement of my claims.

To be filled in case of negatively

Allocation:

Head of Account	Amount
DEBITS (work done)	Rs 161488200.00
Total Debits :	Rs 161489199.00
CREDIT - Other recoveries	0.00
Total credit	Rs 0.00
Net amount of the bill	Rs 161488250.00

Contractor

1. Certified that Measurement recorded in the bill have been checked and found correct and that the bill has been prepared correctly on the measurement recorded in the M.B.

Location of Proposed Railway Siding

Work in progress by M/s Indian Port Rail & Ropeway Corporation Ltd

ANNEXURE 7

AMALG. YEKONA I & II OC MINE

CSR WORKS AS PER PUBLIC HEARING COMMITMENT

ANN 7

SHRI RAM KESHAVRAO PETKULE,CONTRACTOR,NMC, PAN NO.ADPPP0571E GSTN NO.27ADPPP0574R1ZH

1. Name of work : Providing & fixing 8 nos. hand pump at different locations at Yelkhed & Wardu village under Yelkhed Sub Area of Majri Area.
2. Name of contractor :- Shri R.K.Petkule, contractor, Bhadravati
3. Agreement No. / Work order no. : WO/MA/2019/WOF-312/WO-75/ dt.20.05 / 5.5.2020
4. DSRE reference no. :-
5. Bill No. : 2nd and final bill
6. Date of commencement : 28.01.2020
7. Date of completion of the work : 27.02.2020
8. Extension of time granted, if any :
9. Actual completion on : 27.2.2020
10. Claims for the work done from 01 to 02

S.No.	DESCRIPTION OF WORK	QUANTITIES OF WORK			Rate	Unit	AMOUNT		
		Paid for last	Since last	Total upto date			Paid for last	Since last	Total upto date
1	Hydrological survey under drinking charges, consisting of field visit of expert duly trained staff along with necessary instruments preparation and submission of field test report.	2.00	5.00	7.00	3000.00	nos.	21000.00	0.00	21000.00
2	Drilling of borewell 100mm dia by D.T.H. reaction including transportation of rig/tools to work site.	240.00	15.00	255.00	350.00	Rmt	84000.00	5125.00	89125.00
3	Providing and fixing of G.I. and blowing in borewell in intended length 15 meters of 1.5 inch dia - chlorinated PVC pipes suitable for portable water with solvent cement as per specification No.IS/4985/1988 including , transportation /freight charges,insurance charges, work and labour cost of joining materials viz. solvent cement etc.complete.(Self tapping to be painted with reverse solution(Oil)nes do with working pressure 10kg/sq.cm	240.00	15.00	255.00	321.00	Rmt	77040.00	4815.00	81855.00
4	Development of borewell by surging and compressor till the discharge of water is clear water from borewell, high velocity jetting and back washing	20.00	0.00	20.00	1080.00	hrs	22400.00	0.00	22400.00
5	Providing and fixing G.I. pipes complete with G.I. fittings and clamps. Including and making good the wall for the nominal bore.	300.18	0.00	300.18	470.00	Rmt	141084.60	0.00	141084.60
6	Providing and fitting M.S. connecting rod of 10mm dia in deep well pumps.	174.00	0.00	174.00	80.00	Rmt	13920.00	0.00	13920.00
7	Providing and fitting for water supply work in homogeneous casting cast iron sluice valve, non rising stem, check valve, nut bolts etc. complete with all labour and materials.	7.00	0.00	7.00	5500.00	nos.	38500.00	0.00	38500.00

ANN 7

[illegible]	7.00	0.00	7.00	11500.00	each	[illegible]	0.00	80500.00
9 Providing and fixing [illegible] board of size 2.80m to x 0.10 [illegible] including [illegible] planning and [illegible], fixed to the [illegible] with [illegible] angle for supporting [illegible] 0.20cum [illegible] 0.20cum [illegible] 3a Bldg [illegible] 1.00cum [illegible] (f) Transportation	7.00	0.00	7.00	4250.00	each	29750.00	0.00	29750.00
10 Dressed packing in hand pans including providing gravel form medium coarse in required grading & lines as per actual requirement, all complete as per instructions of Engineer-in-charge	2.32	0.04	2.36	4343.00	cum	10068.82	173.60	10242.42
Total						4574604.73	8481.60	4583411.35
Add GST 18%						43373.68	853.34	44227.02
Add SGST 18%						43373.68	853.34	44227.02
Total						5660677.11	11188.28	5671865.39

ANN 7

	3	4	5	6	7	8	9

Date:-

Signature of Contractor

Certified that the foregoing claims are correct and have been ascertained by actual measurement by the E.M.Regular SA(C) on dt.NIL to NIL and recorded at page No.178 to 179 of MB No.HSA/Civil/3.716-17 Respectively. Contractor's measurement has been accepted and that the work has been satisfactorily completed.

Measurement is Accepted

Signature of Contractor as per details on over leaf

Chief Manager(Civil)

Engg.Asst(Civil)

Witness

SAMYSA

Signature of Contractor

Certified that there are no claims outstanding against the contract for the work on ANY account of material supply house rent, water charges, Electric energy supply etc. Further to certify that the work is satisfactory completed. Certified that the work has been completed to the satisfaction of Administration & No dues claims against Contractor.

SUB AREA MANAGER

Chief Manager(Civil)

Engg. Assistant (G)

Certified that I have no claims outstanding against the Administration for the work and the claim pertained in this bill is in full and final settlement of my claim.

To be filled in case of final bills

Allowance

Contractor

1. Certified that Measurements recorded in the bill have been checked and found correct and that the bill has been prepared correctly on the measurement recorded in the M.B.

Head of Account		Amount
DEBITS :-work done :	Rs	11188.28
Total Debits :	Rs	11188.28
CREDIT -		
Other recoveries		
Income Tax 1%	Rs	98.00
R.M. 5%	Rs	559.00
GST 18%	Rs	1706.88
CGST tax 1%	Rs.	55.00
SGST 1%	Rs.	55.00
Total credit	Rs	2550.88
Net amount of the bill	Rs	8637.60

वेस्टर्न कोलफील्ड्स लिमिटेड : माजरी क्षेत्र

वर्क ऑर्डर

01.Name of Work:- Providing and fitting 8 (eight) hand pumps at different localities in Yakoro and Mundo Village under CSR activities under Yakoro Sub Area of Majri Area.

02.Name of Agency/Contractor:- Shri Ram Krishnaram Pulluri, Sanraj Nagar, Chichuri Khadrawali Tallali – Chandrawali, District – Chandrapur (M.S.) GSTIN : 27ADPPP6674H1ZH

03.Work Award Letter Number:- [illegible] Service Date 29.01.2020

04.SAC (C), WA's letter Number:- WCL / MA / T&A / SAM / Civil / 3890 dt. / 748 dated 23.01.2020.

05.Date of Commencement:- 29.01.2020

06.Date of Completion:- 27.02.2020

07.बिल नंबर :- [illegible] / [illegible] / [illegible] / [illegible] / [illegible] / 2019 - 20 DATED :- [illegible]

SL. NO.	PARTICULARS OF WORK	QNTY.	UNIT	RATE IN (Rs.)	AMOUNT IN (Rs.)
1.00	Hydrological survey (water dowsing charges) consisting of field visit of expert authorised team along with necessary instruments, preparation and submission of yield test report.	8.00	No.	3000.00 (Rupees three thousand only)	24,000.00
2.00	Drilling of borewell 165 mm dia by D.T.H. machine including transportation of machine at work site.	240.00	Mtr.	385.00 (Rupees Three hundred and eighty five only)	94,800.00
3.00	Providing and supplying and lowering in borewells in standard length (in market rigid UV - plasticized PVC pipes suitable for potable water with solvent cement as per specification No. 4985/H/2000 including transportation, freight charges, inspection charges. Work includes cost of jointing materials (i.e. solvent cement etc.complete) self type to be jointed with cement solvent). 140 mm dia. with working pressure 6 Kg/Sq.M.	240.00	Mtr.	321.00 (Rupees Three hundred and Twenty One only)	77,040.00
4.00	Development of tubewell by suitable air compressor till the discharge of crystal clear water from tubewell, high velocity jetting and bailer washing.	32.00	Hours	1050.00 (Rupees One thousand & only)	33,600.00
5.00	Providing and fixing G.I. pipes complete with G.I. fittings and clamps, (i.e. cutting and making good the walls etc. internal work - Exposed on wall) 32 mm dia. average bore.	218.00	Mtr.	473.39 (Rupees Four hundred & Seventy Three only)	1,02,188.00

Vendor signature

Name: [illegible]

Date: [illegible]

वीके सिंह (प्रशासन)

कार्य प्रभारी अधिकारी

[illegible]

प्रबन्धक (वि.) : माजरी क्षेत्र

Contd...

NO.	PARTICULARS OF WORK	QNTY.	UNIT	RATE IN (Rs.)	AMOUNT IN (Rs.)
6.00	Providing and fixing M.S. connecting rod of 12mm dia in hand pumps.	216.00	Mtr.	90.00 (Rupees Ninety Only)	19,440.00
7.00	Providing and fixing ISI mark, India marked hand pumps with complete set like handle, chain, check valve, nut bolts etc. all complete with all labour and materials.	8.00	No.	5500.00 (Rupees Five Thousand Five Hundred Only)	44,000.00
8.00	Construction of cement platform of size 3x2 mtr. With side wall of 0.225 mtr. Width brick work up to height 0.90 mtr. Floor ground with plaster / PCC & flooring with one mtr. Length drain and soak pit of size 1.20x1.20x1.25 mtr. With PVC pipe 110mm, nahani trap tot rate as per instruction of Engineer-in-charge (a) Earth work - 2.24 cum (b) Sand filling - 0.05 cum (c) PCC 1:2:4 - 0.85 cum (d) Plaster - 6.30 sqm (e) Flooring 5.67 sqm (f) Nahani Trap - 1 No. (g) PVC pipe - 2 Nos. (h) Bend PVC - 1 No. (i) Honey Comb Brick Work - 0.48 sqm (j) Half Brick - 5.81 cum (k) Brick work - 5.55 cum.	8.00	No.	11500.00 (Rupees Eleven Thousand Five Hundred Only)	92,000.00
9.00	Providing and fixing display board of size 0.60 mtrs. X 0.45 mtr. Including lettering, painting and lettering, board to be fabricated with 35x35 mm angle for supporting (a) Earth work - 0.33 cum (b) PCC 1:2:4 0.04 cum (c) Steel Work - 34.68 kg. (d) Painting - 1.57 sqm (e) Letter writing - 8.43 sqm (f) Transportation.	8.00	No.	4250.00 (Rupees Four Thousand Two Hundred & Fifty Only)	34,000.00
10.00	Gravel packing in hand pump including providing gravel fine / medium / coarse in required grading & shape as per actual requirement all complete as per instruction of Engineer-incharge.	2.32	Cum	4340.00 (Rupees Four Thousand Three Hundred & Forty Only)	10,068.80
				TOTAL – Rs.	5,31,116.80
				GST @ 18% – Rs.	95,601.02
				TOTAL – Rs.	6,26,717.82

Rs. 5,31,116.80 and GST thereon Rs. 95,601.02 and total value of work comes to Rs. 6,26,717.82 (Rupees Six Lakh Twenty Six Thousand Seven Hundred & Seventeen and Paise Eighty Two Only)including GST(Cost of Company).

CONDITIONS :

01. BC. No.WB / MA / GM / 4423 / CSR / 69 / 02 / 2019-20 dated 14.01.2020 for Rs. 6,20,/ nos.
02. The EMD of Rs. 8,100/- (Rupees Eight Thousand One Hundred only) deposited in the form of On line Payment made vide Bank / UTR No. 17273668 & eProcurement Ref. No. 1806/9485569 from Axis Aggregator Bank mcbanking, which has been treated as part of total part of Security Deposit.
03. The Performance Security of Rs. 23,300/-(Rupees Twenty Three Thousand Three Hundred only) has been deposited by the contractor in the form of FDR vide A/c No.36104011893556 dated 26.02.2020 issued from Bank of India, Bhadrawati Branch valid up to 25.02.2021 in lieu of the first part of Security Deposit of Rs. 31,400/- (Rupees Thirty One Thousand Four Hundred Only) (Including GST) i.e. 5% of the total the value, as per security clause. The Security Deposit can not carry any interest.

(Tarunendra Singh)
Junior Engineer

तरुण सिंह / Tarun Singh
जे०ई० / Junior Engineer

(Tarunendra Singh)
कनिष्ठ अभियंता / Junior Engineer

(Tarun Singh)
कनिष्ठ अभियंता / Junior Engineer

(Contd...3)

All running on account bills shall be paid @ 95% (ninety five percent) of the work value as per clause No. 2.2.1 of the general terms and conditions. The 5% deduction towards retention money shall be secured part of the security deposit.

04. SLR and ABR ITEMS : NIL. Quantity of the above item will be treat as 0 as per Clause No. 5.6 of General Terms & Conditions of Tender.

05. Income tax shall be deducted from each running bill as per norms.

06. The following terms & conditions with respect to GST shall be applicable:-

(a) That the total liability of GST will remain with you.

(b) That you will submit Service Accounting Code (SAC).

(c) That GST will be paid as per rule.

(d) That ITC to be passed on by you by way of enclosing relevant input invoice with bill.

(e) That all invoices submitted by you should be in the form of GST invoice (giving all details as required under the law). You will have to make invoice strictly adhering to provisions of section 31 of CGST ACT 2017 along with Rule 46 and 47 of CGST Rule 2017. You will include the rate as well as amount of CGST, SGST or IGST in invoice. You will have to upload the details of invoice in GST portal as per the provision of GST Act. Invoice issued by you should have GST registration of WCL to enable WCL to claim input tax credit. GSTN of WCL is 27AAACW1570L1ZM.

(f) That you will have to file all the returns and details as applicable under GST laws and rules within due dates. You will have to give an undertaking on invoice or as separate Annexure along with invoice that invoice/applicable GST returns has been / will be uploaded in GST portal within due time as prescribed in CGST Act and CGST ROST or IGST has been deposited as per the provision of GST Act and rules thereon.

(g) That if there is any delay in payment against the invoice due to your fault and any reversal of input tax arises, the same will be recovered from you along with interest and penalty, if any, as paid by WCL due to reversal.

(h) That in case the GST rating of vendor on the GST portal/Government official website is negative/blacklisted at any stage even after award of Work, WCL has right to cancel the letter of award. WCL shall not be obligated or liable to pay or reimbursed GST to you and shall also be entitled to deduct / recover such GST along with all penalties / interest, if any, incurred by WCL.

(i) That you will have to issue credit note as per the provisions of Rule 53 of CGST rule, 2017 on quality deduction or liquidity damage, if any arises.

(j) That if any default is committed by you in uploading the invoice/and/or GST returns or details in digital of applicable GST laws, WCL reserves the right to upload such defaulter on WCL website and may also debar you from participating in future tenders for a minimum period of one year.

07. You will have to make the payment of allowances as per prevailing minimum wages Act, through Bank / Contract Labour Payment Management Portal of Coal India Limited as per instruction of the competent authority of principal employer of concern Unit / Sub Area of Majri Area. Labour declaration certificate must be attached on MC and final bill.

08. All materials required for the work shall be arranged by you of your own cost and shall be of approved quality and specification.

09. All other terms and conditions given in the tender document, GCC Engineering Manual as well as detailed work related letter shall also form part of the work order.

10. Paying Authority is the Area Finance Manager, Majri Area.

विश्वासी और भवदीय,

संलग्नित:-

01.सीमा सहायक मैनेजर, मजरी क्षेत्र

02.उप सीमा कार्मिक मैनेजर (सिविल), सिविल उप सीमा

03.श्री उप कार्यालय सचिव, सिविल, मनु मजरी क्षेत्रीय

सीनियर मैनेजर (सिविल)
मनु मजरी क्षेत्र

डिप्टी सीनियर मैनेजर (सिविल)
मनु मजरी क्षेत्र

जा.क्र./ वि.व.अ.-[illegible] / २०२०
कार्यकारी अभियंता (प्रा.वि.), [illegible]
जिल्हा परिषद, चंद्रपूर
दिनांक : 15/02/2020

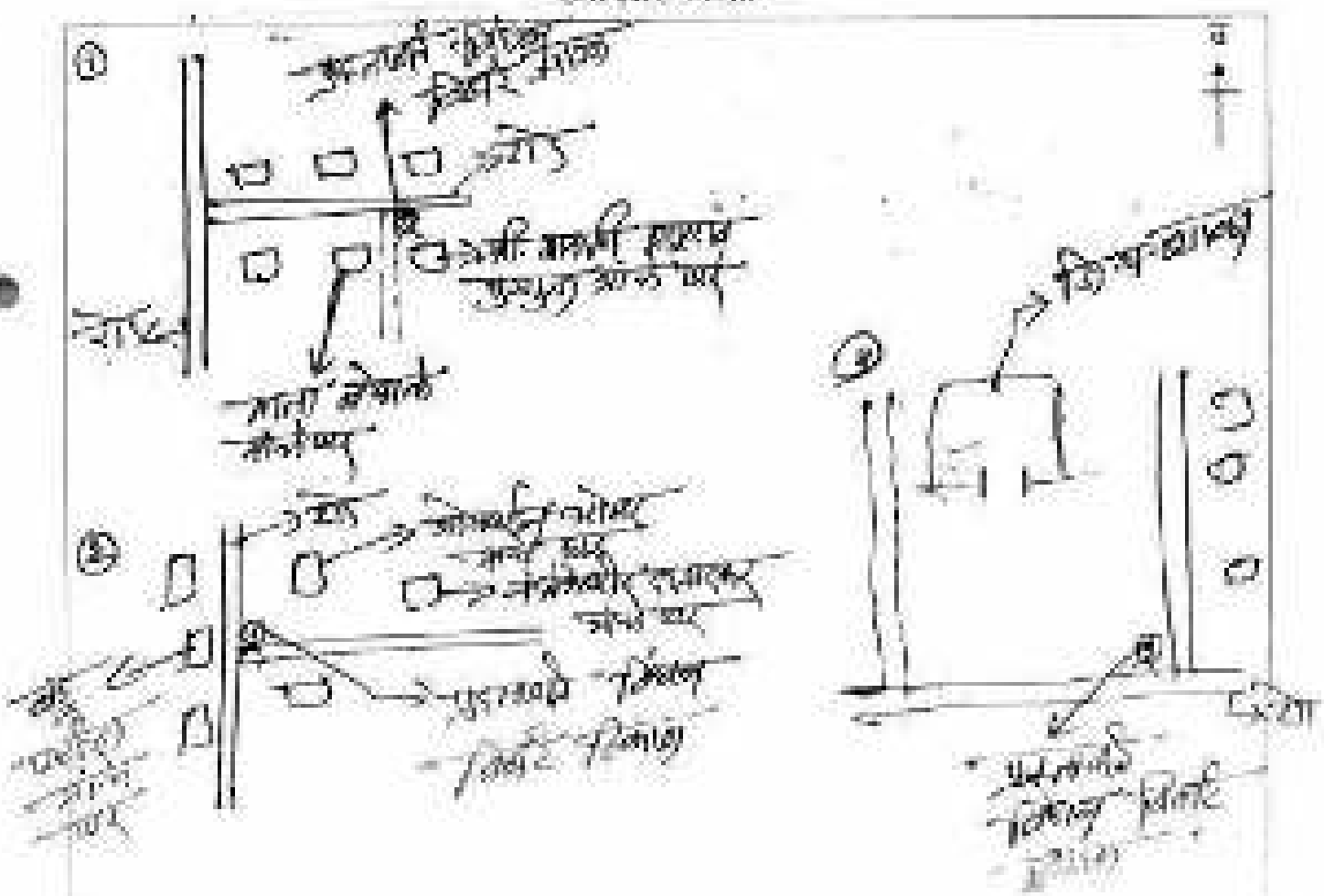
विषय विहीर / कूपनलिका उपलब्ध करणेबाबत

संदर्भ :- आपले कार्यालयीन पत्र क्र. WCL/MA/SAM/YSA/CSR-19-20/[illegible] दिनांक [illegible]

योजनेचे नांव:- CSR
गावाचे नाव- [illegible], ग्रामपंचायत - [illegible], तालुका- [illegible], जिल्हा- चंद्रपूर
विहीर No/ID-[illegible] :- [illegible]
१. सध्याची उपलब्ध गुणवत्ता सांचे प्रमाणपत्र. २. सोबतचे नोंद घेतले पाहिजे. वि.व.अ.यांच्या अभिप्रायानुसार

प्रस्तावित विहीर	प्रस्तावित खोली (मीटर)	संपादित जोडत क्षेत्र (मीटर)	शेरा
१	२	३	४
०३	[illegible] मि. पेक्षा जास्त [illegible]	[illegible]	

आराखडा नकाशा



WESTERN COALFIELDS LIMITED
OFFICE OF THE SUB AREA MANAGER
AMALGAMATED YEKONA I & II SUB AREA
POST. PANURNI, TAH. WARORA
DIST.CHNADRAPUR(MS)

Ref. : WCL/MA/NAM/YSA/C/2018-19/ 791 Date 01/07/2019

To
Geologist
Zila Parishad
Chandrapur (MS)
PIN- 442401

Subject : Providing and fixing 8 number hand pumps at different locations at Yekona and Marda village under CSR activities under Yekona Sub Area of Majri Area.

Dear Sir,

The subject work is awarded to Shri Ram Keshaccao Potarki, Contractor, Bhadravati . Contractor has to fix 5 nos. of hand pumps at Marda village & 3 nos. of hand pumps at Yekona village of Warora Tahsil, Chandrapur.Depth of each hand pump is 100 feet.

You are requested to arrange hydrological survey for identifying the suitable point for fixing hand pumps. Necessary charges shall be paid by by the contractor.

Thanking you.

Yours faithfully

Sr. Manager(Civil)
WCL Yekona Sub-Area

मान./ जि.प.बं./काम/[illegible] [illegible] / [illegible]
कार्यकारी अभियंता (मानसू), [illegible]
जिला परिषद, बांदापुर
दिनांक : [illegible]

विचलन विहीन / पुनर्संरेखन अनुमोदन मानचित्र

संदर्भ :- मानसे कार्यालयीन पत्र क्र. WCL/MANSAM/YSA/C/[illegible] दिनांक [illegible].

योजनेचे नाव:- CSR

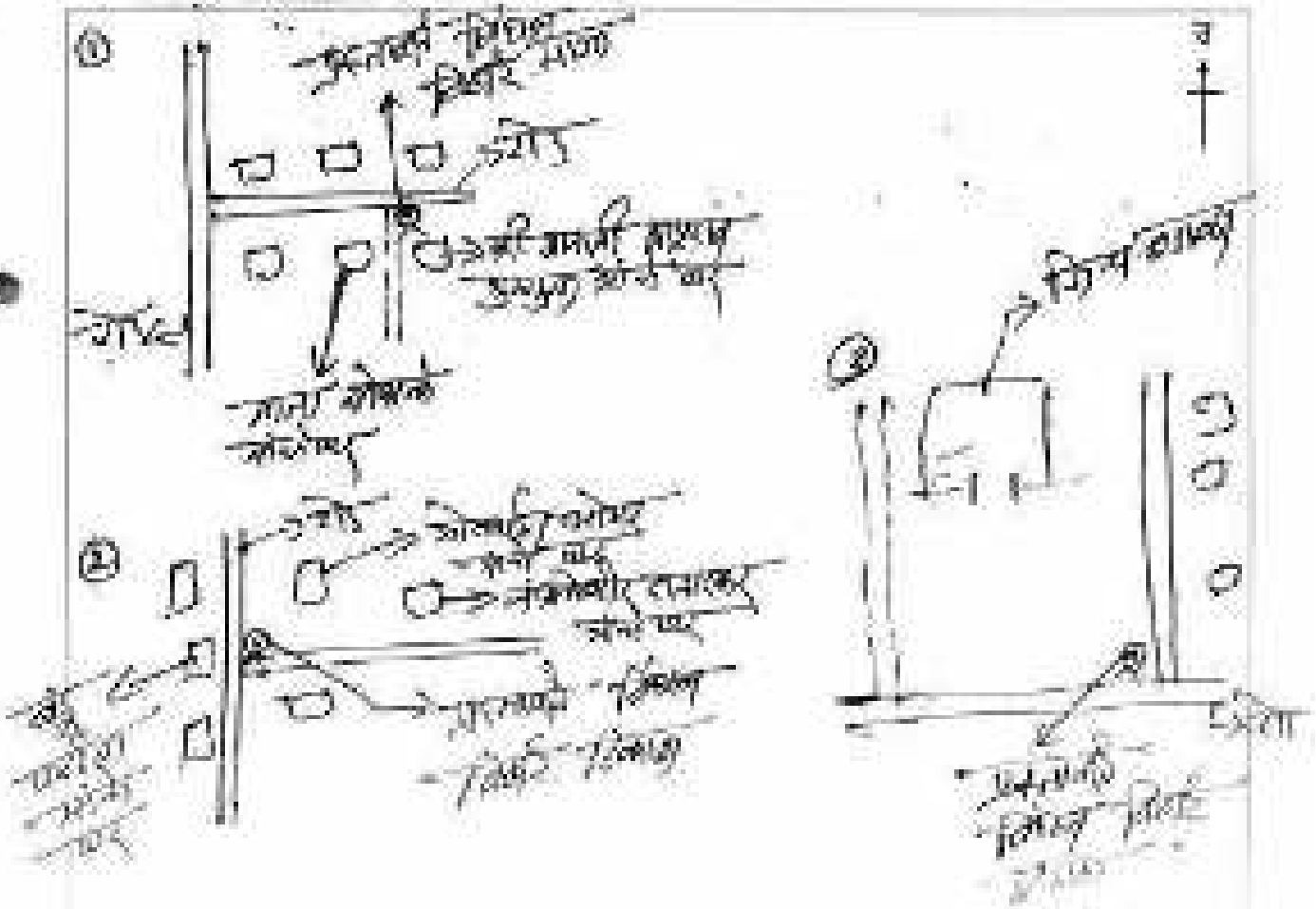
कामाचे नाव- [illegible], ग्रामपंचायत - [illegible], तालुका- [illegible], जिल्हा बांदापुर

विचलन विहीनीचे विवरण: [illegible]

1. मौजे [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

प्रस्तावित विचलन विहीन	प्रस्तावित रुंदी (मीटर)	प्रस्तावित अंतर बदल (मीटर)	शेरा
१	२	३	४
[illegible]	[illegible] मि. पेक्षा जास्त [illegible]	[illegible]	

[illegible]



प्रस्तावित विहिरीची जागा ही, कच्चारस्ता वे.अ.लि., [illegible] यांना उपलब्ध आहे.

हवामान नमुना घेतलेला असल्यास सविस्तर विहिर पेरणीसाठी, कार्यालयातील उपलब्ध (Hydrological RAINFALL DATA and Existing old TW/ BW Detailed log) अधिक माहितीच्या तक्ता क्रमांक आणि भूजल सर्वेक्षणाच्या आधारे, प्रस्तावित भूजल हा कुपनलिका/ विंधन विहिर खोदण्याकरिता योग्य असून सदर ठिकाणी [illegible] मी.मी. लांबीची व ६० मी. खोलीची कुपनलिका/ विंधन विहिर खोदण्याची शिफारस करण्यात येत आहे.

१. अर्जदाराने काम करताना प्रतीदिन ५ तासाचे मर्यादेचे नमूने सादर. जलस्त्रोत शिफारस तेव्हानुसार पंपिंग उपलब्ध राहील.
२. विंधन विहिरी/ कुपनलिकेकरीता १०० मी.मी. व्यासाचा सोसारी पंपिंग पाईप, ई. आय.एस.यू विहीरीस [illegible] (IS:२१२०) व [illegible] मीमी जाडीचा पंपिंग पाईप वापरण्यात यावा.
३. विंधन विहिरी/ कुपनलिकेकरीता १०० मी.मी. व्यासाचा डी.डी.एम. पंपिंग पाईपचा कि.ग्रा./चौ.मी. (IS:[illegible]-[illegible]) वापरण्यात यावा.
४. प्रस्तावित कुपनलिका/विंधन विहिरीचे खोदकाम झाल्यानंतर प्रस्तावित तथा वैधिक तपासणी करूनच उद्भवाचे पाणी पिण्याकरीता वापरण्यात यावा.
५. प्रस्तावित कुपनलिका/विंधन विहिरीचे अर्जदाराने [illegible] पूर्ण झाल्यानंतर आवक झरता तपासण्यात यावी.
६. सदर प्रस्तावित गावातील विंधन विहिरीचे खोदकाम करण्यापूर्वी संबंधित [illegible] आदीचे सर्वेक्षण, [illegible] व इतर सदस्य यांचेशी संपर्क साधून व पूर्वित करूनच करण्यात यावीत.

सहायक भूवैज्ञानिक
ग्रामीण पाणी पुरवठा विभाग
जिल्हा परिषद, चंद्रपूर

प्रति,

Sr. Manager (Civil)
WCL: Yekona subArea

WESTERN COALFIELDS LIMITED
OFFICE OF THE SUB AREA MANAGER
AMALGAMATED YEKONA I & II SUB AREA
POST: PANJURNI, TAL: WARORA
DIST.: CHANDRAPUR (MS)

Ref.: WCL/MA/SAM/YSAC/[illegible] Date: [illegible]

To
Sr. Geologist
Ground water survey and
Development Consultant
Chandrapur (MS)
PIN- 442401

Subject : Providing and fixing 8 number hand pumps at different locations at Yekona and Mando village under CSR activities under Yekona Sub Area of Majri Area

Dear Sir,

The subject work is awarded to Shri Ram Keshaorao Pokale, Contractor, Bhadravati . Contractor has to fix 5 nos. of hand pumps at Mandi village & 3 nos. of hand pumps at Yekona village of Warora Tahsil, Chandrapur.Depth of each hand pump is 100 feet.

You are requested to arrange hydrological survey for identifying the suitable point for fixing hand pumps. Necessary charges shall be paid by by the contractor.

Thanking you.

Yours faithfully

Sr. Manager(Civil)
WCL Yekona Sub Area

ANNEXURE 9

SURFACE WATER MONITORING REPORT

MAIRI AREA

WESTERN COALFIELDS LTD.

[redacted]

Q2-JUNE 2023

[redacted]

[redacted]

ANN 9

Government Laboratory CMPH NAV, NAGPUR	Test Report Borewell water quality monitoring	

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	1		

[illegible]	[illegible]		[illegible]
SL NO	[illegible]	[illegible]	[illegible]
1	pH value	[illegible]	7.[illegible]
2	[illegible]	[illegible]	[illegible]
3	[illegible] mg/l	[illegible]	[illegible]
4	[illegible] mg/l	[illegible]	[illegible]
5	[illegible] mg/l	[illegible]	[illegible]
6	[illegible] mg/l	[illegible]	[illegible]
7	[illegible] mg/l	[illegible]	[illegible]
8	[illegible] mg/l	[illegible]	[illegible]
9	[illegible] mg/l	[illegible]	[illegible]
10	[illegible] mg/l	[illegible]	[illegible]
11	[illegible] mg/l	[illegible]	[illegible]
12	[illegible] mg/l	[illegible]	[illegible]
13	[illegible] mg/l	[illegible]	[illegible]
14	[illegible] mg/l	[illegible]	[illegible]
15	[illegible] mg/l	[illegible]	[illegible]
16	[illegible] mg/l	[illegible]	[illegible]
17	[illegible] mg/l	[illegible]	[illegible]
18	[illegible] mg/l	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

ANN 9

Environment Laboratory CMPCB R-IV, NAGPUR	Test Report [illegible]	

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		

[illegible]				[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	[illegible]	[illegible]
13	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	[illegible]	[illegible]
15	[illegible]	[illegible]	[illegible]	[illegible]
16	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	[illegible]	[illegible]	[illegible]
18	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Annexure 10a

BIO ASSAY TEST REPORT

TEST REPORT

Test Report No: [illegible]	Report Date	[illegible]
Sample ID: [illegible]	Sample Details	[illegible] Sabora Village Mandha River [illegible]
Name and Address Of the Customer: WCL Western Coalfields Limited (A Mini Ratna Company) (A Subsidiary of Coal India Ltd) Office of the Area General Manager, Wani Area, P.O. Bhuccha, Tah: Wani(north), Dist: Chandrapur-442203	Type of Sample	Surface Water
	Volume Of Sample	2 Ltr plastic bottle
	Sample Status	Sealed
	Sample Collected By	Green Environmental Engineers Consultant Pvt. Ltd. Pune
	Date of Sample Collection	[illegible]
	Sample Receipt Date	[illegible]
	Analysis start Date	[illegible]
	Analysis End Date	[illegible]

Parameters	Results	Prescribed Standards	Unit	Standard Method
Bio-Assay Test (% Survival of fish after 96 hrs. in 100% concentration of sample)	55	50-100	%	[illegible]

Remark:

- 100% Effluent concentration shows 55% survival after 96 hrs of bio analysis.

Mr. Vikrant Nanda
(Technical Manager)
Reviewed & Authorized By

End of Report

Terms and conditions :

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]

ANN 10a

TEST REPORT		
Test Report No: [illegible]	Report Date	[illegible]
Sample ID : [illegible]	Sample Detail By	Arnej [illegible] Tolewal S.I. DC Mine Near Vanta Village Hardha River Downstream
Name and Address Of the Customer: M/S. Western Coalfields Limited (A Mini Ratna Company) (A Subsidiary of Coal India Ltd) Office of the Area General Manager, Wani Area, [illegible] Dist: Chandrapur- 442201	Type of Sample	Surface Water
	Volume Of Sample	[illegible]
	Sample Status	Sealed
	Sample Collected By	Shree Environmental Engineers & Consultant Pvt. Ltd. Pune
	Date of Sample Collection	[illegible]
	Sample Received Date	[illegible]
	Analysis Start Date	[illegible]
	Analysis End Date	[illegible]

Parameters	Results	Prescribed Standards	Unit	Standard Method
Bio-Assay Test [illegible]	[illegible]	[illegible]	%	[illegible]

Remark:

- [illegible]

Mr. Vinod Handa
(Technical Manager)
Signatory & Authorized By

[illegible]

Terms and Conditions

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]

ANNEXURE 10b

GREEN ENVIROSAFE

[illegible]

[illegible]

TEST REPORT		
Test Report No: [illegible]	Report Date:	[illegible]
Sample ID: [illegible]	Sample Details:	[illegible]
Name and Address Of the Customer: M/S. Western Coalfields Limited (A Mini Ratna Company) (A Subsidiary of Coal India Ltd) Office of the Area General Manager, Nagpur Area, Pt. Kushwaha, Tah: Hinganghat, Dist: Chandrapur - 442505	Type of Sample:	Surface Water
	Volume Of Sample:	[illegible]
	Sample Status:	Valid
	Sample Collected By:	Green Enviro Safe Engineers & Consultant Pvt. Ltd., Pune
	Date of Sample Collection:	[illegible]
	Sample Received Date:	[illegible]
	Analysis start Date:	[illegible]
	Analysis End Date:	[illegible]

Parameters	Results	Permissible Standards	Unit	Standard Method
Electrical Test: (Electrical Conductivity at 25 deg. C)	[illegible]	[illegible]	µS	[illegible]

Remark:

- [illegible]

Mr. Vineet Hande
(Technical Manager)
Reviewed & Authorized By

END OF REPORT

[illegible]

ANNEXURE 10b

GREEN ENVIROSAFE

[illegible]

[illegible]

TEST REPORT

[illegible]	Report Date	[illegible]
Sample ID : [illegible]	Sample Details	Analysis and Testing [illegible] Nuna Village Wardha River Downstream
Name and Address of the Customer M/S. Western Coal Fields Limited [A Miniratna Company] [A Subsidiary of Coal India Ltd] Office of the Area General Manager, Nagpur Area, [illegible], Dist. Chandrapur 442505	Type of Sample	Surface Water
	Volume of sample	[illegible]
	Sample Status	Tested
	Sample Collected By	Green Envirosafe Engineers & Consultant Pvt. Ltd., Pune
	Date of Sample Collection	[illegible]
	Sample Received Date	[illegible]
	Analysis Start Date	[illegible]
	Analysis End Date	[illegible]

Parameters	Results	Prescribed Standards*	Unit	Standard Methods
[illegible] [illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Remark

2. [illegible]

Mr. Vinod Hande
(Technical Manager)
Reviewed & Authorised By

End of Report

Terms and Conditions

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]

ANNEXURE 11

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FOR COMPANY USE ONLY
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DRINKING WATER MONITORING REPORT

MAJRI AREA

WESTERN COALFIELDS LTD.

JOB NO./094170008

QE-JUNE 2023

[redacted]

Environment Laboratory
NABL Accredited vide Cert. No. TC 7592
CMPFO
REGIONAL INSTITUTE-IV, BAITARNI NAGAR
AMBIKONA, NAGPUR, PIN – 440034

An ISO 9001:2015 COMPANY

[redacted]

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report Drinking water quality monitoring data	

TEST REPORT NO.	[illegible]	DATE OF SALE	[illegible]
NAME OF CUSTOMER	[illegible]	SAMPLE DESCRIPTION	WATER SAMPLE
NAME OF AREA	[illegible]	[illegible]	
NAME OF PROJECT	[illegible]	[illegible]	
NO. OF PAGES	2		

NAME OF LOCATION	[illegible]	TEST REPORT DATE	[illegible]

SL. NO.	PARAMETER	TEST METHOD	DETECTION LIMIT	ANALYSIS RESULT	IS 10500:2012	
					REQUIREMENT (ACCEPTABLE LIMIT)	PERMISSIBLE LIMIT IN THE ABSENCE OF ALTERNATE SOURCE
1	Colour (Hazen)	IS [illegible] Part 4 Sec 1 Method 2017	1	2	5	15
2	Odour	IS [illegible] Part [illegible]	Qualitative	Unobjectionable	Agreeable	Agreeable
3	Turbidity (NTU)	IS [illegible] Part 10 Nephelometric Method 2012	1	3	1	5
4	pH Value	IS 3025 Part 11 Electrometric Method 2017	2	7.38	6.5 to 8.5	No relaxation
5	Total Hardness (as CaCO3) - mg/l	IS [illegible] Part [illegible] EDTA Method 2004	4	352	200	600
6	Iron (as Fe) - mg/l	IS 3025 Part 53 AAS Flame Method 2019	0.06	BDL	0.3	No relaxation
7	Chloride (as Cl) - mg/l	IS 3025 Part 32 1988 Argentometric Method 2014	2	90	250	1000
8	Residual Chlorine - mg/l	APHA, 23rd Edition 4500-Cl B DPD Colorimetric method 2017	0.03	BDL	0.2	1
9	Fluoride (as F) - mg/l	APHA, 23rd Edition 4500-F D SPADNS Method 2017	0.02	0.55	1	1.5
10	TDS - mg/l	IS 3025 Part 16 Gravimetric Method 2017	25	428	500	2000
11	Calcium (as Ca) - mg/l	IS 3025 Part 40 - 2014	1.8	80.8	75	200
12	Magnesium (as Mg) - mg/l	APHA [illegible] Edition B, Calculation Method 2017	3	31	30	100
13	Copper (as Cu) - mg/l	IS 3025 Part 42 AAS Flame Method 2019	0.02	BDL	0.05	1.5
14	Manganese (as Mn) - mg/l	IS 3025 Part 59 AAS Flame Method 2006	0.02	BDL	0.1	0.3
15	Sulphate (as SO_4^{2-}) - mg/l	APHA 23rd Edition 4500-SO_4^{2-} E Turbidimetric Method 2017	3	31	200	400
16	Nitrate (as NO_3^-) - mg/l	APHA 23rd Edition 4500-NO_3^- B UV Method 2017	0.5	12.16	45	No relaxation
17	Total Arsenic (As) - mg/l	APHA 23rd Edition 3113 B AAS GTA Method 2017	0.0005	BDL	0.005	No relaxation

18	Lead as (Pb) -mg/l	APHA, 23rd Edition 3120 B ASC 2014 Method 2017	0.005	BDL	0.01	No relaxation
19	Selenium (Se) -mg/l	APHA, 23rd Edition 3120 C AAS/VGA Method 2017	0.005	BDL	0.01	No relaxation
20	Arsenic (As)-mg/l	APHA, 23rd Edition 3120 C AAS/VGA Method 2017	0.005	BDL	0.05	No relaxation
21	Cyanide (CN)-mg/l	IS 3025 Part-40 AAS Flame Method 2014	0.01	BDL	1	1.5
22	Total Chromium -mg/l	IS 3025 Part 52 Sec 3, AAS Flame Method 2014	0.05	BDL	0.05	No relaxation
23	Boron as (B) -mg/l	APHA, 23rd Edition 4500 B-C Carmine	0.300	BDL	0.5	1
24	Alkalinity -mg/l	IS 3025 Part 23 2014	4	134	200	600
25	Nickel-mg/l	APHA, 23rd Edition 3120 B AAS/FLAME Method 2017	0.005	BDL	0.02	No relaxation
26	Aluminium (Al)-mg/l	APHA 23rd Edition 3120 B AAS-FLAME Method 2017	0.005	BDL	0.1	0.2

BDL: BELOW DETECTION LIMIT

SCIENTIFIC ASSISTANT

DEEPAKSHI SAHU
AUTHORISED SIGNATORY

1 [illegible]
2 [illegible]

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DRINKING WATER MONITORING REPORT

MAJRI AREA

WESTERN COALFIELDS LTD.

JOB NO.4094423068

QE-SEPTEMBER 2023

Environment Laboratory
NABL Accredited vide Cert. No. TC-7102
CMPDI
REGIONAL INSTITUTE-IV, KASTURBA NAGAR,
JARIPATKA, NAGPUR, PIN – 440 014

AN ISO 9001:2015 COMPANY

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report Drinking water quality monitoring data	

TEST REPORT NO.	RIN/TR/SEPT-23/DW31	DATE OF ISSUE	27-10-2023
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	WATER SAMPLE
NAME OF AREA	MAJRI	SAMPLING METHOD: LSOP 5	
NAME OF PROJECT	NEW MAJRI II A OC	SAMPLING PLAN: LQR 47	
NO. OF PAGES	2		

NAME OF LOCATION:	SAM OFFICE				SAMPLING DATE:	13-07-2023
					IS 10500:2012	
SL. NO.	PARAMETER	TEST METHOD	DETECTION LIMIT	ANALYSIS RESULT	REQUIREMENT (ACCEPTABLE LIMIT)	PERMISSIBLE LIMIT IN THE ABSENCE OF ALTERNATE SOURCE
1	Colour (Hazen)	IS 3025 Part-4 Pt-Co Method: 2017	1	3	5	15
2	Odour	IS 3025 Part-5:2014	Qualitative	Unobjectionable	Agreeable	Agreeable
3	Turbidity (NTU)	IS 3025 Part-10 Neplometric Method: 2012	1	2	1	5
4	pH Value	IS 3025 Part-11 Electrometric Method: 2017	2	6.89	6.5 to 8.5	No relaxation
5	Total Hardness (as $CaCO_3$) - mg/l	IS 3025 Part-21 EDTA Metod: 2014	4	120	200	600
6	Iron (as Fe) -mg/l	IS 3025 Part-53 AAS Flame Method:2014	0.06	BDL	0.3	No relaxation
7	Chlorides (as Cl^-)- mg/l	IS 3025 Part-32 1988 Argentometric Method:2014	2	30	250	1000
8	Residual Chlorine -mg/l	APHA, 23rd Edition 4500-G DPD Colorometric method: 2017	0.02	0.120	0.2	1
9	Fluoride (as F^-)- mg/l	APHA, 23rd Edition 4500-F D SPADNS Method: 2017	0.02	0.48	1	1.5
10	TDS -mg/l	IS 3025 Part-16 Gravimetric Method: 2017	25	252	500	2000
11	Calcium (as Ca) -mg/l	IS 3025 Part-40 : 2014	1.6	35.2	75	200
12	Magnesium (as Mg) -mg/l	APHA (23rd Ed.) 3500 B, Calculation Method:2017	3	7.77	30	100
13	Copper (as Cu) -mg/l	IS 3025 Part-42 AAS Flame Method :2014	0.03	BDL	0.05	1.5
14	Manganese as (Mn)- mg/l	IS 3025 Part-59, AAS Flame Method: 2006	0.02	BDL	0.1	0.3
15	Sulphate (as SO_4^{-2}) -mg/l	APHA (23rd Edition) 4500E Turbidimetric Method:2017	2	56.01	200	400
16	Nitrates (as NO3) - mg/l	APHA (23rd Edition) 4500-NO3-B UV Spectrophotometric	0.5	3.31	45	No relaxation
17	Cadmium as (Cd)- mg/l	APHA, 23rd Edition 3113 B AAS GTA Method:2017	0.0005	BDL	0.003	No relaxation
18	Lead as (Pb) -mg/l	APHA, 23rd Edition 3113 B AAS GTA Method:2017	0.005	BDL	0.01	No relaxation
19	Selenium (Se) –mg/l	APHA, 23rd Edition 3114 C AAS-VGA Method:2017	0.005	BDL	0.01	No relaxation
20	Arsenic (As)-mg/l	APHA, 23rd Edition 3114 C AAS-VGA Method:2017	0.005	BDL	0.05	No relaxation
21	Zinc as (Zn) -mg/l	IS 3025 Part-49 AAS Flame Method:2014	0.01	BDL	5	15
22	Total Chromium -mg/l	IS 3025 Part-52 Clause 6, AAS Flame Method:2014	0.03	BDL	0.05	No relaxation
23	Boron as (B) -mg/l	APHA, 23rd Edition 4500 B-C Carmine Method:2017	0.002	BDL	0.5	1
24	Alkalinity -mg/l	IS 3025 Part-23:2014	4	52	200	600
25	Nickel-mg/l	APHA, 23rd Edition 3113 B AAS FLAME Method:2017	0.005	BDL	0.02	No relaxation
26	Aluminum (Al)-mg/l	APHA (23rd Edition) 3113B AAS-GTA Method:2017	0.005	BDL	0.1	0.2

BDL: BELOW DETECTION LIMIT

SCIENTIFIC ASSISTANT

DEEPANSHU SAHU

AUTHORIZED SIGNATORY

1 This Report refers to the values related to the items tested.

2 This Report cannot be reproduced in part or full without written permission of the management.

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report Drinking water quality monitoring data	

TEST REPORT NO.	RIN/TR/SEPT-23/DW32	DATE OF ISSUE	27-10-2023
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	WATER SAMPLE
NAME OF AREA	MAJRI	SAMPLING METHOD: LSOP 5	
NAME OF PROJECT	NEW MAJRI II A OC	SAMPLING PLAN: LQR 47	
NO. OF PAGES	2		

NAME OF LOCATION:	KUCHNA COLONY				SAMPLING DATE:	13-07-2023
					IS 10500:2012	
SL. NO.	PARAMETER	TEST METHOD	DETECTION LIMIT	ANALYSIS RESULT	REQUIREMENT (ACCEPTABLE LIMIT)	PERMISSIBLE LIMIT IN THE ABSENCE OF ALTERNATE SOURCE
1	Colour (Hazen)	IS 3025 Part-4 Pt-Co Method: 2017	1	3	5	15
2	Odour	IS 3025 Part-5:2014	Qualitative	Unobjectionable	Agreeable	Agreeable
3	Turbidity (NTU)	IS 3025 Part-10 Neplometric Method: 2012	1	3	1	5
4	pH Value	IS 3025 Part-11 Electrometric Method: 2017	2	7.44	6.5 to 8.5	No relaxation
5	Total Hardness (as $CaCO_3$) - mg/l	IS 3025 Part-21 EDTA Metod: 2014	4	260	200	600
6	Iron (as Fe) -mg/l	IS 3025 Part-53 AAS Flame Method:2014	0.06	BDL	0.3	No relaxation
7	Chlorides (as Cl^-)- mg/l	IS 3025 Part-32 1988 Argentometric Method:2014	2	28	250	1000
8	Residual Chlorine -mg/l	APHA, 23rd Edition 4500-G DPD Colorometric method: 2017	0.02	0.097	0.2	1
9	Fluoride (as F^-)- mg/l	APHA, 23rd Edition 4500-F D SPADNS Method: 2017	0.02	0.50	1	1.5
10	TDS -mg/l	IS 3025 Part-16 Gravimetric Method: 2017	25	420	500	2000
11	Calcium (as Ca) -mg/l	IS 3025 Part-40 : 2014	1.6	44.8	75	200
12	Magnesium (as Mg) -mg/l	APHA (23rd Ed.) 3500 B, Calculation Method:2017	3	35.96	30	100
13	Copper (as Cu) -mg/l	IS 3025 Part-42 AAS Flame Method :2014	0.03	BDL	0.05	1.5
14	Manganese as (Mn)- mg/l	IS 3025 Part-59, AAS Flame Method: 2006	0.02	BDL	0.1	0.3
15	Sulphate (as SO_4^{-2}) -mg/l	APHA (23rd Edition) 4500E Turbidimetric Method:2017	2	39.08	200	400
16	Nitrates (as NO3) - mg/l	APHA (23rd Edition) 4500-NO3-B UV Spectrophotometric	0.5	4.29	45	No relaxation
17	Cadmium as (Cd)- mg/l	APHA, 23rd Edition 3113 B AAS GTA Method:2017	0.0005	BDL	0.003	No relaxation
18	Lead as (Pb) -mg/l	APHA, 23rd Edition 3113 B AAS GTA Method:2017	0.005	BDL	0.01	No relaxation
19	Selenium (Se) –mg/l	APHA, 23rd Edition 3114 C AAS-VGA Method:2017	0.005	BDL	0.01	No relaxation
20	Arsenic (As)-mg/l	APHA, 23rd Edition 3114 C AAS-VGA Method:2017	0.005	BDL	0.05	No relaxation
21	Zinc as (Zn) -mg/l	IS 3025 Part-49 AAS Flame Method:2014	0.01	BDL	5	15
22	Total Chromium -mg/l	IS 3025 Part-52 Clause 6, AAS Flame Method:2014	0.03	BDL	0.05	No relaxation
23	Boron as (B) -mg/l	APHA, 23rd Edition 4500 B-C Carmine Method:2017	0.002	BDL	0.5	1
24	Alkalinity -mg/l	IS 3025 Part-23:2014	4	352	200	600
25	Nickel-mg/l	APHA, 23rd Edition 3113 B AAS FLAME Method:2017	0.005	BDL	0.02	No relaxation
26	Aluminum (Al)-mg/l	APHA (23rd Edition) 3113B AAS-GTA Method:2017	0.005	BDL	0.1	0.2

BDL: BELOW DETECTION LIMIT

SCIENTIFIC ASSISTANT

DEEPANSHU SAHU

AUTHORIZED SIGNATORY

1 This Report refers to the values related to the items tested.

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report Drinking water quality monitoring data	

TEST REPORT NO.	RIN/TR/SEPT-23/DW33	DATE OF ISSUE	27-10-2023
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	WATER SAMPLE
NAME OF AREA	MAJRI	SAMPLING METHOD: LSOP 5	
NAME OF PROJECT	NEW MAJRI UG TO OC	SAMPLING PLAN: LQR 47	
NO. OF PAGES	2		

NAME OF LOCATION:	FILTER PLANT				SAMPLING DATE:	13-07-2023
					IS 10500:2012	
SL. NO.	PARAMETER	TEST METHOD	DETECTION LIMIT	ANALYSIS RESULT	REQUIREMENT (ACCEPTABLE LIMIT)	PERMISSIBLE LIMIT IN THE ABSENCE OF ALTERNATE SOURCE
1	Colour (Hazen)	IS 3025 Part-4 Pt-Co Method: 2017	1	3	5	15
2	Odour	IS 3025 Part-5:2014	Qualitative	Unobjectionable	Agreeable	Agreeable
3	Turbidity (NTU)	IS 3025 Part-10 Neplometric Method: 2012	1	2	1	5
4	pH Value	IS 3025 Part-11 Electrometric Method: 2017	2	7.45	6.5 to 8.5	No relaxation
5	Total Hardness (as $CaCO_3$) - mg/l	IS 3025 Part-21 EDTA Metod: 2014	4	140	200	600
6	Iron (as Fe) -mg/l	IS 3025 Part-53 AAS Flame Method:2014	0.06	BDL	0.3	No relaxation
7	Chlorides (as Cl^-)- mg/l	IS 3025 Part-32 1988 Argentometric Method:2014	2	24	250	1000
8	Residual Chlorine -mg/l	APHA, 23rd Edition 4500-G DPD Colorometric method: 2017	0.02	0.042	0.2	1
9	Fluoride (as F^-)- mg/l	APHA, 23rd Edition 4500-F D SPADNS Method: 2017	0.02	0.54	1	1.5
10	TDS -mg/l	IS 3025 Part-16 Gravimetric Method: 2017	25	270	500	2000
11	Calcium (as Ca) -mg/l	IS 3025 Part-40 : 2014	1.6	32	75	200
12	Magnesium (as Mg) -mg/l	APHA (23rd Ed.) 3500 B, Calculation Method:2017	3	14.58	30	100
13	Copper (as Cu) -mg/l	IS 3025 Part-42 AAS Flame Method :2014	0.03	BDL	0.05	1.5
14	Manganese as (Mn)- mg/l	IS 3025 Part-59, AAS Flame Method: 2006	0.02	BDL	0.1	0.3
15	Sulphate (as SO_4^{-2}) -mg/l	APHA (23rd Edition) 4500E Turbidimetric Method:2017	2	62.18	200	400
16	Nitrates (as NO3) - mg/l	APHA (23rd Edition) 4500-NO3-B UV Spectrophotometric	0.5	4.95	45	No relaxation
17	Cadmium as (Cd)- mg/l	APHA, 23rd Edition 3113 B AAS GTA Method:2017	0.0005	BDL	0.003	No relaxation
18	Lead as (Pb) -mg/l	APHA, 23rd Edition 3113 B AAS GTA Method:2017	0.005	BDL	0.01	No relaxation
19	Selenium (Se) –mg/l	APHA, 23rd Edition 3114 C AAS-VGA Method:2017	0.005	BDL	0.01	No relaxation
20	Arsenic (As)-mg/l	APHA, 23rd Edition 3114 C AAS-VGA Method:2017	0.005	BDL	0.05	No relaxation
21	Zinc as (Zn) -mg/l	IS 3025 Part-49 AAS Flame Method:2014	0.01	BDL	5	15
22	Total Chromium -mg/l	IS 3025 Part-52 Clause 6, AAS Flame Method:2014	0.03	BDL	0.05	No relaxation
23	Boron as (B) -mg/l	APHA, 23rd Edition 4500 B-C Carmine Method:2017	0.002	BDL	0.5	1
24	Alkalinity -mg/l	IS 3025 Part-23:2014	4	80	200	600
25	Nickel-mg/l	APHA, 23rd Edition 3113 B AAS FLAME Method:2017	0.005	BDL	0.02	No relaxation
26	Aluminum (Al)-mg/l	APHA (23rd Edition) 3113B AAS-GTA Method:2017	0.005	BDL	0.1	0.2

BDL: BELOW DETECTION LIMIT

SCIENTIFIC ASSISTANT

DEEPANSHU SAHU
AUTHORIZED SIGNATORY

1 This Report refers to the values related to the items tested.
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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report Drinking water quality monitoring data	

TEST REPORT NO.	RIN/TR/SEPT-23/DW34	DATE OF ISSUE	27-10-2023
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	WATER SAMPLE
NAME OF AREA	MAJRI	SAMPLING METHOD: LSOP 5	
NAME OF PROJECT	NEW MAJRI UG TO OC	SAMPLING PLAN: LQR 47	
NO. OF PAGES	2		

NAME OF LOCATION:	EKTA NAGAR COLONY				SAMPLING DATE:	13-07-2023
					IS 10500:2012	
SL. NO.	PARAMETER	TEST METHOD	DETECTION LIMIT	ANALYSIS RESULT	REQUIREMENT (ACCEPTABLE LIMIT)	PERMISSIBLE LIMIT IN THE ABSENCE OF ALTERNATE SOURCE
1	Colour (Hazen)	IS 3025 Part-4 Pt-Co Method: 2017	1	2	5	15
2	Odour	IS 3025 Part-5:2014	Qualitative	Unobjectionable	Agreeable	Agreeable
3	Turbidity (NTU)	IS 3025 Part-10 Neplometric Method: 2012	1	3	1	5
4	pH Value	IS 3025 Part-11 Electrometric Method: 2017	2	6.86	6.5 to 8.5	No relaxation
5	Total Hardness (as $CaCO_3$) - mg/l	IS 3025 Part-21 EDTA Metod: 2014	4	200	200	600
6	Iron (as Fe) -mg/l	IS 3025 Part-53 AAS Flame Method:2014	0.06	BDL	0.3	No relaxation
7	Chlorides (as Cl^-)- mg/l	IS 3025 Part-32 1988 Argentometric Method:2014	2	62	250	1000
8	Residual Chlorine -mg/l	APHA, 23rd Edition 4500-G DPD Colorometric method: 2017	0.02	0.074	0.2	1
9	Fluoride (as F^-)- mg/l	APHA, 23rd Edition 4500-F D SPADNS Method: 2017	0.02	0.46	1	1.5
10	TDS -mg/l	IS 3025 Part-16 Gravimetric Method: 2017	25	380	500	2000
11	Calcium (as Ca) -mg/l	IS 3025 Part-40 : 2014	1.6	40	75	200
12	Magnesium (as Mg) -mg/l	APHA (23rd Ed.) 3500 B, Calculation Method:2017	3	24.3	30	100
13	Copper (as Cu) -mg/l	IS 3025 Part-42 AAS Flame Method :2014	0.03	BDL	0.05	1.5
14	Manganese as (Mn)- mg/l	IS 3025 Part-59, AAS Flame Method: 2006	0.02	BDL	0.1	0.3
15	Sulphate (as SO_4^{-2}) -mg/l	APHA (23rd Edition) 4500E Turbidimetric Method:2017	2	82.76	200	400
16	Nitrates (as NO3) - mg/l	APHA (23rd Edition) 4500-NO3-B UV Spectrophotometric	0.5	2.37	45	No relaxation
17	Cadmium as (Cd)- mg/l	APHA, 23rd Edition 3113 B AAS GTA Method:2017	0.0005	BDL	0.003	No relaxation
18	Lead as (Pb) -mg/l	APHA, 23rd Edition 3113 B AAS GTA Method:2017	0.005	BDL	0.01	No relaxation
19	Selenium (Se) –mg/l	APHA, 23rd Edition 3114 C AAS-VGA Method:2017	0.005	BDL	0.01	No relaxation
20	Arsenic (As)-mg/l	APHA, 23rd Edition 3114 C AAS-VGA Method:2017	0.005	BDL	0.05	No relaxation
21	Zinc as (Zn) -mg/l	IS 3025 Part-49 AAS Flame Method:2014	0.01	BDL	5	15
22	Total Chromium -mg/l	IS 3025 Part-52 Clause 6, AAS Flame Method:2014	0.03	BDL	0.05	No relaxation
23	Boron as (B) -mg/l	APHA, 23rd Edition 4500 B-C Carmine Method:2017	0.002	BDL	0.5	1
24	Alkalinity -mg/l	IS 3025 Part-23:2014	4	140	200	600
25	Nickel-mg/l	APHA, 23rd Edition 3113 B AAS FLAME Method:2017	0.005	BDL	0.02	No relaxation
26	Aluminum (Al)-mg/l	APHA (23rd Edition) 3113B AAS-GTA Method:2017	0.005	BDL	0.1	0.2

BDL: BELOW DETECTION LIMIT

SCIENTIFIC ASSISTANT

DEEPANSHU SAHU

AUTHORIZED SIGNATORY

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report Drinking water quality monitoring data	

TEST REPORT NO.	RIN/TR/SEPT-23/DW35	DATE OF ISSUE	27-10-2023
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	WATER SAMPLE
NAME OF AREA	MAJRI	SAMPLING METHOD: LSOP 5	
NAME OF PROJECT	YEKONA I & II OC	SAMPLING PLAN: LQR 47	
NO. OF PAGES	2		

NAME OF LOCATION:	SAM OFFICE				SAMPLING DATE:	13-07-2023
					IS 10500:2012	
SL. NO.	PARAMETER	TEST METHOD	DETECTION LIMIT	ANALYSIS RESULT	REQUIREMENT (ACCEPTABLE LIMIT)	PERMISSIBLE LIMIT IN THE ABSENCE OF ALTERNATE SOURCE
1	Colour (Hazen)	IS 3025 Part-4 Pt-Co Method: 2017	1	2	5	15
2	Odour	IS 3025 Part-5:2014	Qualitative	Unobjectionable	Agreeable	Agreeable
3	Turbidity (NTU)	IS 3025 Part-10 Neplometric Method: 2012	1	1	1	5
4	pH Value	IS 3025 Part-11 Electrometric Method: 2017	2	8.20	6.5 to 8.5	No relaxation
5	Total Hardness (as $CaCO_3$) - mg/l	IS 3025 Part-21 EDTA Metod: 2014	4	220	200	600
6	Iron (as Fe) -mg/l	IS 3025 Part-53 AAS Flame Method:2014	0.06	BDL	0.3	No relaxation
7	Chlorides (as Cl^-)- mg/l	IS 3025 Part-32 1988 Argentometric Method:2014	2	36	250	1000
8	Residual Chlorine -mg/l	APHA, 23rd Edition 4500-G DPD Colorometric method: 2017	0.02	0.083	0.2	1
9	Fluoride (as F^-)- mg/l	APHA, 23rd Edition 4500-F D SPADNS Method: 2017	0.02	0.52	1	1.5
10	TDS -mg/l	IS 3025 Part-16 Gravimetric Method: 2017	25	340	500	2000
11	Calcium (as Ca) -mg/l	IS 3025 Part-40 : 2014	1.6	40	75	200
12	Magnesium (as Mg) -mg/l	APHA (23rd Ed.) 3500 B, Calculation Method:2017	3	29.16	30	100
13	Copper (as Cu) -mg/l	IS 3025 Part-42 AAS Flame Method :2014	0.03	BDL	0.05	1.5
14	Manganese as (Mn)- mg/l	IS 3025 Part-59, AAS Flame Method: 2006	0.02	BDL	0.1	0.3
15	Sulphate (as SO_4^{-2}) -mg/l	APHA (23rd Edition) 4500E Turbidimetric Method:2017	2	15.87	200	400
16	Nitrates (as NO3) - mg/l	APHA (23rd Edition) 4500-NO3-B UV	0.5	5.85	45	No relaxation
17	Cadmium as (Cd)- mg/l	APHA, 23rd Edition 3113 B AAS GTA Method:2017	0.0005	BDL	0.003	No relaxation
18	Lead as (Pb) -mg/l	APHA, 23rd Edition 3113 B AAS GTA Method:2017	0.005	BDL	0.01	No relaxation
19	Selenium (Se) –mg/l	APHA, 23rd Edition 3114 C AAS-VGA Method:2017	0.005	BDL	0.01	No relaxation
20	Arsenic (As)-mg/l	APHA, 23rd Edition 3114 C AAS-VGA Method:2017	0.005	BDL	0.05	No relaxation
21	Zinc as (Zn) -mg/l	IS 3025 Part-49 AAS Flame Method:2014	0.01	BDL	5	15
22	Total Chromium -mg/l	IS 3025 Part-52 Clause 6, AAS Flame Method:2014	0.03	BDL	0.05	No relaxation
23	Boron as (B) -mg/l	APHA, 23rd Edition 4500 B-C Carmine Method:2017	0.002	BDL	0.5	1
24	Alkalinity -mg/l	IS 3025 Part-23:2014	4	320	200	600
25	Nickel-mg/l	APHA, 23rd Edition 3113 B AAS FLAME Method:2017	0.005	BDL	0.02	No relaxation
26	Aluminum (Al)-mg/l	APHA (23rd Edition) 3113B AAS-GTA Method:2017	0.005	BDL	0.1	0.2

BDL: BELOW DETECTION LIMIT

SCIENTIFIC ASSISTANT

DEEPANSHU SAHU
AUTHORIZED SIGNATORY

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AMALG. YEKONA I & II OC MINE

AIR POLLUTION CONTROL MEASURES

AIR POLLUTION CONTROL MEASURES

1) Deployed Surface Miner Technology which avoid blasting in Coal and Coal crushing
2) Fixed Sprinklers at Coal Stockyard = 15 nos.
3) Fixed Sprinklers at coal transportation road and weigh bridge site = 15 nos. at Yekona II OC mine and 6 nos. at Yekona I OC Mine
4) Mobile water tanker : 2 no. 15 KL Capacity & 2 no. 12 KL Capacity
5) Tree Plantation: 75,000 nos. trees planted over an area of 30 Ha
6) Mist Cannon – 5 nos. of 100 mtr throw (Supply order issued) out of which 1 no. installed at Coal stockyard

ENVIRONMENT MONITORING MEASURES

1 No. CAAQMS with cont. monitoring of following parameters PM10, PM2.5, SO2, NOx, CO, Wind Speed, Wind Direction, temperature, Humidity etc

USE OF CLEAN TECHNOLOGY: **SURFACE MINER TECHNOLOGY**

ADVANTAGES:

ELIMINATE BLASTING IN COAL

ELIMINATE REQUIREMENT OF CHP

MIST CANNONS FOR ARRESTING FUGITIVE EMISSION

WATER SPRINKLING THROUGH FIXED SPRINKLERS AT COAL STOCKYARD & WEIGH BRIDGE

15 Nos. with 20-25 mtr throw at Coal Stockyard
15 Nos. with 10 mtr throw at Weigh Bridge
Tank Capacity: 2 lakhs Litres

WATER SPRINKLING THROUGH FIXED SPRINKLERS AT COAL STOCKYARD

WORK OF COAL TRANSPORTATION ROAD (METALLED ROAD) IN PROGRESS

TARPAULIN COVERED COAL TRASPORTATION TRUCKS

CHEMICAL ($MgCl_2$) WITH WATER SPRINKLING

IN DUST SUPPRESSION

Condition 4 (xiii): Tree Plantation Details

FY	Nos	LOCATION
2021-22	10,000 Nos.	PLAIN LAND/ GREENBELT NEAR YEKONA VILLAGE
2021-22	15,000 Nos.	TOP SOIL DUMP YEKONA I OC
2022-23	50,000 Nos.	TOP SOIL DUMP NEAR YEKONA II OC
2023-24	35,000 Nos.	TOP SOIL DUMP NEAR YEKONA II OC
2023-24	10,000 Nos.	PLAIN LAND & AVENUE PLANTATION
TOTAL	**120,000 Nos. OVER AN AREA OF 48 Ha**	

GRASS SEEDING ON OB DUMP (FACING YEKONA VILLAGE)

Condition 4 (xiii): Photographs of Tree Plantation

GREEN BELT PLANTATION ALONG MINE BOUNDARY: PLAIN LAND NEAR YEKONA VILLAGE

2021-22

2023-24

Condition 4 (xiii): Photographs of Tree Plantation

TREE PLANTATION ON TOP SOIL DUMP (PLANTATION IN AUGUST 2022)

TREE PLANTATION ON TOP SOIL DUMP (PIC TAKEN IN AUGUST 2023)

ANNEXURE 14

वेस्टर्न कोलफील्ड्स लिमिटेड
Western Coal Fields Limited
(मिनिरत्न कंपनी) (A Miniratna Company)
(कोल इंडिया लिमिटेड की अनुषंगी कंपनी)
(A Subsidiary of Coal India Limited)

[illegible]

[illegible] /2023-24/ 351 दिनांक: [illegible]

Amalgamated Volume (R&R OC Mine)

Details of BME/PME and VTC

Year	Departmental		Contractual	
	PME/BME	VTC	PME/BME	VTC
2021	41	44	279	242
2022	81	38	140	129
2023	33	42	77	90

[illegible]
महाप्रबंधक
अमलगमेटेड एरिया (एवं खुली खदान)

वेस्टर्न कोलफील्ड्स लिमिटेड
Western Coalfields Limited
(कोल इंडिया के की अनुषंगी कम्पनी)
(A Subsidiary of Coal India Limited)

क्षेत्रीय चिकित्साधिकारी का कार्यालय माइरी क्षेत्र Office of Area Medical Officer Majri Area
चिकित्सा विभाग
Medical Department

Ref No. WCL/MA/MED/2023-24/ दिनांक/Date: 28.03.2023

MEDICAL CAMPS CONDUCTED BY MAIRI AREA HOSPITAL 2023

SR.NO	DATE	PLACE	TYPE OF CAMP	BENEFICIAL
1	26/01/2023	Nawa Banjari	Berriy [illegible] shibir	120
2	23/02/2023	Nawa village	Mega cancer Detection camp	186
3	28/03/2023	Mairi co hospital	Cancer [illegible] camp	70
4	14/04/2023	Mairi area hospital	HIV & DM screening camp	32
5	16/05/2023	Majri area hospital	Free eye check up camp	97
6	03/07/2023	Patalkot village	Mega health check up camp	254

Condition 4 (xv): Details and Photographs Water Pollution Control System

- Primary sedimentation of mine water will occur in mine sump, the supernatant will be pumped out and further treated in RCC sedimentation tank
- Sedimentation tanks (2 nos.) of dimension 45 m x 15 m x 1.20 m and 32m x 8m x 1.8m respectively
- Modular STP (MBBR Technology) of 5 KLD for mine premises
- 100 KLD Workshop ETP with Oil Skimmer.

Sedimentation Tanks

WORKSHOP EFFLUENT TREATMENT PLANT (100 KLD CAPACITY)

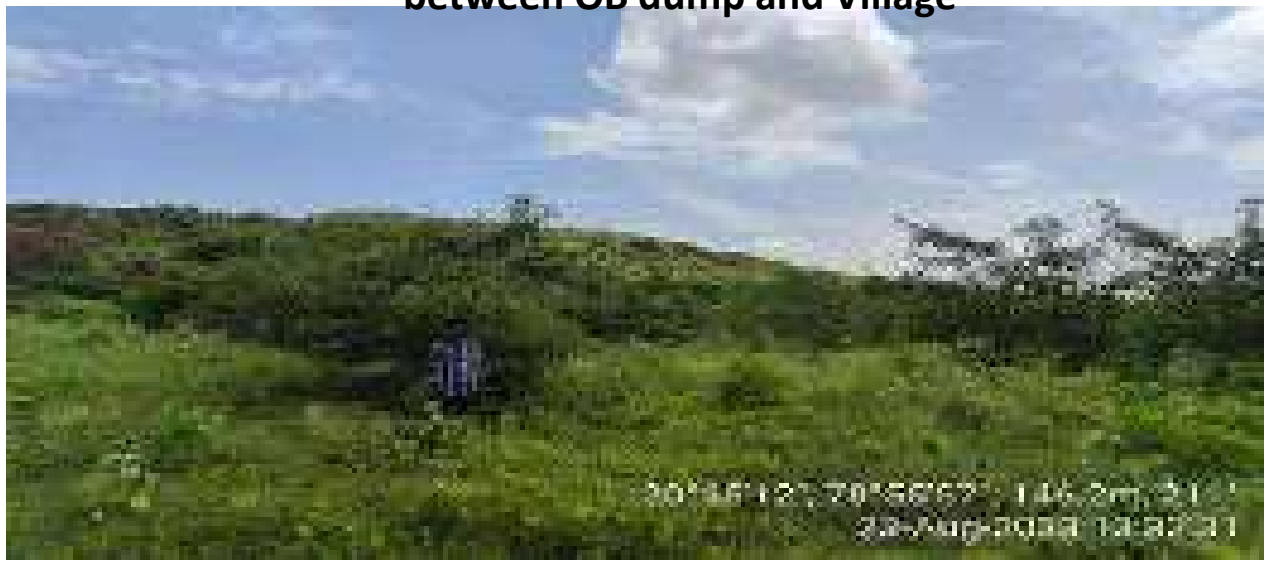
MODULAR STP FOR MINE PREMISES : 5 KLD CAPACITY BASED ON MBBR TECHNOLOGY

MITIGATIVE MEASURES ON/ AT BOTTOM OF OB DUMP NEAR YEKONA VILLAGE

Yekona Village and OB Dump

Plantation in 2021-22

10,000 nos of tree has been planted between OB dump and Village



Present Status of Plantation in Aug 2023

GRASS SEEDING ON OB DUMP via SEED BALL METHOD

GRASS SEEDING ON OB DUMP (FACING YEKONA VILLAGE)

Biologically Reclaimed Top Soil Dump near Yekona Village
(to be completed by 2023-24)

Catch Drains along Mine Boundary

REPORT

FEASIBILITY STUDY REGARDING TOE WALL AND PROVIDING REMEDIAL MEASURES FOR BLACK COTTON SOIL DUMP TOWARDS YEKONA VILLAGE IN YEKONA MINE, WCL, WARORA, CHANDRAPUR

VISVESVARAYA NATIONAL INSTITUTE OF TECHNOLOGY

SOUTH AMBAZARI ROAD, NAGPUR, MAHARASHTRA – 440010, INDIA

November 2023

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CHAPTER 1 – INTRODUCTION & SCOPE

1.1 General Background

The Amalgamated Yekona I and II Opencast Coal Mine is a mine owned by Western Coalfields Limited (WCL), a subsidiary of Coal India Limited (CIL). This mine is situated in the Warora Tahsil of the Chandrapur district in Maharashtra State and is named after the nearby Yekona village.

Fig 1.1: BC Soil Dump near the village of yekona

The region's topsoil is predominantly composed of Black Cotton (BC) soil, known for its problematic nature. The BC soil is high in Montmorillonite minerals, which cause the soil to shrink or swell due to weather changes. This phenomenon pronounces the urgency of promptly addressing the soil stability concerns. As a result, the dump of BC soil is kept separately. The BC soil dump is approximately 100-120 m away from the village of Yekona, as shown in Figure 1.1. The village of Yekona is in very close proximity to the BC soil dump, which makes the situation potentially hazardous for the villagers in the event of any unforeseen catastrophe. *As per a letter from the Ministry of Environment, Forest & Climate Change (mentioned in section 4, point xviii), it has been suggested that to protect Yekona village, a toe wall of at least 15-20 meters in height should be constructed along the OB dump in response to the*

situation mentioned above. The current BC soil dump height is 36 m, and building a toe wall that's 15-20 m high may not be practical or cost-effective. However, it's essential to ensure the stability of the BC soil dump in the long term by implementing protective measures based on scientific investigation. To this end, WCL has approached Visvesvaraya National Institute of Technology (VNIT), Nagpur, to assess the feasibility of a toe wall or suggest alternative measures to stabilise the BC soil dump and safeguard the village of Yekona.

VNIT Nagpur has carried out the study with the inclusion of laboratory experimentation, field experimentation, numerical analysis, field observation, data analysis, etc and this final report is presented to WCL.

1.2 About the study

Amalgamated Yekona-I and II block is located in Warora Tahsil of Chandrapur district of Maharashtra State. The mine area is delimited by latitudes N 20° 13' 42" to 20° 16' 10" N and longitudes E 78° 55' 00" to 78° 58' 30" and is covered by Survey of India Topo Sheet No.55L/15 & 55L/16. The mine is operated by an opencast working method using conventional drilling and blasting methods with a shovel-dumper combination for ore and waste excavation. Nagpur and Chandrapur townships are 110 km and 52 km from the block, respectively.

The slope-forming materials in the mine mainly consist of soil and sandstone as overburden followed by a composite coal seam of 15–17 m thickness. The soil consists of black cotton soil and silty/clayey sand and is classified mainly as clay of high plasticity. The sandstone rock mass belongs to the Kamptee and Barakar formations. The Kamptee sandstone acts as an unconfined aquifer and is a significant source of groundwater. The Kamptee sandstone is a very weak to weak rock with uniaxial compressive strength in the range of 3–25 MPa. The Barakar sandstone is a predominantly medium-weak rock with compressive strength in the range of 25–50 MPa. The Wardha river forms a major drainage system of the area and flows from NW to SE along the central part of Wardha Valley Coalfields. The slope stability problems in this coalfield are predominantly restricted to soil and very weak sandstone benches. The slope failures occur mainly during the rainy season, which runs from the months of 15th June–30th September. The external loading on slopes by overburden dumps also contributes towards slope instability in some cases. The

average annual rainfall in this coalfield is 1,250 mm. The presence of clay minerals results in a rapid decrease in cohesion during rainfall, as loss of surface frictional contact between the grains is due to the high absorption of water. The presence of clay minerals gives more plasticity to the soil, one of the most important causes of slope failure. (Behera et.al, 2016, 88:725-735).

The study area falls under a subtropical climate zone, experiencing hot summers and mild winters. The rainfall measured in the area in July is 605mm, 217mm, and 316mm in the last three years.

The mine consists of external and internal OB dumps. The height of the overburden hard dump can be made up to 90m, keeping the benches 20m in height and width 25m with a bench slope angle of 35°. The height of the OB black soil dump can be made up to 45m, keeping the benches 10m in height and 15m in width with a bench slope 30°. The loose or broken dumps of the mine consist of top BC soil and rocky overburden. BC soil dump is kept separately. In the mine, there is one BC soil dump and another rocky overburden dump. Both these dumps require separate analytical treatment to determine slope stability parameters. The BC soil dump on the site is currently 36 m high, and the dumping on this site has been discontinued.

1.3 Scope of the Work

A broad scope of work includes:

1. A detailed geotechnical analysis and feasibility study to examine the present condition of the BC dump.
2. To provide effective remedial measures for future considerations for the BC dump for the safety of Yekona village, which is approximately 100-120m.
3. Scientific justification, codal provisions, test data, engineering judgement and computational modelling shall duly support all the above.
4. Providing technically feasible recommendations based on site-specific conditions

1.4 Methodology followed for the study

VNIT has initiated work in the pertinent direction and is utilising the following methodology for the study:

I. Field visits and collection of data (contour plan, cross sections, rainfall data, etc.)
II. Geotechnical investigation of BC dump and exploration of ground profile through borehole
III. Numerical analysis of existing dump profiles and possible enhancement in factor of safety through possible remedial measures
IV. Viability of feasible remedial measures and their suitability to site-specific conditions.

Recommendations made in this report must be incorporated into the further progress of the project

CHAPTER 2 – FIELD VISITS AND FIELD OBSERVATIONS

2.1 Field Visits

Initially a field visit from VNIT for a preliminary survey was carried out. After-which a detailed site visit for extensive field observation and sample collection was made. Field visits are an essential aspect of any project. They provide first-hand knowledge of the site and its surroundings, which is crucial for developing accurate and practical solutions.

The technical team of VNIT carried out two field visits at the Yekona mine BC dump. During the visit, the team of VNIT noted several observations regarding the field ambiguities and the measures already taken on the site to improve the stability of the BC dump. One of the significant issues identified was the nature of the Black cotton soil present at the site, characterised by its high Montmorillonite mineral content. Montmorillonite, an expansive mineral, causes the soil to undergo substantial volume changes in response to weather fluctuations, leading to shrinkage or swelling.

2.1.1 Field Visit 1

The first field visit was conducted on last week of August 2023. The primary objective of the first site visit was to address the issues related to the Black Cotton (BC) dump and do a reconnaissance survey of the site. Upon close examination, it became evident that the face of the slope of the BC dump was spoiled at several locations by significant rain cuts (varying from large to medium in size), sliding of soil mass, inadequate drainage measures, inappropriate geometric configuration, etc. These erosional features raised immediate concerns about the stability of the BC dump site. Moreover, the site officials highlighted several additional challenges linked to the BC dump and the protective measures they employed on-site for BC dump stabilisation. Various suggestions were exchanged between the VNIT technical experts and the site officials during these collaborative discussions, and the documents (BC soil dump contour map, cross-section of BC dump, working plan, rainfall data of the region, vibrometer data, geological borehole profile, etc.) related to the BC dump were shared with the technical team of VNIT. The data collected during this visit will be vital in conducting a comprehensive analysis to assess the stability of BC soil,

providing a solid barrier against potential soil slippage and ensuring the safety of the Yekona village inhabitants.

The objective was to address the existing challenges related to the BC dump but also ensure the long-term stability and safety of the site and its surrounding areas. The investigation plan was developed by the technical team from VNIT after observing the site condition and proposed to conduct a detailed geotechnical investigation to reach conclusive remarks. The challenges faced during the execution of the field investigation were discussed with the site officials to carry out the work smoothly.

2.1.2 Field Visit 2

The second field visit was carried out on the third week of October, 2023, by the technical team of VNIT, along with a hired outsourcing agency (Sankalp Civil Consultants) for geotechnical investigation, sample collection, extraction and soil testing. VNIT independently carried out the appointment of this agency and borne its charges. The primary objective of this visit was to conduct necessary field testing, gather essential samples for laboratory analysis and collect required data.

To know the ground profile near the dump, two boreholes were decided to be carried out of about 20 m deep. The borehole investigation was initiated, and the strategic location of two boreholes is shown in Figure 2.1. The borehole investigation below OGL includes collecting samples from different depths, determining soil/rock type layer and carrying out SPT (Standard penetration test). The disturbed and undisturbed soil sample was also collected by excavating a pit of 0.5 m from the specific location on the BC soil dump, as shown in Figure 2.2. These specific locations were targeted purposefully to extract soil samples to gather samples from regions displaying significant rain cuts.

Undisturbed samples were carefully extracted alongside disturbed samples. Samples obtained from the BC dump were systematically documented and catalogued. The VNIT technical team gathered additional undisturbed and disturbed samples from the BC dump site for in-house testing. These samples were reserved for in-house testing, allowing for a parallel analysis that could provide immediate insights into the soil's properties.

Fig. 2.1: Borehole location near the toe of BC soil dump

Fig. 2.2: Sample Collection (Pits and Slope)

2.1.3 Summary of Field Visits

The field visits have given the technical team from VNIT a broad understanding of the site-specific condition through visual identification. Based on the field observations, the investigation plan was prepared, and the sample collection and testing were carried out. The successive discussions between the VNIT technical team and the site officials have provided valuable insights into the complex issues regarding the BC dump.

2.2 Field Observations

Field observations are fundamental, offering valuable insights to ascertain the current state of the BC soil dump slope conditions, rain cuts, geometric irregularities, misalignment in benches, plantation at the site, and drainage conditions. They aid in identifying potential weak points. Additionally, field observation enhances the accuracy and reliability of the subsequent data analysis and numerical simulation. The VNIT technical team made the following field observations among different aspects during their field visit.

2.2.1 BC Dump Slope

i. During the field inspection, it was evident that the BC dump slope face had experienced soil erosion, leading to a severe misalignment of the slopes. It was evident that the face of the BC dump slope had experienced varying degrees of erosion, ranging from partial to complete, leading to a drastic misalignment of the slopes. The erosion caused in the BC dump is severe, and no visible benches can be observed on the site. This can be attributed to the presence of loose BC soil surface layer, which is due to the combined action of rainfall, drying shrinkage, temperature variation, humidity, runoff, etc making it potentially susceptible to erode.

ii. Steep slopes were observed at several locations in the BC soil dump varying from 40°-50°. Also, the slope at some sections is too steep due to soil mass sliding/vertically collapsing. This steep nature of slopes can be a potential result of the continuous surface erosion of BC soil dump over the monsoonal cycle.

iii. Wide rain cuts were observed in the BC soil dump. These rain cuts were formed due to heavy surface water runoff flowing from top to toe of the dump. These rain cuts damaged the slope severely. The rain cuts observed on the site (Figure 2.3) were found to be widened when visited after heavy rain of about 15 days. This rain cuts apart from surface erosion, provides a passage of water in deeper depth in the dump, creating a wetting front at higher depth during monsoon season, making the slope potentially weaker. It can be

inferred if these rain cuts are not handled on an immediate basis, it will cause a severe issue with time.

iv. There were instances of soil mass sliding observed at some parts of the BC soil dump. This sliding is attributed to the loss of shear strength in the soil at the failure surface due to steep slopes, water movement, external loads, etc.

Fig. 2.3: Critical Slope Section and Rain Cuts

2.2.2 Plantations Growth

i. Trees with sturdy roots were noticed on the dump. The roots of the trees can penetrate deep into the slope, loosening the adjacent layer of the soil due to root movement and self-weight, which can be unsuited for the long-term stability of the BC soil dump slope.

ii. Plantations on the dump site play an excellent role in stabilising slopes by reinforcing the soil, preventing erosion, and enhancing the overall environment of the area. It was found that on the face of the slope, at several places, the plantation was grown, which is suitable for BC soil dump as their roots can penetrate into the slope, which can hold the surface layer of the dump.

iii. As informed by the site officials, Stylo Hamata grass was planted on the face of the slope, observed on the site. This grass helps to prevent erosion of the slope and also reinforces the slope face.

iv. Plantations have been carried out in the area between Yekona village and the toe of the dump as observed on the site, and site officials mention that the

horticulture team monitors the plantation through regular visits for healthy growth.

v. Further measures are taken by creating a barrier of drain and temporary boundary arrangement to keep animals and village people away from dump and plantations. Although a lack of stern safeguard measures was taken against the trespassing of animals and village people is observed which may lead to grazing of plantation and destabilization of the slope. It is worth mentioning here that trespassing can harm plantations indirectly affecting the slope protection measures in addition to causing misalignment of geometry. Hence strict guidelines and measures regarding trespassing shall be maintained at the mine site.

Fig. 2.4: Vegetation on BC Dump Slopes

2.2.3 Site-specific

i. At the site, a garland drain of 2m×2m was constructed at the toe of the BC soil dump as a remedial to manage surface water flow effectively. It has also been informed that a siltation pond connected to the garland drain is also constructed for settling suspended sediments, such as silt and clay particles, from stormwater. However, it is to be noted that there is a lack of maintenance of garland drains. In the rainy season, a considerable amount of soil from the face of the slope is washed away by the rainwater due to erosion.

Sedimentation occurs in the drains, which causes the drain's misalignment, and the drain's depth also decreases. Proper maintenance strategies shall be developed pre and post-monsoon to keep the flow in the garland drain running and prevent water inundation at the toe of the BC soil dump.

ii. No heaving was observed near the toe of the dump. As the dumping has been restricted to a height of 36m, the pressure on the soil beneath the dump is constant. In the current situation, the dump is not applying appreciable pressure, which can cause heaving in the periphery.

iii. There were no monitoring measures in place to observe the movement of the dump at the site. The monitoring of the dump movement shall be essentially carried out regularly using temporary or sophisticated arrangements, which will provide an alert of any early signs of failure.

iv. The site vibrometer data was shared by site officials. The readings of vibrations were taken by installing the vibrometer at the village of Yekona. The peak particle velocity (PPV) measured during blasting at the village is under the limiting value (i.e., PPV< 5 mm/sec). The range of vibrometer PPV readings are observed to be in desirable limits, hence the dynamic loads due to blasting shall not create substantial effect on the BC soil dump.

2.3 Summary of site visit and site observations

The first site visits and successive discussions between the VNIT technical team and site officials provided valuable insights into the complex issues regarding the BC soil dump. Additionally, the second site visit involved the collection of soil samples from specific locations at the BC dump site in collaboration with an outsourcing agency. These samples were analysed to capture diverse soil properties, enhancing the depth and accuracy of subsequent analyses.

After observing the site environments, it is understood that site officials have taken preliminary action as remedial measures for the BC dump, i.e., plantation, garland drain, siltation pond, etc. However, there is still a need for more remedial measures to be employed at the site from the observations seen. *It has been attributed from physical identification and field observation that the present condition of the BC soil*

dump slope is in poor condition and is susceptible to failure. Due to erosion, soil mass sliding, rain-cuts and steep slopes are evident.

CHAPTER 3 – FIELD TESTING AND SOIL INVESTIGATION RESULTS

3.1 General

The VNIT Nagpur and an outsourced agency conducted testing for both undisturbed and disturbed samples. In this section, the sample collection procedure of soil/rock extraction was discussed along with the testing results. Comprehensive details and specific values for these tests are provided in Annexure 1. The parameters required for the numerical analysis, including material properties, are outlined in this section. Appropriate inferences were made on the testing results from a scientific standpoint.

3.2 Methodology:

Soil Sample Collection: Soil samples (Undisturbed and Disturbed) were collected from the different benches of the BC soil dump and boreholes during the field visits. Primarily, Laboratory testing was carried out for the experimental analysis of the Black Cotton soil dump; for which samples were collected from the surface of the dump at different benches during the first field visit. The results show that the Free Swell Index is 52-75%, and the soil type is highly compressible (CH) clay, as per USCS classification. This result created the urgency to conduct a detailed field investigation of the dump and the foundation material to reach a conclusive remark. During the second visit, the sample from the dump was collected from the pit of 0.5 m.

Borehole location: The location of the BC soil dump facing the Yekona village side (related to the particular study as per the letter by EC guidelines) was visited, and the borehole investigation locations were decided based on the scientific judgement by the technical team of VNIT. Two points for borehole investigation are marked for knowing the stratigraphy for the study, as shown in Figure 2.1(BH1 and BH2). The borehole investigation is executed at a decided location along the study stretch. The IS codes used for testing disturbed and undisturbed soil samples are mentioned in Table 3.1.

Table 3.1: Conducted Test with IS code References

S.No	Test	IS code
1	Grain Size analysis	IS 2720 Part 4
2	Free Swell Index	IS 2720 Part 40
3	Liquid & Plastic Limit Test	IS 2720 Part 05
4	Core cutter method	IS 2720 Part 29
5	Unified Soil Classification System (USCS)	ASTM D-2487-98 & IS: 1498-1970
6	Specific Gravity	IS: 2720 Part 3
7	Standard Penetration Test	IS 2131 (1981)
8	Direct Shear Test	IS 2720-13 (1986)
9	Consolidation Test	IS 2720-15 (1965)
10	Permeability Test	IS 2720 (PART 17)-1986

3.3 Results of Soil Testing by VNIT

3.3.1 Lab Testing

The disturbed and undisturbed collected soil sample from the bench & slope of the BC soil dump during the field visit is examined in the VNIT Geotechnical Engineering laboratory. The results show that the soil has a Free Swell Index of 58.5-70%, and the soil belonging to CH type with the presence of clay & silt content in the range of 86.28 - 93.1% according to the test results. The direct shear test has been carried out by the VNIT at field density (bulk) to determine shear strength parameters. The results of the lab testing are given below in Table 3.2.

Table 3.2: Soil sample results

L	Soil Type	Clay - Silt %	FSI (%)	LL (%)	PL (%)	PI (%)	Bulk Density (g/cm^3)	Dry Density (g/cm^3)	C (kg/cm^2)	(Φ°)
L1	CH	86.28	75.00	45	24.34	20.66	1.66	1.28	0.281	22.74
L2	CH	93.1	58.34	41	21.94	19.06	1.93	1.53	0.274	22.05

3.4 Results - Outsource Agency

3.4.1 Disturbed Soil - Lab Testing

The disturbed soil sample was separately collected by an outsourcing agency (Sankalp Consultancy) from the different benches of the BC soil dump from locations S1 and S2. The results show that the soil has a Free Swell Index of 90-100%, and the soil type as 'CH' with presence of clay content percentage ranging from 43.3 to 46.6%

according to the test results. The direct shear test has been carried out by the outsourcing agency using Maximum dry density (MDD) and optimum moisture content (OMC) parameters for the test. The results provided in Table 3.3 were briefly discussed in Annexure 1.

Table 3.3: Test disturbed soil results

Sample	Soil Type	Clay - Silt %	FSI (%)	LL (%)	PL (%)	PI (%)	OMC %	MDD (g/cm³)	C (kg/cm²)	(Φ°)	K (cm/sec)
S1	CH	46.6	100	72.4	32.4	40	19	1.578	0.48	15.1	$7.25*10^{-5}$
S2	CH	43.3	90	70.6	31.4	39.2	22	1.559	0.51	14.1	$7.81*10^{-5}$

3.4.1 Borehole Investigation

The borehole investigation is carried out at the chosen locations. The geotechnical investigation is carried out by the outsourcing agency like drilling work, standard penetration test, and collection & preservation of disturbed/ undisturbed soil and rock samples. The level of groundwater table for BH1 and BH2 is 4m and 5m below the original ground level (OGL) respectively.

The index properties, grain size analysis, bulk and dry density, direct shear test, consolidation test, water absorption and specific gravity of rock, and compressive strength of rock are the various properties and tests carried out on the collected samples. Table 3.4 shows the clay type of soil was observed up to 15m, and between 15-20m, the completely weathered rock was found. The tests and test procedures are explained briefly in Annexure 1.

Table 3.4: Borehole Specification

B.H. No	Depth (m)	GWT (m)	Soil type	Bulk Density (gm/cc)	Rocks	Reference
BH 1	20	4	CH – upto 15 m depth	1.577	Completely Weathered rock – 15.5 m to 20 m depth	Annexure 1 Soil testing Bore hole sheet
BH 2	20	5	CH – upto 13.5 m depth	1.598	Completely Weathered rock – 14 m to 20 m depth	

The undisturbed soil samples were collected at 3m and 6m depth during the borehole investigation and tested. The results show that at BH1 and BH2 locations, the CH type of soil was observed. The cohesion and internal friction angle at both borehole locations ranges between BH1 location C (0.35-0.41) kg/cm^2 & Φ° (13.8-16.4), and for the BH2 location C (0.37-0.39) kg/cm^2 & Φ° (12.9-13.5).

Table 3.5: Undisturbed soil sample results

BH No	Depth (m)	Soil Type	Bulk Density (gm/cc)	Moisture content %	C (kg/cm^2)	(Φ°)	Remark
BH1	3.0	CH	1.584	28.90	0.35	16.4	Annexure 1 Soil testing Bore hole sheet
	6.0	CH	1.571	30.10	0.41	13.8	
BH2	3.0	CH	1.594	27.10	0.37	12.9	
	6.0	CH	1.602	29.10	0.39	13.5	

3.6 Material properties used for Numerical Analysis

The properties of the geomaterials used for slope stability analysis shown in Chapter 4 were determined from the testing results shown above through proper scientific judgements. The primary properties required as input are cohesion, friction angle and bulk unit weight. These properties of the dump material were found from the collected sample, and the properties of the foundation material were referred from the borehole investigation. The water table encountered in the borehole is 4m and 5m below GL. The foundation material property was taken as the average of the similar soil samples encountered in BH1 and BH2.

The dump material was tested at field density and density at OMC to know the shear strength parameters (c and ϕ). Three cases of dump properties were considered:

Case A: shear strength parameters tested at field density.

Case B: shear strength parameters tested at maximum density, i.e. at OMC.

Case C: minimum shear strength parameters encountered during testing.

Case A resembles the compacted dump properties, and Case B corresponds to the field properties. Case C are the minimum values of shear strength parameters recorded during the lab testing. The data which is not available were anticipated from

published literature/codal provisions. The values used in the analysis are shown in Table 3.6.

Table 3.6: Physical Properties Used for the Numerical Analysis

S.No.	Material	Properties				References
			Case A	Case B	Case C	
1.	Dump Soil	Bulk Unit Weight (kN/m³)	17.61	17.61	17.61	Testing
		Cohesion (kPa)	27.26	48.55	27.26	
		Phi (°)	22.39	14.9	14.9	
2.	Foundation Soil	Unit Weight (kN/m³)	15.56	-	-	
		Cohesion (kPa)	37.27	-	-	
		Phi (°)	14.15	-	-	
3.	Trench/ stone pitching	Unit Weight (kN/m³)	22	-	-	Sekhar el. al. (2016)
		Cohesion (kPa)	150	-	-	
		Phi (°)	25	-	-	

3.7 Summary of field and soil investigation

This chapter presents field testing and soil investigation results for slope stability of the BC soil dump, Yekona mine. Testing, including sample collection and analysis of soil and borehole investigation, was conducted by VNIT Nagpur and an outsourced agency. Soil samples revealed a Free Swell Index (FSI) of 52-75% and CH soil type observed in VNIT test results and FSI of 90-100% and CH soil type observed in outsourcing agency test results. The variation between FSI is due to the sample collected from the various locations on the dump section. The water table was met at 4 m and 5 m below the ground level at BH1 and BH2, respectively.

The outsourced agency reported, as per the bore log data, that the black cotton soil was observed up to 15m and 13.5m for the BH1 and BH2, respectively, and completely weathered rock was found below the clay soil up to 20m depth.

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CHAPTER 4 – NUMERICAL ANALYSIS RESULTS

4.1 General

A two-dimensional Limit Equilibrium Method (LEM) is used to carry out the slope stability analysis of the cross sections and possible feasibility using the Slope/W software (Geoslope package). Slope/W provides a robust platform for conducting detailed stability analyses for soil and rock slopes, analysing both simple and complex problems for various slip surface shapes, pore-water pressure conditions, soil properties, and loading conditions.

4.2 Methodology

Slope/W is a limit equilibrium method (LEM) based software package. In the LEM method, the stability of any mass is examined while assuming incipient failure over a prospective slip surface, which frequently makes it possible to solve a variety of issues using straightforward statics under the condition that some simplifying assumptions are made. Out of several LEM methods, the Simplified Bishop method is a widely used method that has been employed in the current problem. The simplified Bishop method employs the method of slices to discretize the soil mass and determine the FoS (Factor of Safety). This method satisfies vertical force equilibrium for each slice and overall moment equilibrium about the centre of the circular trial surface. Since horizontal forces are not considered at each slice, the simplified Bishop method also assumes zero interslice shear forces. Bishop's Method of slices is a commonly used technique for analysing slope stability for geotechnical problems. Slope stability refers to the ability of a soil or rock slope to remain in its current position without collapsing or sliding.

When developing a numerical model using Slope/W, the steps involved are creating geometry, assigning materials and boundary conditions, and obtaining results.

4.2.1 Cross section used:

The cross-sections used in the analysis are shown in Annexure 2 (Figure (a)). *These contour plans and cross-sections were provided by mine officials as the survey is not in the study's purview.* Twelve cross-sections were supplied by cutting sections of the BC soil dump profile, as shown in Figure 4.1. Only ten cross-sections were

considered for the analysis based on the representativeness of site condition. Apart from that, the recommended cross-section provided in the scientific report by IIT KGP was used for the analysis, as shown in Annexure 2 (Figure (b)). An analysis is also carried out by considering stone pitching and a rockfill trench in the recommended cross-section.

Fig. 4.1: Contour Map with cross-sections locations

4.2.2 Material Models and Properties Used

In the slope stability analysis, the direction of movement for the slip surface was considered "Right-Left" for all simulations. The material model used for dump soil and foundation soil is the Mohr-Coulomb material model. The bedrock material model is taken as an impenetrable material model. The properties used in the analysis are provided in Table 3.6. The effect of blasting loads was neglected as the generated PPV were within codal limits.

4.2.3 Cases used in the analysis

The cross-sections, along with the feasible solution, were analysed. The following cases were used for the slope stability analysis cross-sections:

Case 1: Slope stability analysis of existing cross sections using properties according to Case A, Case B and Case C

Case 2: Slope stability on recommended slopes and slope flattening

Case 3: Slope stability when the dump is partially saturated and fully saturated

Case 4: Effect of stone pitching

Case 5: Effect of Rockfill trench

4.3 Results and Discussion of Numerical Analysis

4.3.1 Case 1: Slope stability analysis of existing cross-section using properties according to Case A, Case B and Case C

The FoS of each of the 10 cross-sections were determined by numerical analysis using material properties mentioned under Case A, Case B and Case C and the water table considered at 4m below GL. The FoS of each section of each analysis is catalogued in Table 4.1. The image results of critical sections whose FoS is less in the analysis are shown in Annexure 2, i.e., sections 4 and 5. The result of the critical cross-section 4 is shown in Annexure 2 (Figure (c)), and the result of the critical cross-section 5 is shown in Annexure 2 (Figure (d)). The slope with FoS under 1.3 is considered unsafe per DGMS circular. The FoS of cross-sections 4 and 5 is 1.14 and 1.27 at Case C, respectively. The FoS value of these cross-sections indicates the slope of the dump is very steep. This is attributed to the fact that the slope is susceptible to failure due to the steep inclination angle of the slope at section 4 and section 5. The slope can be stabilised by applying remedial measures like slope flattening, as discussed in the next section. *It is worth mentioning that the cross-sections provided by the mine officials were flat, which is contrary to the steep slopes present on the site.* This might be due to the date on which the survey was conducted, i.e., before monsoon. After rainfall, due to excessive erosion, the present state of the dump slope is steep. The slope flattening is an effective method that can increase the stability of BC soil dump, discussed in the next section.

Table 4.1: FoS for each analysis case

Cross-Sections	At field density (Case A)	At OMC (Case B)	At minimum value of cohesion and friction angle (Case C)
Section 1	1.68	1.7	1.58
Section 2	1.56	1.56	1.48
Section 3	1.63	1.61	1.53
Section 4	1.31	1.79	1.14
Section 5	1.51	1.6	1.27
Section 6	1.81	1.75	1.66
Section 7	1.64	1.59	1.52
Section 8	1.6	1.59	1.52
Section 9	2.41	2.39	2.3
Section 10	1.58	1.58	1.5

4.3.2 Case 2: Slope stability on recommended slopes and slope flattening

A slope flattening study was carried out for the BC soil dump at Yekona mine. A scientific study report by IIT KGP recommends a 30° slope angle of the bench with 10m height and 15m width for BC dump. Flattening of slope has been analysed for bench angles 25°,30°,35°,40°,45° and 50°, and FoS was calculated. The height and width of the bench are taken from the scientific report as 10m and 15m. The analysis used the minimum shear strength parameters value (Case C), and the results were catalogued in Table 4.2. The analysis results indicate that a 30° slope is minimum for flattening bench is sufficient, and FoS is also suitable as per DGMS guideline (FoS > 1.3) for the dump. The cross-section for bench angle 30° and the analysis results are shown in Annexure 2 in Figure (e). As the slope of the dump is flattened, the FoS is increasing.

Table 4.2: FOS for each analysis case

S.N.	Bench angle with Height 10 m and width 15 m	FoS
1.	25	1.42
2.	30	1.334
3.	35	1.296
4.	40	1.261
5.	45	1.19
6.	50	1.128

4.3.3 Case 3: Slope stability when the dump is partially saturated and fully saturated

This analysis is performed by assuming that the water table in the dump is increased due to rain in the monsoon season. For this analysis, it is assumed that by increasing the water table level in the dump, the saturation level is also increasing. For the purpose of this analysis, the IITKGP recommended cross-section is used, and the water table level was taken till half and full saturation of the dump. The analysis used the minimum shear strength parameters value (Case C) for dump. The half saturation and fully saturation conditions are ideal conditions that may not take place on the field. However, it is the worst condition for the dump stability. BC soil exhibit high Free swell index (90-100) as shown in chapter 3. This may be potential reason of soil mass sliding. *When the BC soil with high FSI comes in contact with the water, it loses the shear strength to great extent. The effect of water on BC soil was included in this analysis by considering the saturation level.*

The analysis results in images are shown in Annexure 2. The result of the cross-section with half saturation is shown in Figure (f); the result of the full saturation is shown in Figure (g); the result of the analysis showed that due to the increase in saturation level of dump, FoS is decreasing. The results indicate that even in the worst condition, the FoS for the recommended cross-section for half and full saturation conditions is 1.099 and 1.006, respectively, which is safe as it is above 1.

4.3.4 Case 4: Effect of stone pitching

For this analysis, the IITKGP recommended slope cross-section was used, and this analysis is performed by providing stone pitching of 300mm thickness at the first bench slope of the cross-section. The property of stone pitching for analysis is given in Table 3.6 and the analysis used the minimum shear strength parameters value (Case C) for dump. Also, the analysis was performed considering the water table at the half and full saturation. The analysis was carried out by considering the failure surface passing through stone pitching in order to know the effect.

The image results of the analysis are shown in Annexure 2. The result of the cross-section with stone pitching without saturation of the dump is shown in Figure (h), the result of the cross-section with stone pitching with water table at half saturation is shown in Figure (i) and the result of the cross-section with stone pitching with water

table with full saturation is shown in Figure (j). The cross-section result indicates a decrement of FoS when increasing the saturation.

When the stone pitching is provided, the FoS of the bottom bench increases, indicating that stone pitching is a good remedial measure against face failure and slope erosion. The FoS for the cross sections for stone pitching, stone pitching with water table half saturation and full saturation are 1.420, 1.148 and 1.005, respectively. These results were suited for stone pitching if implemented with a 30° bench slope at the bottom bench at the site by fulfilling all the required site conditions and following the proper construction guidelines included in IRC [IRC 56 (2011)] and IS [IS 8237(1985)] codes.

4.3.5 Case 5: Effect of Rockfill trench

For this analysis, IITKGP recommended cross-section was used and this analysis is performed by providing Rockfill trench of 3m width and 4m depth at toe of cross-section. The property of Rockfill trench for analysis is given in Table 3.6 and the analysis used the minimum shear strength parameters value (Case C) for dump. Also, the analysis was performed considering water table at half and full saturation. The analysis was carried out by considering the failure surface passing through rockfill trench at the toe of the dump in order to know the effect.

The image results of the analysis are shown in Annexure 2. The result of the cross-section with rockfill trench without saturation of the dump is shown in Figure (k), the result of the cross-section with stone pitching with water table at half saturation is shown in Figure (l) and the result of the cross-section with stone pitching with water table with full saturation is shown in Figure (m). The result of cross-sections shows that there is decrement of FoS when increasing the saturation. But these results indicate that rockfill trench is a good remedial measure against toe failure of slope and increase retention against failure. The FoS for the cross sections for the rockfill trench, stone pitching with water table half saturation and full saturation 1.412, 1.141 and 1.006 respectively. These results were suited for rockfill trench if implemented at the toe with 30° bench slope at site, by following the proper construction methodology and fulfilling all the required site conditions.

4.4 Summary of Numerical Analysis

The analysis results show that some cross-sections required attention to improve slope stability. However, if the flattening of the slope is carried out at the site with a bench angle of 30°, bench height of 10m, and bench width of 15m, FoS can be improved. Further stone pitching and trenching can enhance FoS by preventing face failure, toe failure, and slope erosion and ultimately increase retention against failure.

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CHAPTER 5 – PREVENTIVE MEASURES TAKEN AT SITE, POSSIBLE REMEDIAL MEASURES AND MONITORING OF BC SOIL DUMP TO BE NECESSITATED

5.1 Introduction

The present section discusses remedial measures for BC soil dump slope stability, maintenance, and prevention. In cases where overburden dump materials present challenges in maintaining slope stability, measures like slope widening, geotextiles, Drains, Stonewalls, retaining structure at the toe, etc., play a vital role. An overview of various remedial measures for BC soil dump slope stabilization is given in this section.

5.2 Black Cotton Soil Nature

Black cotton soil mainly contains clay minerals responsible for swelling and shrinkage, montmorillonite. This BC soil's swelling behaviour is attributed to montmorillonite's unique crystal structure, which allows it to absorb water molecules between its layers. When water enters the soil, it is attracted by the negatively charged surfaces of montmorillonite, causing the clay particles to expand as they hydrate. This expansion increases soil volume and results in the swelling characteristic of black cotton soil. Conversely, when the soil dries out, the water is released from the clay mineral structure, and the soil contracts, which can lead to substantial shrinkage and cracking. This dynamic interplay between moisture and montmorillonite structure is responsible for black cotton soil's swelling and shrinking behaviour, making it a challenge in any major projects. These cyclic changes can lead to ground movement, causing foundation medium to crack and BC soil dump to settle unevenly, resulting in severe failures and slope stability issues for mining projects.

5.3 Preventive measures taken for the BC soil dump by Yekona mine authorities

The following steps have been executed by the mine authorities to prevent the failure of BC soil dump as a precautionary measure.

i. **Grass seeding on dump:** With references to documents and field observation of the experts from VNIT, it has been observed that grass seeding was

implemented, but the denseness of the grass seeding was not observed at all places of the dump or face of the slope.

ii. **Tree plantation on dump:** Tree plantation was implemented on the overall dump, but the visibility of the plantation is observed at predominant places. Fig. 5.1 shows the tree plantation on dump.

Fig. 5.1: Plantation on Dump

iii. **Tree plantation between dump and Yekona Village:** Well-maintained tree plantation was observed at the toe section of the dump towards Yekona village. Fig 5.2 shows that the plantation b/w dump and village.

Fig. 5.2: Plantation b/w Dump and village

iv. **Garland drains along dumps:** The garland drain (2m wide × 2m deep as reported by mine officials) is also provided along the dump to collect runoff and surface water. However, the garland drain filled with siltation and the depth of garland drain is reduced substantially. Fig 5.3 shows garland drain around the dump.

Fig. 5.3: Garland drain

v. A siltation pond connected with a garland drain was provided to collect the siltation.

vi. Monitoring of plantation is carried out by horticulture team by regular visits during casualty replacement of plants, protecting from animals, etc.

vii. No further dumping is made on BC soil dump after 36m and shall not be made in future.

5.4 Suggested Remedial Measure for BC soil dump stabilization

The suggested remedial measures are as per the BC soil dump field observation, material testing and numerical analysis as discussed in Chapters 2, 3 and 4, respectively. Following are the remedial measures for the BC soil dump of the Yekona mine.

5.4.1 Flattening of slopes

For consistent stability of BC soil dump over a long period of time, it is necessary to maintain a healthy geometrical configuration of the dump in order to protect the dump from the impact of surface weathering, erosion, heavy surface runoff, etc. Slope flattening is the most widely used remedial measure to enhance the stability of slope of already constructed dump. This measure assists in redistributing the soil's weight and reduces the risk of slope failure; by reducing the steepness of slope, the gravitational forces acting on the material are distributed more evenly, minimizing the risk of mass movements, such as mass wasting. Maintaining these flattened slopes is essential to mitigating potential hazards and ensure safety near the dump. Figure 5.4 shows the typical failure in dump due to the steep slopes.

The existing BC soil dump at Yekona mine consists of steep slopes at several locations, as observed and discussed in Chapter 2. The existing dump is found to be disturbed at various locations due to external and internal factors. In Chapter 4, it has been shown through numerical simulation that flattening of the slope increases the stability appreciably. It is recommended to reduce the slope angle to 30° as per the scientific study report provided by the IIT KGP at the section of steep slopes of the dump.

Fig 5.4: failure of slope without slope flattening

5.4.2 Widening of Benches

Bench widening is instrumental in preventing slope failure through several technical mechanism, including reducing the overall slope angle, enhancing geotechnical stability, and reducing the overburden load on the slope. As mentioned in section 2.2.1, point (i), it is evident that the benches on the field are not visible. It is recommended to provide a bench width of 15m as per the scientific study report provided by the IIT KGP. Also, the height of each bench shall not exceed 10m.

5.4.3 Garland drain widening & Side face protection

The construction of garland drains is a regular practice to take care of run-off water in mining operations. Widening and proper maintenance of garland drains is an effective strategy for preventing waterlogging at or near the toe of the dump. It is worth mentioning here that, inundation/stagnation of water at the toe can pose submerged condition of toe thereby making it weak and susceptible to collapse. Garland drain of 2m×2m is provided near the toe of BC soil dump in Yekona mine, but upon observation, the depth is less than 2m due to siltation. The gradient of the drain shall allow a continuous flow of water without any waterlogging. The widening of garland drain improves their capacity to manage excess water. This proactive approach enhances the stability of toe and its safety by controlling surface water runoff. Further to avert the risk of side slope instability of the garland drain due to running water, stone pitching is recommended to prevent the scouring of side face. Figure 5.5 shows a picture of the garland drain near the dump toe.

Fig. 5.5: Garland drain

5.4.4 Geonet with vegetation

Utilizing geonets with integrated vegetation is a highly effective strategy for preventing slope failures of BC soil dumps. The geonets provide structural reinforcement, while the vegetation's roots enhance slope stability by binding the soil together. Roots of plants/bushes help to bind the soil particles together and prevent erosion. The root systems act as a natural anchor, reducing the risk of soil erosion on the dump slope. This dual approach safeguards against erosion and landslides and promotes environmental sustainability by creating a natural and biodiverse landscape in the mining area. The combination of geonets and vegetation serves as a robust, eco-friendly solution for BC soil dump stabilization. Figure 5.6 shows a geonet with vegetation on slopes.

Fig. 5.6: Geonet with Vegetation

Table 5.1: Soil Type and vegetation used for erosion control (IRC:56-2011)

Situation	Height of filling bank/cutting	Rainfall/ Velocity of water	Erosion control system
Bank/Cutting made in cohesive soil/fine grained soil (CH, CL, & CI)	Less than 6m	Low moderate rainfall (flow velocity 3 m/sec)	Vegetation (deep or shallow rooted)
Bank/cutting made in all type of soil	More than 6m	High rainfall (flow velocity more than 3m/sec)	Reinforced vegetation or reinforced protection

The table 5.1 shows the vegetation type recommended to be planted on the slopes corresponding to the cutting/filling made in clay type of soil. The BC soil dump is having benches like filling section and the recommended bench height is 10m. So, the erosion control system of reinforced vegetation is suitable remedial measure.

5.4.5 Hydroseeding on slope of dump

Hydroseeding typically consists of applying a mixture of wood fiber/jute fiber, seed, fertilizer, and stabilizing emulation with hydroseeder. It prevents exposed soils from erosion by water and wind by initiating the germination of seeds followed by the growth of the roots.

Overall, hydroseeding is cost-effective, considering the higher germination rate than conventional seeding methods. Figure 5.7 shows the application of hydroseeding on the slope. The method can be effectively applied on the BC soil dump in the Yekona mine for increasing the stability. If surface of slope 10° to 40° the hydroseeding can be made directly, but if the slope is more than 45° the slope needs to be protected by the natural or synthetic geotextile. The Bhanegaon OCM, WCL Nagpur, has also carried out this remedial measure. IRC:56 (2011) provides a guideline of hydroseeding for erosion control.

Fig. 5.7: Spreading of hydroseeder mixture on slope

5.4.6 Surface Drainage

Effective surface drainage planning is paramount in mitigating the challenges of BC soil. Properly designed drainage systems can prevent soil erosion, reduce waterlogging, and provide access to runoff. This arrangement ensures the safe passage of water from the top of the dump to the toe of the dump. Providing surface drains on the BC soil dump of Yekona mines will increase the stability against hydrological erosional factors. Figure 5.8 shows the surface drains on the slopes.

Drainage ditches can be constructed with different shapes and sizes. The appropriate shape and size for a particular site depends upon factors such as the expected runoff, site conditions and availability of resources and construction materials. Usually, a waterway can be triangular, trapezoidal, or parabolic. A parabolic shape is hydrologically more efficient and easier to construct. Usually, a gradient of less than **5%** is preferred; in a normal course, it should not exceed 10%.

Fig. 5.8: Surface drainage

In order to safeguard the diversion ditches from collapse while slope movement or particles collecting on the drain surface, they should be connected to form a garland drain, leading to the sediment pond. Regular maintenance is crucial, especially before and during the monsoon season. It's essential to check the drain's capacity and the flow of water through it to ensure its functioning as intended. Interconnected ditches can be made by using **concrete or impervious soil slurry like bentonite soil slurry**.

As per the **IRC: SP: 42 (2014)** high embankments are vulnerable to erosion of side slopes on account of water attaining high velocity. In such cases special arrangement like flumes/chutes are provided at regular intervals so the water collected from the

shoulder is channelized to these chutes or flumes. Normally the **spacing** between two surface drains is maintained **20 m centre to centre**. Further, IRC also suggests the **depth and width** of the chute/flume shall be **300 mm** and the **thickness** of it must be **100-150 mm** in order to avoid percolation.

5.4.7 Stone Pitching to stop slope erosion

Stone pitching is an effective erosion control technique employed to prevent the degradation of slopes composed of black cotton soil in mining areas. Strategically placing stones or rocks along the slope acts as a protective barrier, reducing the impact of water runoff and minimizing soil erosion. This method stabilizes the slope and maintains the integrity of the BC soil dump, safeguarding against potentially hazardous soil movements and environmental damage. Stone pitching is a practical and sustainable solution for preserving the stability of BC soil slopes in mining operations. Also, stone pitching can increase FoS to some extent, as shown in Chapter 4.

Implementing stone pitching at each bench for slopes is a vital preventive measure for mitigating the risk of slope failure. These stone pitching provide structural support and stability to the excavated benches, reducing the likelihood of landslides and reducing the erosion rate. As the height of BC soil at the site is 36m, applying stone pitching on each bench is not advisable due to the additional load exerted by the self-weight of stone pitching. It is recommended to use stone pitching at the bottommost bench of the BC soil dump at Yekona mine to prevent erosion and protect the toe. Figure 5.9 shows the stone pitching at the slope.

Rock of hard and durable nature is required for the stone pitching and stone pitching shall not crumble on long exposure to water, frost and air. Stone pitching refers to placement of approximately single sized rocks along the slope. IRC 56 (2011) also suggests the same for protecting the embankments from sliding failure. IS 8237 (1985) provides methodology for stone pitching, which can be adopted.

Fig. 5.9: Stone pitching

5.4.8 Trench cutting and filling with hard rocks at the toe

Trench cutting and filling with hard rocks at the toe of the slope of an already constructed dump is a method for mitigating slope/base failures. This technique provides a stable foundation at the toe of the slope with durable materials, effectively preventing movement of soil mass (Figure 5.10). This method is effective in strengthening the toe portion by providing a retainment. The dimensions of the trench vary depending on the usability and site conditions. The trench of 3m width and 4m depth was used in the analysis in Chapter 4. It is found that the trench is effective where the trench is inhibiting the failure surface. The trench can be provided at the toe to stabilize the BC soil dump. Trench cutting and rock filling represent a reliable and practical approach for dump stabilization in mining (*Sekhar et al. 2021*).

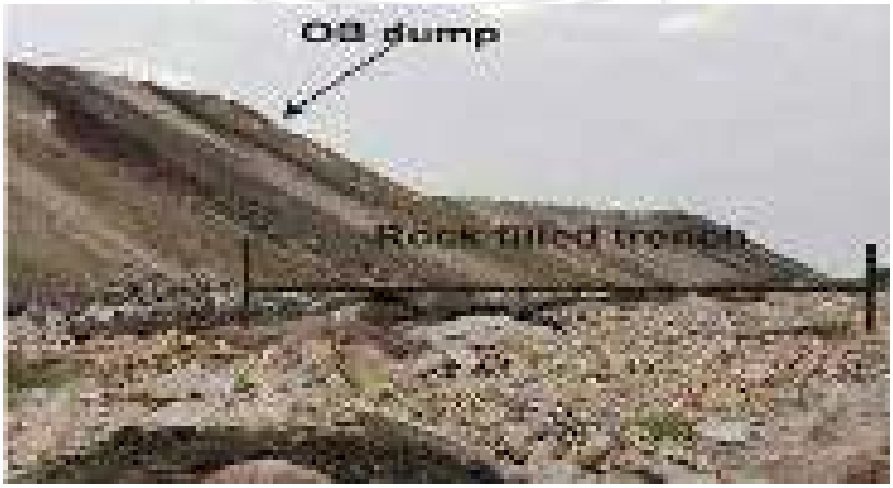

Fig. 5.10: Trench with hard rock

5.5 General Remedial measures before and post-monsoon

The following measures to be complied before and after the monsoon to ensure the proper stability of the BC soil dump:

i. Removal of the siltation load and deposition of debris through dredging of the garland drain and maintaining appropriate longitudinal slope for the flow of water through gravity.
ii. Filling of rain cuts with suitable material like sandbags to avert further erosion.
iii. Bench flattening and widening at the appropriate section shall desist mast wasting, vertical collapse of the BC soil dumps due to heavy rainfall.
iv. Installing fencing around the dump site helps prevent unauthorised access, minimising the risk of damage or disturbance that could lead to slope deterioration. Controlling access reduces the likelihood of slope failure, surface erosion, damage to the slope and the plantation.
v. Plantation shall be made regular intervals, based on seasonal changes.

5.6 Monitoring of BC Soil Dump

Monitoring is an essential part of capturing the movement of the dump and determining the early signs of failure. The scientific report of IIT KGP (March 2019) recommended the monitoring procedure to be followed on the Yekona mine site for the BC soil dump. The following are the monitoring procedures in accordance with the IIT KGP scientific report.

The poles/pegs with cement blocks should be placed in the slope. The interval between the poles/pegs should be in grid of 100m × 100m in staggering pattern. The total station method of surveying will measure the position of the poles/pegs from a reference point. The purpose of this action is to measure abrupt disturbance in the dump during normal working conditions. For the BC dump slope, the top of the poles/pegs will be monitored for displacement once every 30 days during the dry period of October to May. Particularly for the BC soil dump, when vegetated with all season plants of at least 2.0 m in height, the frequency of survey can be done once in 2 months during October to May. In the rainy season, the monitoring should be made

once every seven days, and if there is heavy rainfall, the monitoring should be done twice weekly.

5.7 Summary of remedial measures

BC soil dump poses challenges in mining operations due to its unique swelling and shrinking characteristics. It emphasizes various remedial measures to ensure slope stability, including slope flattening, widening of benches, surface drainage, garland drain widening, stone pitching, stonewalls, geonets with vegetation, trench cutting with rock filling, and installing fencing to prevent unauthorised access. These measures aim to enhance stability of BC soil dump.

The suggested remedial measures to be taken, preventive measure already taken and continuous monitoring is discussed in this chapter. Among the remedial measures, the feasible solution shall be recommended for the BC soil dump site along the village of Yekona in the recommendation chapter.

CHAPTER 6 – RECOMMENDATIONS AND CONCLUDING REMARKS

The following are the recommendations and concluding remarks from the study carried out in this report.

- From the field observation mentioned in section 2.2, It is understood that the BC soil dump's present condition is not so stable and is susceptible to failure if prior attention is not taken in to account. The **slope of BC soil** at steep sections shall be flattened as the **recommended limit of 30° or less than 30°.**
- The **bench width** of the BC soil dump shall be maintained at **15m or more**, and **bench height** shall be maintained at **10m or less than 10m**.
- As discussed in the previous chapter, there is a strong need towards the **widening of the garland drain** and the **side slope must be protected through stone pitching** on the side face of the garland drain. In addition to which, proper gradient shall be provided for easy flow of water.
- Geonet with vegetation prevents erosion and increases the stability of the slope. This measure shall be applied to the BC soil dump.

  [OR]

  The hydroseeding method can also be applied on slopes for vegetation.
- **Surface drainage** on the BC soil dump must be provided to collect the water from the dump and drain water in to the garland drain.
- **Stone pitching** must be carried out on the **bottom bench of the BC soil dump** for erosion control and toe reinforcement.
- Continuous monitoring using poles/pegs and total station method of surveying shall be regularly carried out for measuring movement of dump.

Note:

It shall be noted that all the above remedial measures must compulsorily be executed in the chronological order as mentioned in this report. It is worth mentioning that the EC requirement of constructing a toe wall of 15-20 m height to resist a BC soil dump of about 36 m high may not be an economically viable solution, in contrast to the effective implementation of above remedial measures and stringent continuous monitoring.

As of the report submission date, there are only instances of slope misalignment. No toe movement or heaving near the toe is observed. Also, the dumping height is restricted to 36m and no future dumping will be carried out. In case of any sign of failure observed in the BC soil dump through monitoring, the failure shall be brought to the notice of the undersigned as soon as possible. Based on the failure assessment, the Rockfill trench shall be provided at the toe as suggested in the previous chapter.

Dr. Srinivasan V.
(Asst. Prof., CED)

Dr. A. Patel
(Asso. Prof., CED)

Dr. A. Mandal
(Prof., CED)

Dr. Y.B. Katpatal
(Prof. & Head, CED)

Dr. M.A. Chaudhari
(Dean R&C, VNIT)

----------END OF REPORT----------

Disclaimer:

This report is to facilitate the consultant [i.e., Yekona mine, WCL] to decide the feasible measures for BC soil dump towards Yekona village.
This report represents the technical opinion in our capacity as a scientific consultant based on the observation, testing and engineering judgement. Our responsibility is limited to technical advice only on technical matters referred to in this report. VNIT does not have any control on the execution of recommendations mentioned in this report.
The institute/investigators shall not be involved in any litigation and shall not be called before any legal jurisdiction. Further to this, we shall not participate in any legal matter arising out of implementation/use/reference to this report.

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Annexure 1 – Detailed Field Investigation & Experimental Test Data

PROJECT NAME

GEOTECHNICAL INVESTIGATION AT YEKONA MINES OF WCL MAJRI AREA ,SHIVAJINAGAR , TQ. BHADRAVATI , DIST. CHANDRAPUR.

CLIENT

VISVESVARAYA NATIONAL INSTIUTE OF TECHNOLOGY,
SOUTH AMBAZARI ROAD, NAGPUR.

GEOTECHNICAL INVESTIGATION DONE BY

SANKALP
CIVIL CONSULTANTS
Geotechnical Investigation & Testing Services
info@sankalpgeotech.com
sc@sankalpconsultantsnagpur@gmail.com

Report Ref. No: SCCN/Geo/VNIT/Yekona/ 04/11/2023

Geo-Technical Investigation Report

1.0.0 Introduction

A comprehensive soil investigation has been conducted for the services pertaining to the Geotechnical Investigation at Yekona Mines of WCL Majri area, Shivajinagar, Ta. Bhadravati, dist. Chandrapur., on behalf of V.N.I.T. Nagpur. This investigation aimed to analyze soil stratification and classify the physical properties of the soils. The findings from this study will inform potential improvements and design considerations.

2.0.0 General Discussion.

Sankalp Civil Consultants has carried out the Geo-technical investigations as per the investigation plan, specifications, and data requirements provided by V.N.I.T. Nagpur. The fieldwork adhered to V.N.I.T. Nagpur's guidelines.

3.0.0 SCOPE OF GEO-TECHNICAL INVESTIGATION:

The geo-technical investigation programmed drawn by V.N.I.T. Nagpur for this project envisages obtaining sufficient data regarding the engineering properties of soil for different soil strata. The relevant data regarding sub-soil profile is to be generated for all kinds of strata at investigation location by drilling borehole at various locations up to relevant depths.

3.0.1 Scope of work as covered under specification includes the following;

- To identify the soil stratification by sinking boreholes up to 20.0 meter depth.
- To identify the soil stratification up to recommended depth. All borehole locations were approved by VNIT, Nagpur.
- Collection of representative samples from Boreholes.
- To record standing ground water levels.

4.0.0 METHODOLOGY OF INVESTIGATION AND FIELD WORK

4.1.0 BORING AND DRILLING:

Two Exploratory borehole of 20-meter depth were sunk by deploying boring rigs using either the conventional rotary drilling Methodology followed for boring confirmed to IS: 1892. Boring was effected by the cutting action of rotating bit with casing in the top layer to stabilize the side of the bore and to prevent soil from absorbing water during drilling process.

Bore logs are attached with this report separately.

4.1.1 SAMPLING:

At this site, we collected both disturbed and undisturbed soil samples from accessible soil strata under the guidance of the Engineer Incharge.

4.2.0 STANDARD PENETRATION TEST:

Standard Penetration Test (SPT) to determine penetration resistance was conducted in the boreholes at various depths using the procedure described in IS: 2131. In this method, driving bit is replaced by split spoon sampler (50.8mm OD and 35.0mm ID) and the sampler is driven by dropping 65 kg hammer on top of the driving collar with free fall of 75 cm. The length of the sampler is 60 cm. The sampler is first driven through 15 cm as "Seating Drive". It is further driven through 30 cm. The number of blows required to drive the sampler for 30 cm beyond seating drive is termed as "Penetration resistance', 'N'. Test is terminated on recording a blow count of 100 blows for 30 cm or less penetration for consecutive two tests.

4.3.0 GROUND WATER LEVEL:

The standing ground water level in the borehole after stabilization of the water level has been recorded whenever water table has been met.

4.4.0 Laboratory Testing

Brief procedure for conducting laboratory tests is described below.

- **Atterberg's Limits**

  Liquid limit and plastic limit tests on clayey samples have been done as per procedure in IS: 2720 (Part 5) - 1985.

- **Liquid Limit**

  Testing is done as per IS: 2720 (Part 5) 1985. About 200 gm of soil sample passing through 425 micron IS sieve is mixed thoroughly with distilled water on the flat glass to form a uniform paste. The paste generally has a consistency that will require 30 to 35 drops of the cup to cause the required closure of standard groove. The ready-mix soil is placed in the Casagrande cup in such a way to form a depth of 1 cm at the centre of the cup, and then central groove of 12 mm is made using standard grooving tool. The cup is lifted and dropped by turning the crank at the rate of 2 revolutions per second until the two halves of the soil close. The number of drops required to make the groove close for the length of 12 mm is recorded.

  A portion of the sample is then taken out for water content determination and the water content corresponding to 25 blows represents the liquid limit.

- **Plastic Limit**

  About 15 gms of oven dried soil passing through 425 microns sieve is mixed with sufficient quantity of water such that the soil mass becomes plastic enough to be easily shaped into a ball. A portion of this ball is rolled on a glass plate with the palm of the hand into a thread of uniform Dia of 3 mm. The water content represents the plastic limit.

- **Plasticity Index**

  It is the difference between liquid limit and plastic limit.

- **Specific Gravity**

  Test procedure shall be as per IS: 2720 (Part 3/ Section 1) – 1987 for fine-grained soils. Specific gravity of soil solids can be defined as the weight of given volume of soil particles to the weight of equal volume of distilled water. This term is used in relating weight of soil to its volume.

Specific gravity is found out using standard specific gravity bottle of 50 ml capacity by weighing empty bottle (w_1), bottle+ dry soil (w_2), bottle + dry soil + water (w_3), bottle + water (w_4)

Specific gravity of soil = $(w_2-w_1)/((w_2-w_1)-(w_3-w_4))$

- **Bulk and Dry Density**

Test procedure shall be as per IS: 2720 (Part-7) – 1987.

The unit weight of soil in g/cc is its weight per unit volume. Soil is filled in container and its weight determined. Knowing the volume of container, the ratio of weight to volume represents bulk density.

The soil is then oven dried and weighed and dry density γ_d(g/cc) is computed using formula.

$\gamma_d = \gamma_b/(1+W)$

Where, γ_b = bulk density in g/cc

W= natural moisture content in %

- **Particle size analysis**

Testing procedure generally confirms to IS: 2720 (Part 4)- 1985.

Both sieve analysis and hydrometer analysis has been carried out.

- **Sieve Analysis**

Sieve analysis for coarser fractions has been done by dry sieving, while wet sieving method has been followed for soil fractions with appreciable amount of clay. This method involves the separation of soil particles into various size fractions by passing them through a series of sieves with progressively finer openings. The procedure begins by air-drying the soil sample and then thoroughly breaking down any agglomerates. Afterward, a representative portion of the soil is weighed and placed on the top sieve, which typically has the largest opening, and the stack of sieves is mechanically shaken for a fixed duration to facilitate particle separation. Sieving has been done using a sieve shaker by passing through the following IS sieves, 4.75 mm, 2.36 mm, 1.70

mm, 1.40 mm, 1.00 mm, 600 microns, 425 microns, 100 microns and 75 microns.

- **Direct Shear Test**

Test procedure shall be as per IS: 2720 (Part 13). In this test the soil specimen is confined in a square metal box split into two halves horizontally. Perforated metal plates and pores stones are placed above and below the specimen to allow free drainage. After applying vertical load, the soil is gradually sheared by applying horizontal force, which makes the two halves of the box move relative to each other. The shear is applied at a constant strain rate and measured in a proving ring. Vertical deformation is measured with dial gauge. Minimum of three specimens are tested and the graph drawn with normal stress in 'X' axis and shear stress in 'Y' axis. From the straight-line plot, values of C and ϕ are measured.

- **Free swell Index**

Free swell Index of fine-grained soils sample is determined according to Indian Standard IS:2720 (Part 40) - 1977. Begin by preparing a representative soil sample, drying it until constant weight is achieved, and then weigh an empty graduated cylinder (W1). Fill the cylinder with distilled water up to the 250 ml mark, immerse the air-dried soil sample, and allow it to swell for 24 hours at a temperature of 27 ± 2°C. After this period, record the initial volume of water occupied by the soil and water together as V1 (in ml). Subsequently, let the soil-water mixture stand undisturbed for an additional 24 hours and record the final volume as V2 (in ml). Calculate the free swell index (FSI) using the formula FSI = [(V2 - V1) / V1] x 100 and report the result as a percentage. Ensure representative soil sampling, constant temperature, and the use of distilled water throughout the procedure for accurate results.

- **Permeability**

The constant head permeability test is a widely employed method for determining the coefficient of permeability (hydraulic conductivity) of fine-

grained soils. Permeability test is conducted as per 2Indian Standard IS:2720 (Part 17) – 1986. To initiate this test, a representative sample of the soil under investigation is carefully prepared, ensuring homogeneity and the absence of coarse particles. Prior to testing, the soil sample must be fully saturated with water to ensure that all void spaces within the soil are completely filled. Saturation is achieved by submerging the soil sample in distilled water until no further air bubbles emerge from the soil. Once the soil sample is saturated, it is placed within a specially designed constant head permeameter, which consists of a soil sample holder, a water reservoir, and mechanisms to maintain a constant head of water above the soil sample. This constant hydraulic head (h) is created by adjusting the water level in the reservoir. During the test, water flows through the soil sample, and the rate of flow (Q) is measured, typically in cubic centimeters per second (cm³/sec). The cross-sectional area (A) of the soil sample holder and the length of the soil sample (L) are also measured. By applying Darcy's law, the coefficient of permeability (k) is calculated as $k = (Q * L) / (A * h)$. This method is particularly suitable for soils with relatively high hydraulic conductivity, where water flow remains steady under a constant head condition.

5.0.0 Location: Yekona mines, Chandrapur.

Sr. No.	B.H. NO.	Terminated Depth (m)	G.W.T. (m)	Location
1	BH-01	20.00	4.00	20.2532129, 78.9325065
2	BH-02	20.00	5.00	20.2525560, 78.9312910

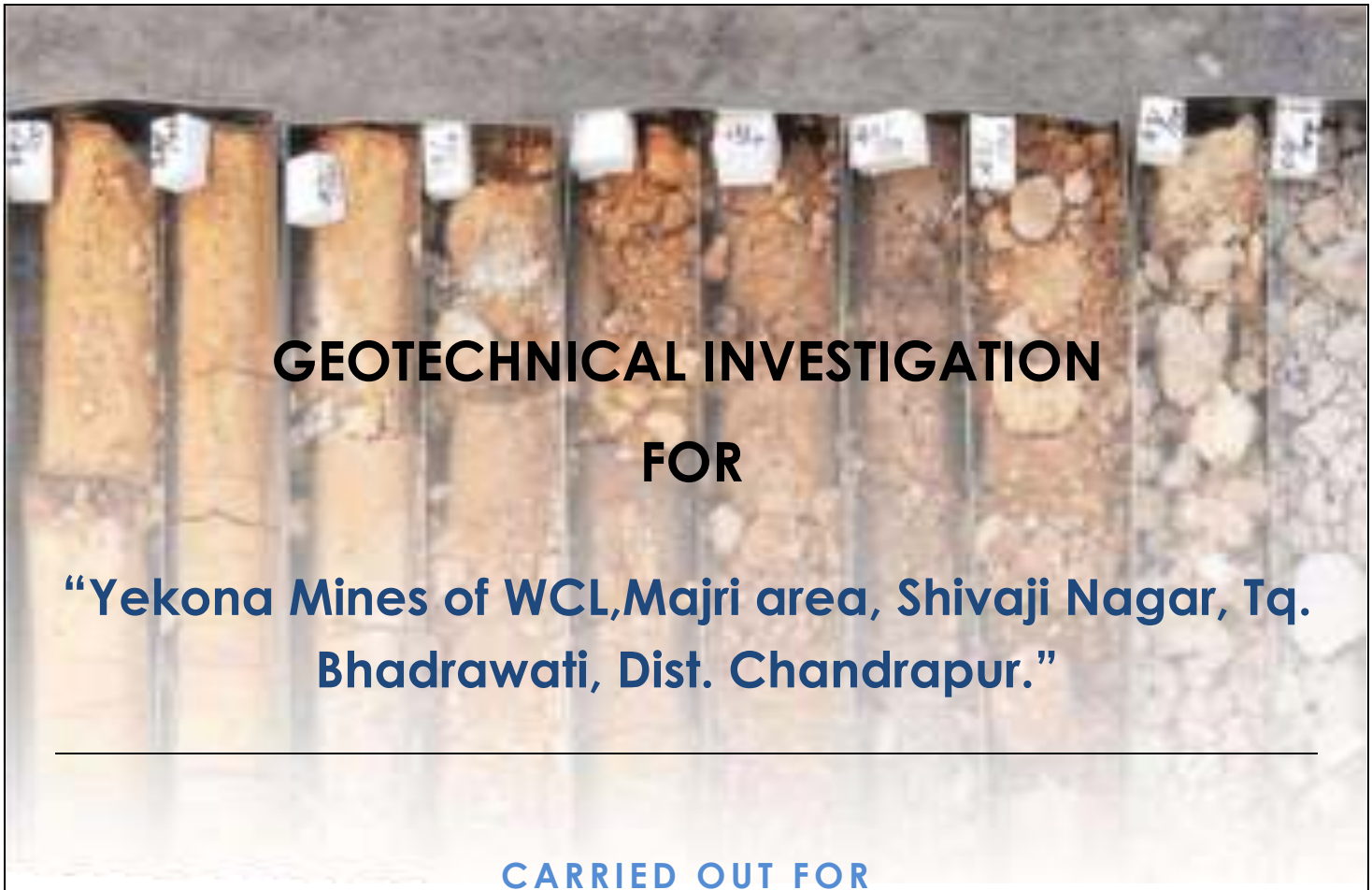
Two boreholes have been executed at this location. The location and depth of termination is finalized by Engineer Incharge of V.N.I.T. The terminated depth at the boreholes as mentioned above.

6.0.0 Lab Test Results:

The laboratory testing is carried out at Decquent Industries pvt. ltd. The test results are enclosed with this report separately.

Yakona Borehole Location Map

BH-01 and BH-02



GEOTECHNICAL INVESTIGATION

FOR

"Yekona Mines of WCL,Majri area, Shivaji Nagar, Tq. Bhadrawati, Dist. Chandrapur."

CARRIED OUT FOR

M/s Sankalp Civil Consultants

SUBMITTED BY

NABL Accredited Laboratory

H/O: 3, New Trimurti Co.Op. Hsg Society, Ingole Nagar,
Wardha Road, Nagpur - 440005.MAHARASHTRA, INDIA.
H/O: +91 9822 565 879 | Fax.:0712-228666
Lab Add.: A-36, MIDC Industrial Area, Butibori, Nagpur - 441108
Lab Phone: (07104) 265587 | +91 9689 909 304
E-mail: spectro@biplndt.com, Web Site: www.biplndt.in

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Report No.	:	**3508**	**Report Date.**	:	**04.11.2023**
CUSTOMER	:	**M/s Yekona Mines, WCL**	**ADDRESS**	:	**Chandrapur**
PROJECT	:	**Geotechnical Investigation for Yekona Mines of WCL,Majri area, Shivaji Nagar, Tq. Bhadrawati, Dist. Chandrapur .**			
CUSTOMER REFERENCE No.	:	Nil	**SAMPLED BY**	:	CUSTOMER
DATE OF FIELD TEST	:	14.10.2023 to 20.10.2023	**MATERIAL IDENTIFICATION**	:	SPT , Soil & Rock From 2 Locations
DATE OF LAB TEST	:	From 26.10.2023 onwards	**TEST PERFORMED**	:	Lab Test on Soil samples.
METHOD OF TEST	:	As Per Indian Standard			

SUBSOILEXPLORATION&ANALYSISREPORT

1.0 OBJECTIVE

Conducting detailed Geotechnical Investigation for **"Yekona Mines of WCL,Majri area, Shivaji Nagar, Tq. Bhadrawati, Dist. Chandrapur."**The present report consists of detailed Geotechnical engineering services carried out at the above mention site location.

2.0 INTRODUCTION

2.1 PROJECT DESCRIPTION

Exploratory drilling and other geotechnical instigations work is carried out for **"M/s Sankalp Civil Consultants"** for **"Yekona Mines of WCL,Majri area, Shivaji Nagar, Tq. Bhadrawati, Dist. Chandrapur."**Investigation was intended to evaluate bearing capacity of available soil/rock stratum and other physical parameters necessary for the design of suitable foundation for proposed construction. The scope of work includes in this project is explain briefly below. The main text of the report includes description of field explorations, laboratory testing, subsurface conditions, conclusions and recommendations based upon review of existing data, engineering studies and analysis. **M/s.Becquerel Industries Pvt. Ltd**. has been appointed by **M/s Sankalp Civil Consultants.** for carrying out geotechnical investigation at the above-mentioned project site.

3.0 METHODOLOGY OF FIELD INVESTIGATION

The investigation was planned to obtain the subsurface stratification in the proposed project site and collect soil samples for laboratory testing to determine the engineering properties such as shear strength, along with basic engineering classification of the subsurface stratum to arrive at the foundation design parameters.

A) FIELD TESTS

4.1 Drilling Work:

Boring was carried outusing Rotary wash method with double tube core barrel. The work was in general accordance to IS: 1892-1979.

4.2 Standard Penetration Test:

Standard penetration number ***N*** is the penetration resistance in terms of number of blows for *30 cm*. penetration of split spoon sampler (test conducted as per *IS: 2131: 1981)*.

4.3 Collection & Preservation of disturbed soil & rock samples from borehole:

Disturbed soil & rock samples were collected & sealed for laboratory tests. These samples were transported in the laboratory with care and stored properly. After that further tests were carried out on the samples.

Kindly note that representing soil samples were preserved for 3 months only from the date of this report, any query should be raised before that.

4.4 Ground Water Table:

At present ground water table was encountered from 4.0m to 5.0m at time of investigation at above mentioned test locations, however seasonal variations in ground water table is expected.

B) Laboratory tests

4.5 Grainsize analysis:

In laboratory, the soil samples collected were tested for soil classification, summary of grain size analysis (*IS: 2720 Part – 4*) are presented in **Annexure III sheet no.1** of this report.

4.6 Atterberg Limits, Free swell index, Specific gravity & Classification:

Liquid limit, Plastic limits & Plasticity index (*IS: 2720 Part – 5 & 6*), Free swell Index (*IS: 2720 Part – 40)*, Specific gravity (*IS: 2720 Part-3/ sec-1*) tests were conducted on the soil samples collected and are classified as per *IS: 1498 (1978), summary of* results are presented in the **Annexure III**of this report.

4.7 Bulk Density & Dry Density:

Bulk density & dry density are obtained as per IS: 2720 Part 29-1975 from the undisturbed sample submitted, summary of results are presented in the **Annexure III sheet no.1** of this report.

4.8 Direct Shear Test:

Unconsolidated Undrained (UU) Direct shear test (*IS: 2720 Part –13: 1986) was* conducted on undisturbed soil samples and C and Ø parameters were obtained. The results are presented in **Annexure: III Sheet no.1.**

4.9 Consolidation test:

Consolidation test were conducted in the laboratory on the undisturbed soil samples collected from boreholes and parameters obtained from the test are reported in **Annexure-III sheet no: 1** to this report.

4.10 Compressive Strength, Point load strength Index, Water Absorption & Specific Gravity of Rock:

Unconfined compressive strength test on rock material (IS 9143:1979,), point load strength index (IS 8764:1998) along with Specific Gravity, water absorption on rocks samples obtained from boreholes were conducted and the results are presented in **Annexure: III.**

4.0 CONCLUSION :

1.0 The general stratification of these sites was comprised of Blackish Clayey Soil up to 15.0m depth followed by Weathered Rock up to the depth of investigation. Water Table Encountered at 4 to 5m depth.

2.0 This report is issued based on the subsoil condition revealed at the location of boreholes and laboratory tests performed on recovered samples. If during construction of foundations it is observed that sub soil conditions vary from those revealed during investigation it is essential that Becquerel Industries Pvt. Ltd. Nagpur shall be contacted so that on confirmation supplementary report shall be issued.

Reviewed By | **For, Becquerel Industries Pvt. Ltd.**

Mr. Sushant Mallick
(Quality Head)

Mr. Jeevan G. Ghime
(Authorised Signatory)

5.0 REFERENCES

Sr. No.	IS Codes No	TITLE
1	IS : 1892-1979	Code of Practice for subsurface investigation for foundations.
2	IS : 1498-1970	Classification and Identification of soils for general Engineering Purpose.
3	IS : 2131-1981	Method for Standard Penetration Test (SPT) for Soils.
4	IS : 4464-1985	Code of Practice for presentation of drilling information and core description in foundation investigation.
5	IS : 5313-1980	Guide for core drilling observations.
6	IS : 4078-1980	Code of Practice for indexing and storage of drill cores
7	IS : 6935-1973	Method of determination of water level in a bore hole
8	IS : 456- 2000	Plain and Reinforced Concrete-Code of Practice.

ANNEXURE

1.0 BORE LOGS

BORE LOG

BECQUEREL

ANNEXURE - III Sheet no.1

CLIENT :- Sankalp Civil Consultants		BORE HOLE NO.	BH 01
PROJECT:-"Geotechnical Investigation for Yekona Mines of WCL,Majri area, Shivaji Nagar, Tq. Bhadrawati, Dist. Chandrapur."		Date of Start:	14.10.2023
		Date of Completion:	17.10.2023
Dia of Hole	150/90 mm	Location	[illegible]	Co-Ordinates
BORING METHOD :-	As per IS 1892,& SPT as per IS 2131	-	-

Depth (m)	Thickness of Layer (m)	Log	Soil/Rock Description	Sample Type	Sample No.	Sample Depth (m)	SPT 15	SPT 30	SPT 45	N Value	Core Recovery %	RQD %	Remark
0.0													
0.5													
1.0													
1.5				SPT-1	DS-1	1.0-1.45	2	2	4	7			
2.0													
2.5													
3.0				UDS-1	DS-2	3.0-3.45	-	-	-	-			
3.5													
4.0													Water Table at 4.00m from (GL)
4.5				SPT-2	DS-3	4.50-4.95	1	6	11	18			
5.0													
5.5													
6.0				UDS-2	DS-4	6.00-6.45	-	-	-	-			
6.5													
7.0	7.0m		Black/Clayey Soil with High Plasticity Index	SPT-3	DS-5	7.00-7.55	4	14	17	31			
7.5													
8.0													
8.5				SPT-4	DS-6	8.00-8.55	11	13	19	19			
9.0													
9.5													
10.0				SPT-5	DS-7	10.00-10.55	14	17	20	37			
10.5													
11.0													
11.5				SPT-6	DS-8	11.00-11.47	12	19	21	39			
12.0													
12.5													
13.0				SPT-7	DS-9	13.50-13.95							
13.5													
14.0													
14.5													
15.0				SPT-8	DS-10	15.00-15.45	16	20	25	45			
15.5													
16.0													
16.5				SPT-9	DS-11	16.50-16.95	>50/50	-	-	Refusal			
17.0													
17.5													
18.0	3.0m		Completely Weathered Rock	SPT-10	DS-12	18.00-18.05	>50/05	-	-	Refusal	0.67%	Nil	
18.5													
19.0													
19.5													
20.0											10%	Nil	*Bore hole terminated at 20.00m depth from G.L.

S.O.S.	ABBREVIATIONS		
Black/Clayey Soil with High Plasticity Index	DS :-	Disturbed Sample	10 Nos.
Completely Weathered Rock	WS :-	Work Sample	3 Nos.
	RDS :-	Undisturbed Sample	2 Nos.
	GP :-	Core Pieces	Nil
	SP :-	Small Pieces	
	SPT :-	Standard Penetration Test	10 Nos.
	WT :-	*Water Table From (GL)	4.00 m from GL

BORE LOG

BECQUEREL

ANNEXURE - III Sheet no.2

CLIENT :- Sankalp Civil Consultants		BORE HOLE No.	BH 02
PROJECT:-"Geotechnical Investigation for Yekona Mines of WCL,Majri area, Shivaji Nagar, Tq. Bhadrawati, Dist. Chandrapur."		Date of Start:	10.10.2023
		Date of Completion:	20.10.2023
Size of Hole	Location	Co-Ordinates	
BORING METHOD :-	As per IS:38[illegible] & SPT as per IS:2131	-	-

Depth (m)	Thickness of Layer (Levels)	Log	Soil/Rock Discription	Sample Type	Sample No.	Depth (m)	SPT 15	SPT 30	SPT 45	N Value	Core Recovery %	Rqd %	Remark
							Core Recovery 25	50	75	100			
0.0													
0.5													
1.0													
1.5				SPT-1	BS-1	1.5-2.00	4	5	6	11			
2.0													
2.5													
3.0				DPT-1	BS-2	3.0-3.45	-	-	-	-			
3.5													
4.0													
4.5				SPT-2	BS-3	4.50-4.95	5	8	7	15			
5.0													Water Table at 5.00m from GL
5.5													
6.0				DPT-2	BS-4	6.00-6.45	-	-	-	-			
6.5													
7.0													
7.5				SPT-3	BS-5	7.50-7.95	6	8	12	20			
8.0													
8.5													
9.0				SPT-4	BS-6	9.00-9.45	8	10	11	21			
9.5													
10.0													
10.5				SPT-5	BS-7	10.50-10.95	9	11	14	25			
11.0													
11.5													
12.0				SPT-6	BS-8	12.00-12.45	10	12	14	26			
12.5													
13.0													
13.5				SPT-7	BS-9	13.50-13.53	(>50/50)	-	-	Refusal			
14.0													
14.5													
15.0				SPT-8	BS-10	15.00-15.03	(>50/50)	-	-	Refusal			
15.5													
16.0													
16.5				SPT-9	BS-11	16.50-16.54	(>50/50)	-	-	Refusal			
17.0													
17.5													
18.0				SPT-10	BS-12	18.00-18.03	(>50/50)	-	-	Refusal			
18.5													
19.0													*Bore hole terminated at 20.00m depth from GL.
19.5													
20.0											72%	50	

LOG	ABBREVIATION		
Weathered Clayey Soil with High Plasticity Index	BS :-	Disturbed Sample	10 Nos
Completely Weathered Rock	RS :-	Rock Sample	00
	UDS :-	Undisturbed Sample	00nos
	LP :-	Long Piston	00
	SP :-	Small Piston	
	SPT :-	Standard Penetration Test	10 Nos
	WT :-	Water Table From GL	5.00 m From GL

2.0 TEST RESULTS

ANNEXURE III, Sheet No. 1

Summary of Soil Test Results

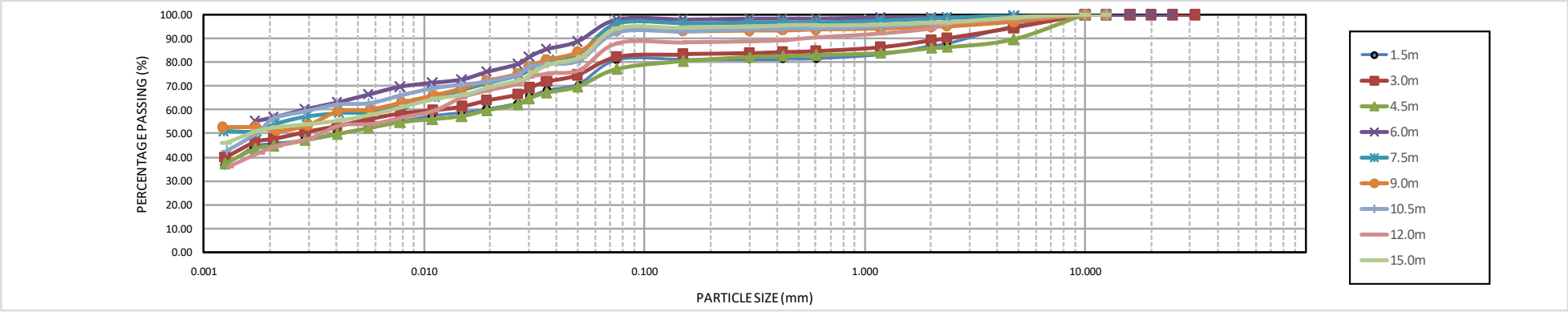
Client: Sankalp Consultants | **Report No.** 3508

Project: "Geotechnical Investigation for Yekona Mines of WCL,Majri area, Shivaji Nagar, Tq. Bhadrawati, Dist. Chandrapur."

Bore Hole NO.	Sample Type	Depth (m)	IS:2720(P29) Bulk Density	IS:2720(P29) Dry Density	IS:2720(P2) Moisture Content	IS:2720(P5) Liquid Limit	IS:2720(P5) Plastic Limit	IS:2720(P5) Plasticity Index	IS:2720(P4) Grain Size Analysis Gravel	Sand	Silt	Clay	IS:2720(P40) Free Swell Index	IS:2720(P3) Specific Gravity	IS:2720(P13) Cohesion	IS:2720(P13) Angle of Internal	IS:2720(P15) Compression Index (Cc)	IS:2720(P15) Intial Void Ratio	IS:1498 IS Classification
			g/cc	g/cc	%	%	%	%	%	%	%	%	%	-	kg/cm^2	degree	-	-	-
BH 1	SPT-1	1.5	-	-	-	71.2	29.5	41.7	4.6	14.3	36.5	44.6	-	-	-	-	-	-	CH
BH 1	UDS	3.0	1.584	1.229	28.90	75.6	31.5	44.1	5.4	12.1	35.8	46.7	90	2.621	0.35	16.4	0.384	1.13	CH
BH 1	SPT-3	4.5	-	-	-	68.7	29.9	38.8	10.3	12.5	33.6	43.6	-	-	-	-	-	-	CH
BH 1	UDS	6.0	1.571	1.208	30.10	72.6	27.4	45.2	0.6	1.2	42.7	55.5	80	2.628	0.41	13.8	0.372	1.18	CH
BH 1	SPT-5	7.5	-	-	-	68.4	29.5	38.9	0.2	3.4	45.4	51.0	-	-	-	-	-	-	CH
BH 1	SPT-6	9.0	-	-	-	70.4	28.6	41.8	2.9	3.9	40.5	52.7	-	-	-	-	-	-	CH
BH 1	SPT-7	10.5	-	-	-	67.4	27.1	40.3	1.1	6.0	42.5	50.4	-	-	-	-	-	-	CH
BH 1	SPT-8	12.0	-	-	-	65.2	28.3	36.9	1.5	10.4	46.0	42.1	-	-	-	-	-	-	CH
BH 1	SPT-9	15.0	-	-	-	64.9	29.4	35.5	0.9	4.6	43.4	51.1	-	-	-	-	-	-	CH

A B B R E V I A T I O N:- CH: Highly Plastic Clayey Soil

PARTICLE SIZE DISTRIBUTION CURVE



For BIPL Nagpur

ANNEXURE III, Sheet No. 2

Summary of Soil Test Results

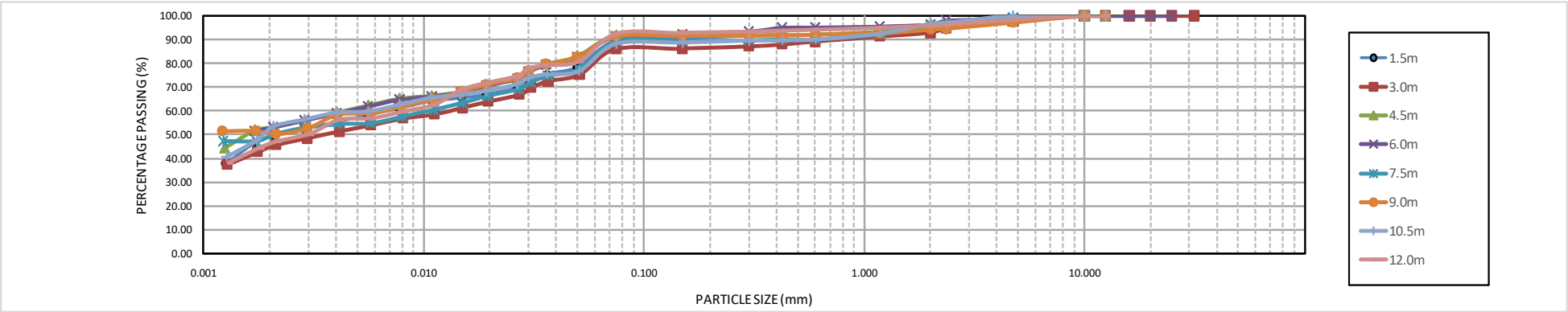
Client: Sankalp Consultants | **Report No.** 3508

Project: "Geotechnical Investigation for Yekona Mines of WCL,Majri area, Shivaji Nagar, Tq. Bhadrawati, Dist. Chandrapur."

Bore Hole NO.	Sample Type	Depth (m)	IS:2720(P29) Bulk Density	IS:2720(P29) Dry Density	IS:2720(P2) Moisture Content	IS:2720(P5) Liquid Limit	IS:2720(P5) Plastic Limit	IS:2720(P5) Plasticity Index	IS:2720(P4) Grain Size Analysis: Gravel	Sand	Silt	Clay	IS:2720(P40) Free Swell Index	IS:2720(P3) Specific Gravity	IS:2720(P13) Cohesion	Angle of Internal	IS:2720(P15) Compression Index (Cc)	Intial Void Ratio	IS:1498 IS Classification
			g/cc	g/cc	%	%	%	%	%	%	%	%	%	-	kg/cm^2	degree	-	-	-
BH 2	SPT-1	1.5	-	-	-	65.2	28.9	36.3	2.0	7.8	43.6	46.6	-	-	-	-	-	-	CH
BH 2	UDS	3.0	1.594	1.254	27.10	69.1	32.7	36.4	2.1	11.6	43.3	43.0	80	2.625	0.37	12.9	0.415	0.98	CH
BH 2	SPT-3	4.5	-	-	-	62.3	28.6	33.7	0.8	6.0	39.9	51.9	-	-	-	-	-	-	CH
BH 2	UDS	6.0	1.602	1.241	29.10	70.5	30.4	40.1	0.9	7.8	39.7	51.6	80	2.619	0.39	13.5	0.394	1.05	CH
BH 2	SPT-5	7.5	-	-	-	65.1	30.9	34.2	0.2	3.4	42.1	47.3	-	-	-	-	-	-	CH
BH 2	SPT-6	9.0	-	-	-	67.2	31.5	35.7	0.5	10.1	39.8	51.8	-	-	-	-	-	-	CH
BH 2	SPT-7	10.5	-	-	-	59.6	30.7	28.9	2.6	5.8	40.5	47.9	-	-	-	-	-	-	CH
BH 2	SPT-8	12.0	-	-	-	60.5	29.8	30.7	0.0	11.6	48.5	44.4	-	-	-	-	-	-	CH

A B B R E V I A T I O N:- CH: Highly Plastic Clayey Soil

PARTICLE SIZE DISTRIBUTION CURVE



For BIPL Nagpur

ANNEXURE III, Sheet No. 3

Summary of Soil Test Results

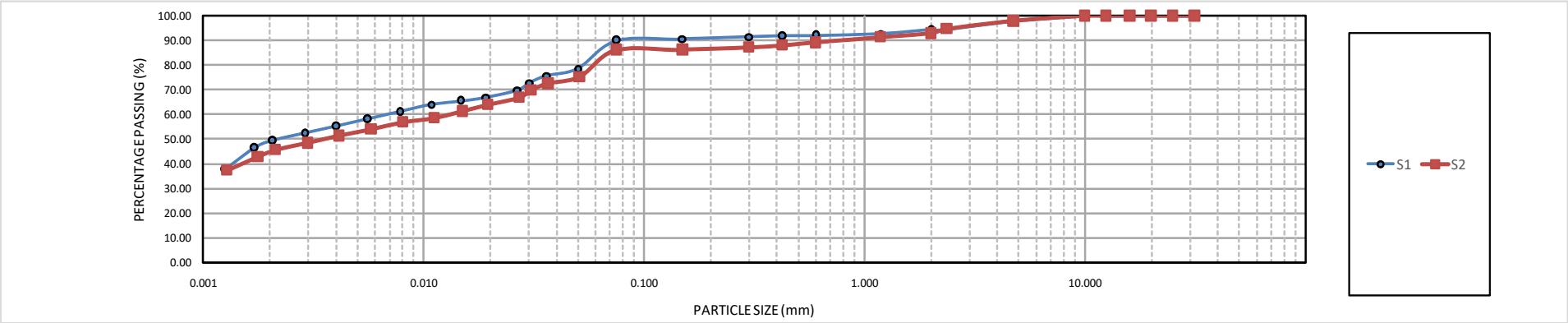
Client: Sankalp Consultants | **Report No.** | **3508**

Project: "Geotechnical Investigation for Yekona Mines of WCL,Majri area, Shivaji Nagar, Tq. Bhadrawati, Dist. Chandrapur."

Bore Hole NO.	Sample Type	IS:2720(P5) Liquid Limit	IS:2720(P5) Plastic Limit	IS:2720(P5) Plasticity Index	IS:2720(P4) Grain Size Analysis Gravel	IS:2720(P4) Sand	IS:2720(P4) Silt	IS:2720(P4) Clay	IS:2720(P40) Free Swell Index	IS:2720(P3) Specific Gravity	IS:2720(P8) OMC	IS:2720(P8) MDD	IS:2720(P13) Cohesion	IS:2720(P13) Angle of Internal	IS:2720(P15) Compression Index (Cc)	IS:2720(P15) Intial Void Ratio	IS 2720(P17) Permeability	IS:1498 IS Classification
		%	%	%	%	%	%	%	%	-	%	gm/cc	kg/cm^2	degree	-	-	cm/sec	-
S 1	DS	72.4	32.4	40.0	3.7	13.3	43.6	46.6	100	2.618	19	1.578	0.48	15.1	0.419	1.05	7.25×10^{-5}	CH
S 2	DS	70.6	31.6	39.0	2.3	16.2	43.3	43.0	90	2.622	22	1.559	0.51	14.1	0.425	1.12	7.81×10^{-5}	CH

A B B R E V I A T I O N:- CH: Highly Plastic Clayey Soil

PARTICLE SIZE DISTRIBUTION CURVE



For BIPL Nagpur

3.0 PHOTOGRAPHS

BH-1
YEKONA

BH-2

PHOTOGRAPHS

Drilling BH-01

Drilling BH-01

PHOTOGRAPHS

Drilling BH-02

Drilling BH-02

PHOTOGRAPHS

Collection of DS-01

Collection of BS-02

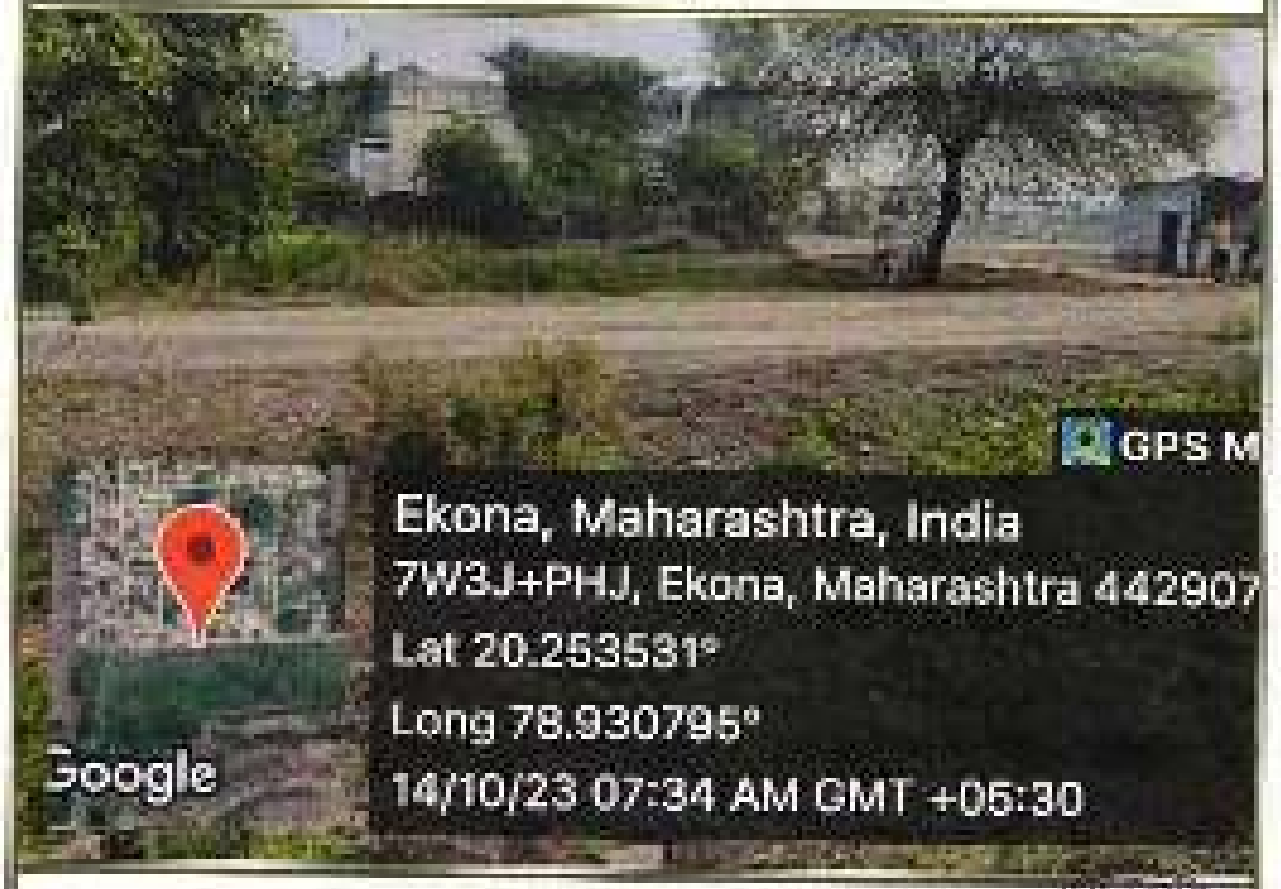
PHOTOGRAPHS

Site Photograph

Site Photograph

PHOTOGRAPHS

Site Photograph



Site Photograph

Annexure 2 – Numerical Analysis of Different cases

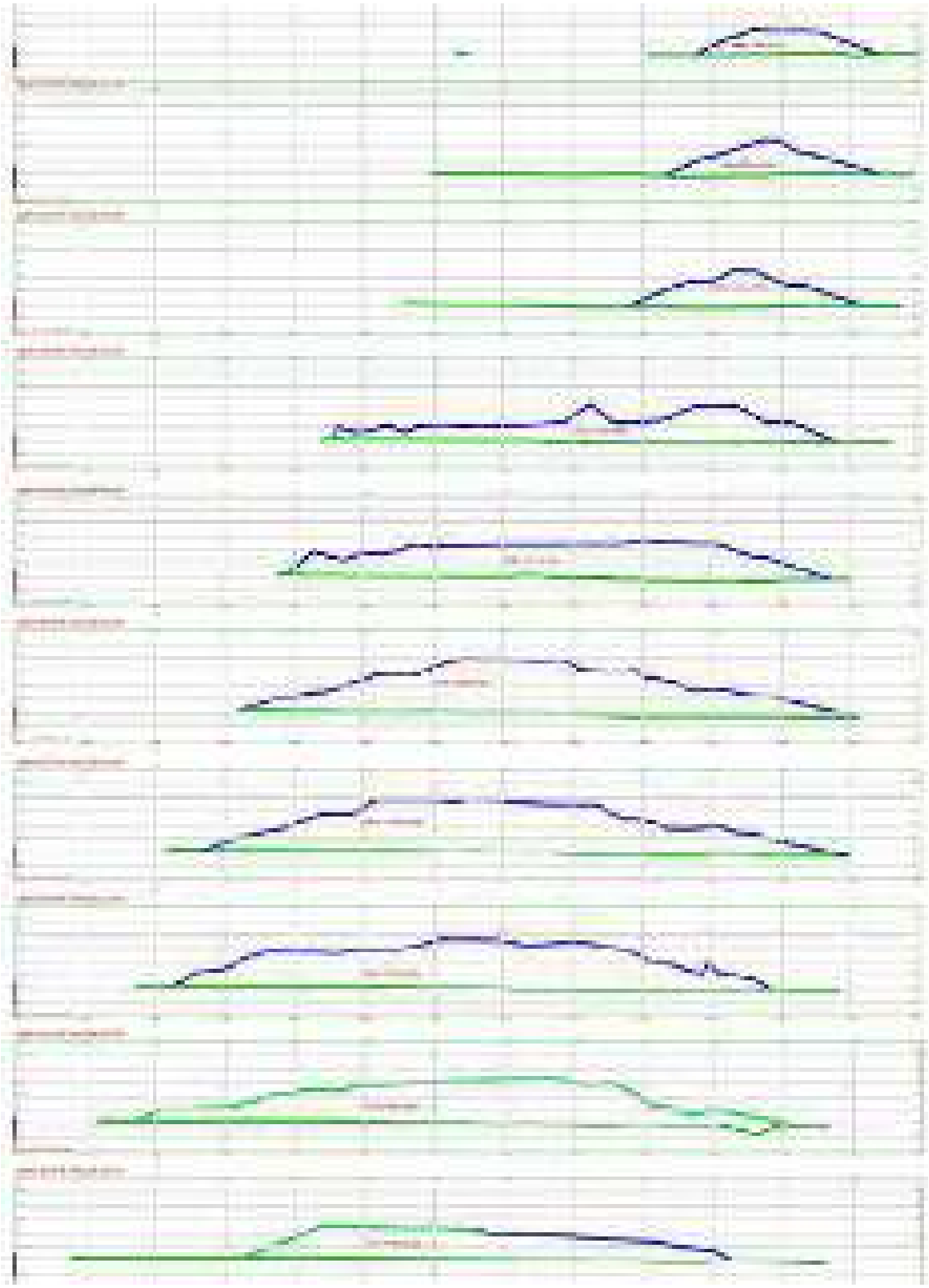


Fig. (a): Cross-sections used for analysis

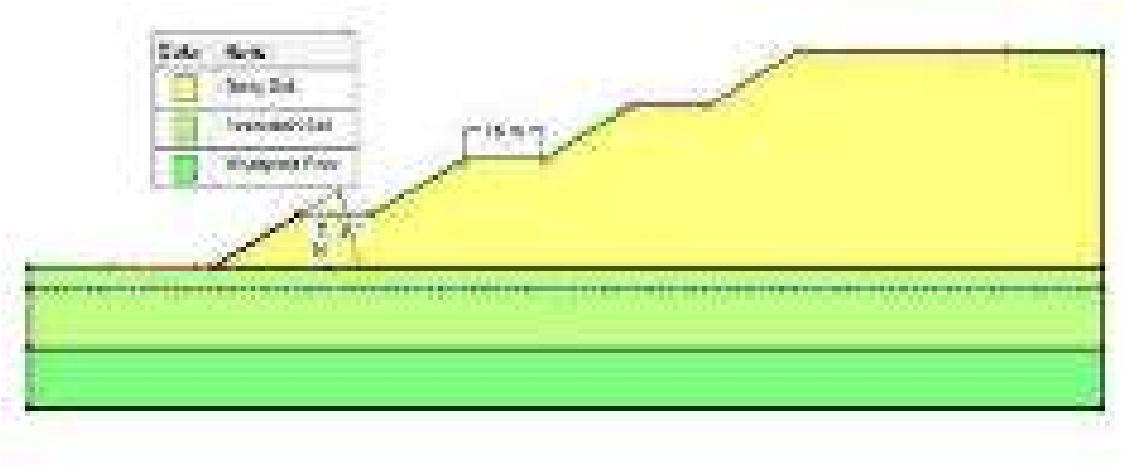


Fig. (b): IIT KGP recommended Cross-section with a height of 10m and a width of 20m

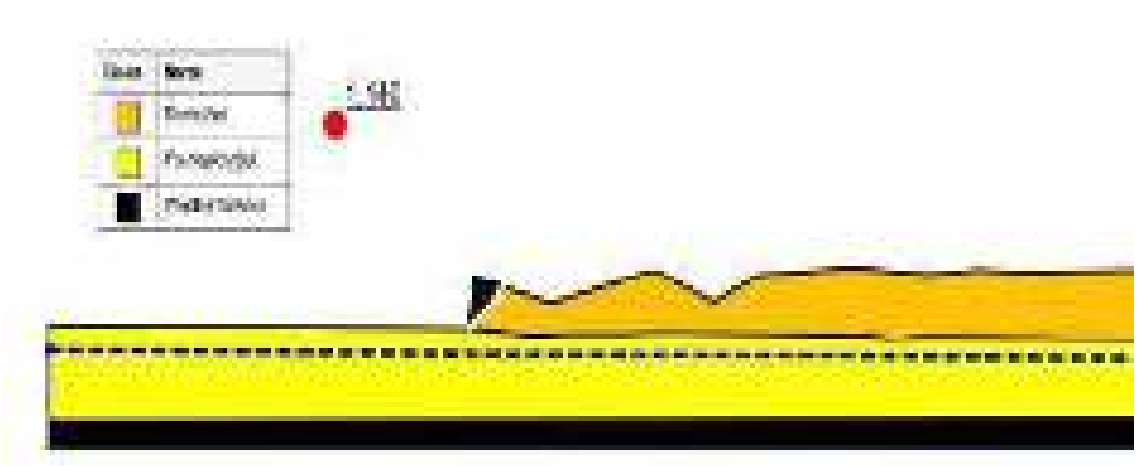


Fig. (c): Analysis results of Cross section-4

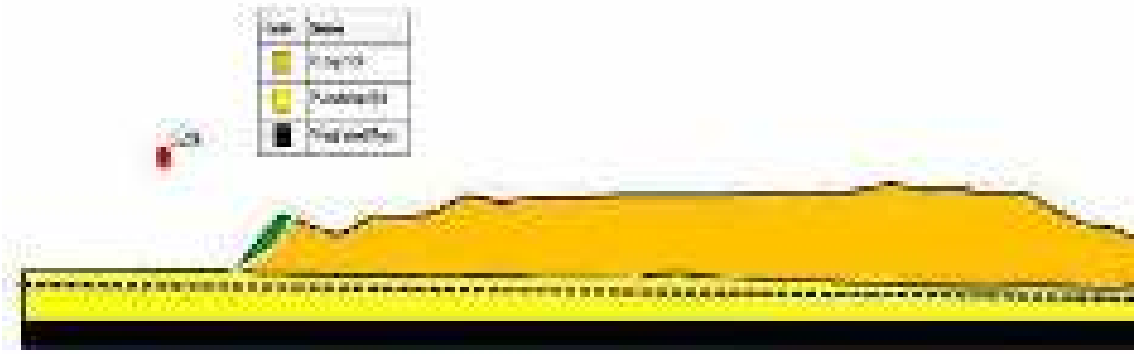


Fig. (d): Analysis results of Cross section-5

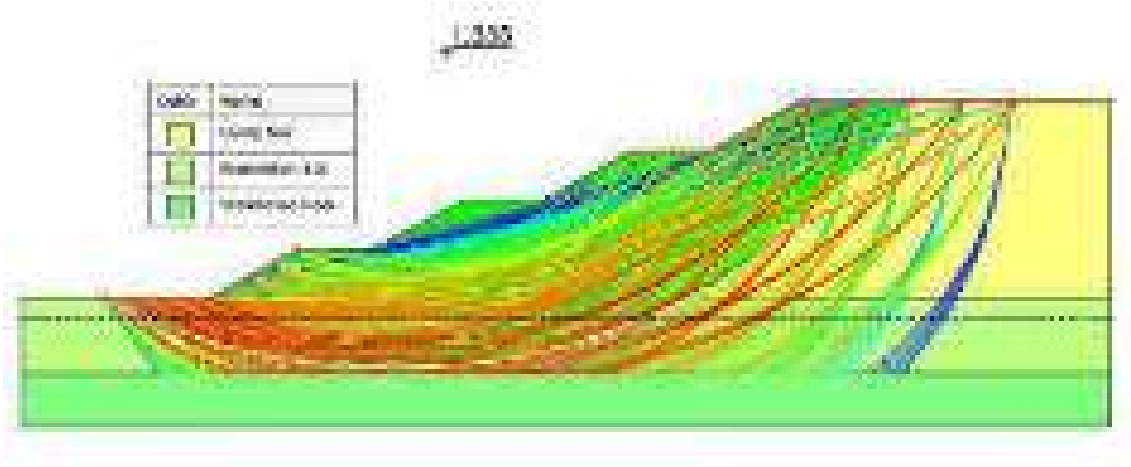


Fig. (e): Analysis results of IIT KGP recommended Cross-section

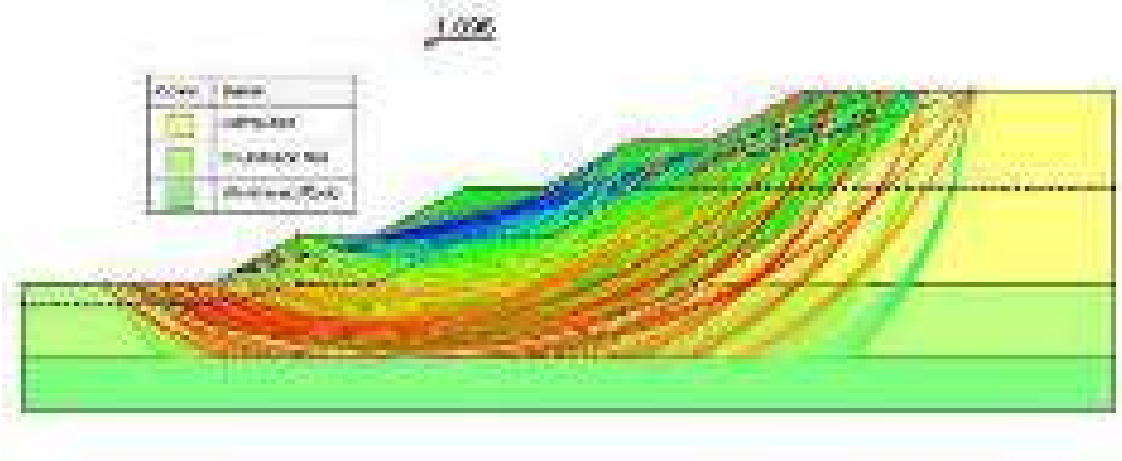


Fig. (f): Analysis results of IIT KGP recommended Cross-section with water table at half saturation

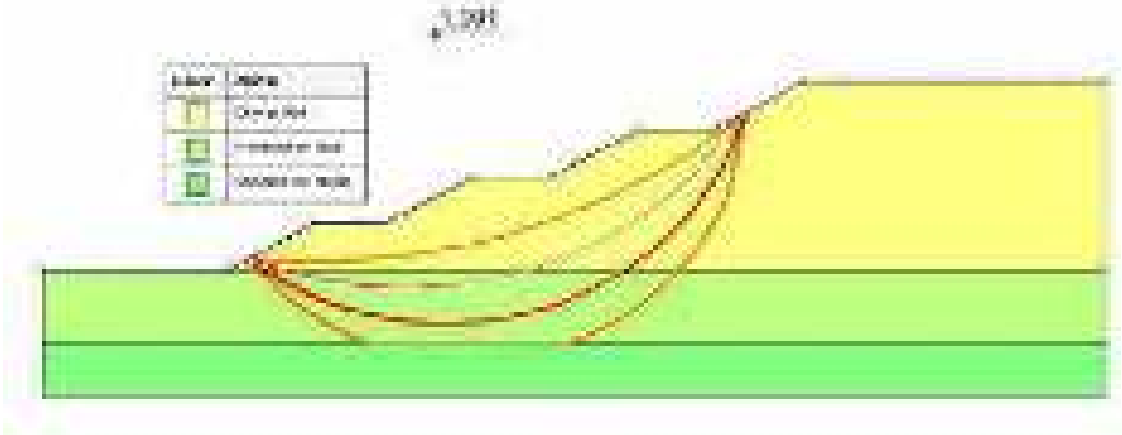


Fig. (g): Analysis results of IIT KGP recommended Cross-section with water table at full saturation

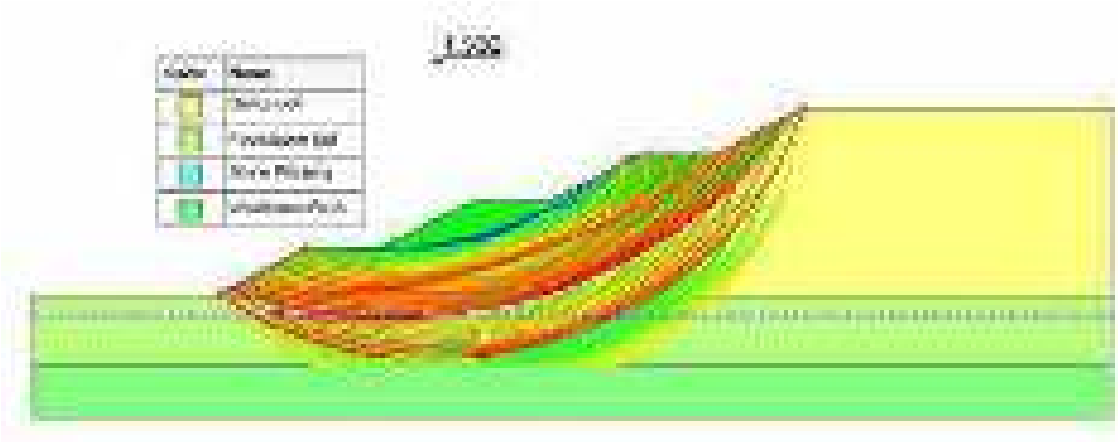


Fig. (h): Analysis results of IIT KGP recommended Cross-section with Stone pitching

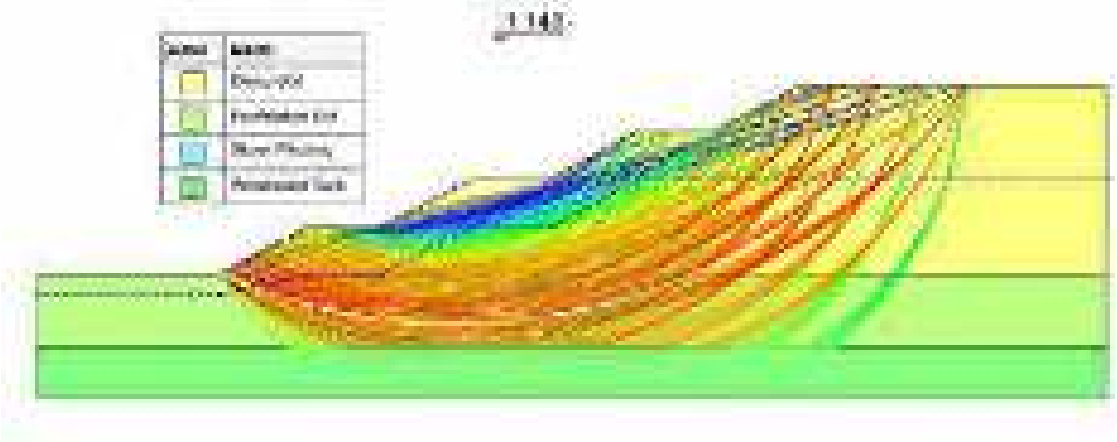


Fig. (i): Analysis results of IIT KGP recommended Cross-section with Stone pitching and water table at half saturation

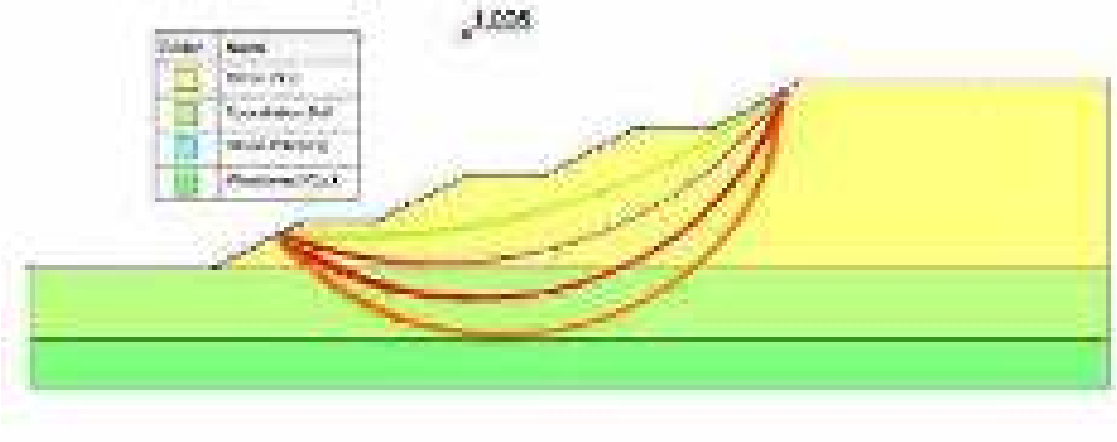


Fig. (j): Analysis results of IIT KGP recommended Cross-section with Stone pitching and water table at 40m height from GL

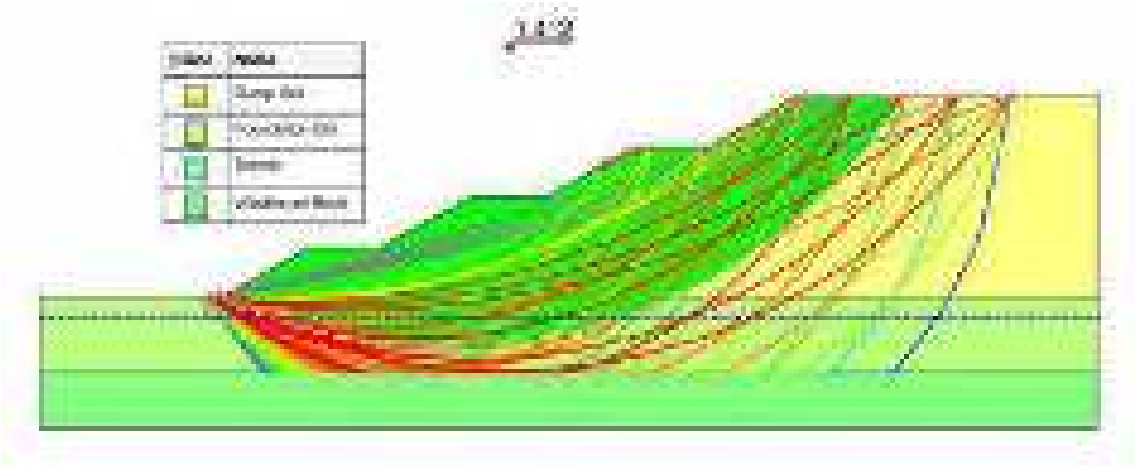


Fig.(k): Analysis results of IIT KGP recommended Cross-section with Trench

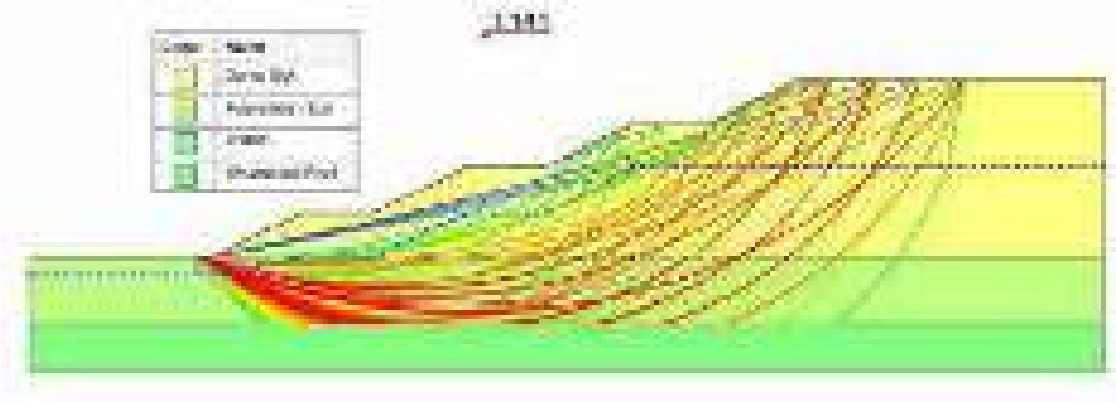


Fig. (l): Analysis results of IIT KGP recommended Cross-section with Trench and water table at half saturation

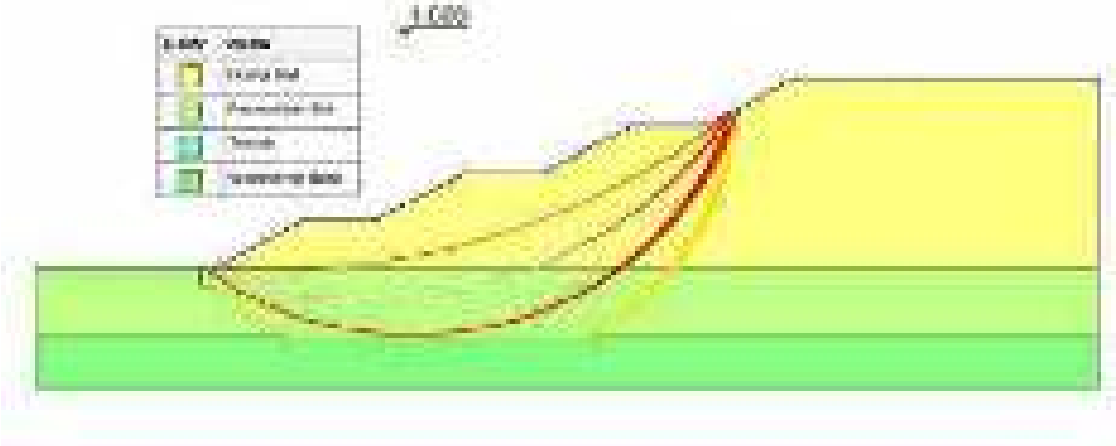


Fig. (m): Analysis results of IIT KGP recommended Cross-section with Trench and water table at full saturation

Condition 4 (xix): Air Pollution Control – Fog Canons at Mine

AMALG. YEKONA I & II

ROOF TOP RAIN WATER HARVESTING AT OFFICE BUILDINGS

ANN 20

Latitude: 20.25[illegible]7
Longitude: 75.[illegible]
Elevation: 203.44±79 m
Accuracy: 18.8 m
Azimuth: 213° (SW)
Pitch: -14° (-0.9°)
Time: 08-02-2023 18:43
Note: Yelona Rail1
Powered by AngleCam

ANNEXURE 21

वेस्टर्न कोलफील्ड्स लिमिटेड

Western Coalfields Limited

(A Subsidiary of Coal India Limited)

पर्यावरण विभाग

Environment Department

क्षेत्रीय महाप्रबंधक कार्यालय, माजरी क्षेत्र

Office of the Area General Manager, Majri Area

PO: Kuchna, Dt: Shadol (M.P.) Dist Chandrapur - 442505

Tel: 07175-285006, Fax - 07175-285005

पत्र संख्या Ref. No. WCL/माजरी/पर्यावरण/पर्यावरण/2020/ 127 दिनांक Date: 07.06.2020

प्रति,

विभागीय वन अधिकारी,

चंद्रपुर वन विभाग,

चंद्रपुर

विषय : Submission of Cheque for Implementation of Oil Conservation Plan of Amalgamated Yekona OC of Majri Area, WCL

संदर्भ : Your office letter no. वन/वन्यजीव/वन्यजीव/ 2020/1 dated 22.05.2020

महोदय,

With reference to you above mentioned letter, please find enclosed herewith a cheque bearing no. "0 3564" dated 06.06.2020 of Bank of Maharashtra, Kuchna Branch in favour of "Divisional Forest Officer, Chandrapur" amounting to Rs. 35,00,000/- for implementation of Oil Conservation Plan of Amalgamated Yekona OC of Majri Area, WCL.

You are requested to give the acknowledge of the same.

धन्यवाद

भवदीय

सहायक विक्रय अधिकारी (पर्यावरण),

माजरी क्षेत्र

संलग्न : Cheque no. "0 3564" dated 06.06.2020

प्रतिलिपि :

- क्षेत्रीय महाप्रबंधक, माजरी क्षेत्र
- उप क्षेत्रीय प्रबंधक, कोलार्ड उपक्षेत्र

O/C

ANN 21

06 08 2020
D D M M Y Y Y Y

Pay to the order of Divisional Forest Officer Chandrapur

Rupees Thirty five Lakh only

₹ 3500000=00

30363122

Authorised Signatory

⑈013366⑈ 442044030⑆ 000016⑈ 11

विभागीय वन अधिकारी, चंद्रपूर वनविभाग,चंद्रपूरचा सर्व कार्यालय,

[illegible] पोस्ट ऑफिस जवळ, चंद्रपूर - 442401 (म.प्र.)

दूरध्वनी क्र. 07172-210445 फॅक्स नं. 07172-210445 Email - [illegible]

क्रमांक : [illegible] 1079 चंद्रपूर, दि-[illegible] - 11/10/2023

प्रति,

[illegible] (वनविकास), [illegible],
[illegible]

विषय - [illegible] Report in respect of Goal Index - Sustainal (GLS) Conservation Plan.

संदर्भ - [illegible]

[illegible] (GIS) [illegible] 25 [illegible] [illegible]

GIS PROJECT Manual

(रु. [illegible])

Sr. No.	Action	Quantity	Rate / Unit	Estimated Value (Rs. in Lakhs)	Expenditure Up Wards (Rs. in Lakhs)
A	B	C	D	E	
1	[illegible]	1	[illegible]	140	140
2	[illegible]	1	[illegible]	5000	5000
3	[illegible]	20	[illegible]	400	400
4	[illegible]	50	[illegible]	500	500
5	[illegible]	20	[illegible]	[illegible]	[illegible]
6	[illegible]	10	[illegible]	[illegible]	[illegible]
7	[illegible]	2	[illegible]	[illegible]	[illegible]
8	[illegible]	10	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	10	[illegible]	[illegible]	[illegible]
11	[illegible]		[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	[illegible]	1	[illegible]	[illegible]	[illegible]
14	[illegible]	20	[illegible]	[illegible]	[illegible]
15	[illegible]	2	[illegible]	[illegible]	[illegible]
16	[illegible]		[illegible]	[illegible]	[illegible]
	TOTAL			[illegible]	[illegible]

(प्रशांत खाडे)
विभागीय वन अधिकारी
चंद्रपूर वनविभाग, चंद्रपूर

प्रतिलिपी :- [illegible]
प्रतिलिपी :- [illegible]

ANNEXURE 23

Final Report

Scientific Study for Method of Working, Ultimate Pit Slope, Dump Slope & Monitoring of Slope Stability in Amalgamated Yekona I & II Mine of Majri Area, Nagpur, Maharashtra

Awarded by Western Coalfields Limited, India

Project Coordinator:

Prof. Jayanta Bhattacharya, Department of Mining Engineering and

School of Environmental Science and Engineering

Indian Institute of Technology, Kharagpur

Project Team:

Prof. Jayanta Bhattacharya

Shubham Gavel(17MI60R02)

Sachidanand Kumar(17MI60R18)

Indian Institute of Technology, Kharagpur

DEPARTMENT OF MINING ENGINEERING

INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR

September, 2019

Scope of Work

A. **Assessment of ultimate pit slope benches.**

B. **Determination of optimum pit slope design.**

C. **Suitable remedial measure shall be suggested for better safety of mine.**

D. **Suggestion of safe mining method including working near fault planes and other geological disturbance.**

E. **Monitoring method to be adopted by the mine management.**

F. **Safe operation of dumping.**

G. **Slope stability of dump.**

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DISCLAIMER

It is appropriate to mention here that neither the day-to-day mining operations would be under the control of the authors of this report, nor it is possible to have any such control on the execution of the recommendations mentioned in this report. The authors of this report would in no way be held responsible for any untoward incident, which might occur due to the implementation of the recommendations of this report. This report merely contains (i) analysis of internal dump slope stability estimated using the theoretically established approaches at a certain time period and (ii) stability of pit slopes derived from the data during the time period. Due to the dearth of data, some essential properties are taken from the literature during the analysis and appropriately mentioned in the report. The factors of safety for different slope angles are mentioned in the report. The alteration of assumed geotechnical data may significantly change the safety factor. Time to time testing of geotechnical properties and modification in the analysis is required.

The study has not dealt with the following:

1. Impact of high volume surface blasting on slope stability.
2. Seismic and extraneous vibration related slope stability aspects.
3. Slope failure due to excessive and permanent loading
4. Geological data has been used as given.

Final Report

1. Introduction:

Wardha Valley Coalfield (WVC) is a NW–SE elongated structural basin with its coal bearing zone spreading over an area of 800 sq. km along a length of 116 km situated towards the south of the city of Nagpur in the central region of India. This coalfield has around 40 opencast coal mines, which are largely of medium scale type with annual coal production from each mine ranging mostly between 0.5 and 1.5 million tonnes and mine depths varying between 70 and 250 m. The slope forming materials in these mines mainly consist of soil and sandstone as overburden followed by a composite coal seam of 15–17 m thickness. The soil consists of black cotton soil and silty/clayey sand and is classified mainly as clay of high plasticity. The sandstone rock mass belongs to Kamptee and Barakar formations. The Kamptee sandstone acts as an unconfined aquifer and is a major source of ground water. The Kamptee sandstone is very weak to weak rock with uniaxial compressive strength in the range of 3–25 MPa (ISRM 1981). Its rock mass rating (RMR) (Bieniawski 1989) varies in the range of 34–40 signifying poor rock mass conditions. The Barakar sandstone is a predominantly medium weak rock with compressive strength in the range of 25–50 MPa (ISRM 1981). Its RMR varies in the range of 35–55 signifying poor to fair rock mass conditions.

The Wardha River forms a major drainage system of the area and flows from NW to SE along the central part of WVC. The predominant structural disturbances in this coalfield are defined by a set of NW–SE trending faults parallel to the rift boundary of the basin. These faults have caused shifting of the coal seam in both the eastern and the western limbs. Different mining and exploration blocks have been broadly defined on the basis of such faults. The slope stability problems in this coalfield are predominantly restricted to soil and very weak sandstone benches. The slope failures occur mainly during the rainy season, which run from the months of 15thJune–30thSeptember. Structural disturbances in the form of strike faults, which run parallel to the slopes also cause instabilities. Besides these, external loading on slopes by overburden dumps also contributes towards slope instability in some cases. The average annual rainfall in this coalfield is 1,250 mm.

1.1. Regulatory requirements of Slope Stability Control and Management:

Ministry of Environment and Forest mandate for environment protection of OB dumps cites the following:

1. The individual dump should have a maximum slope and an overall slope not exceed a certain value.
2. The external dump should have stretches of retaining wall at suitable locations.
3. The wall should be constructed with suitable height and top surface. The wall will have weep holes to drain out water to the garland drain/sediment pond.
4. The back-filled areas should be levelled to match with adjoining ground level.
5. The completed dumps and the back-filled areas should be afforested in a planned way to increase their stability.
6. Over burden in most cases are not contaminated. However, composition of the leach ability of heavy metals of over burden and low grade ore dumpsites are very important.
7. The top soil prior to drilling and blasting should be stacked at designated area surrounded by embankment to prevent erosion.
8. The over burden and top soil dumps should be stabilized by plantation and anchoring with coir nets / blankets.

Further, Chapter X of Coal Mines Regulations, 2017,106. says all mechanized opencast working. - (1) In all mechanized opencast workings, the precautions specified in sub-regulation (2) to sub-regulation (6) shall be observed. (2) Before starting a mechanized opencast working, the owner and agent of the mine

shall ensure that the mine, including its method of working, ultimate pit slope, dump slope and monitoring of slope stability, has been planned, designed and worked as determined by a scientific study and a copy of the report of such study has been kept available in the office of the mine: Provided that in case of mines where such a study has not been made, it shall be the responsibility of the owner and agent to get the said study made within one year from the date of coming into force of these regulations. (3) The owner, agent and manager of every mechanized opencast mines shall ensure that the recommendations made in the report of scientific study referred to in sub-regulation (2) are complied with.

1.2. CMR 2017 108. Spoil-banks and dumps. –

1. While removing overburden, the top soil shall be stacked at a separate place, so that, the same is used to cover the reclaimed area.
2. The slope of a spoil bank shall be determined by the natural angle of repose of the material being deposited but, in any case, shall not exceed 37.5 degrees from the horizontal: Provided that where in any mine, a steeper slope of spoil bank has been recommended as a result of scientific study by any scientific agency or institution, having expertise in slope stability, the Regional Inspector may, by an order in writing and subject to such conditions as he may specify therein, permit steeper slope of the spoil bank.
3. Loose overburden and other such materials from opencast workings or other rejects from washeries or from other sources shall be dumped in such a manner that there is no possibility of dumped material sliding.
4. Any spoil bank exceeding 30 meter in height shall be benched so that no bench exceeds 30 meter in height and the overall slope shall not exceed 1 vertical to 1.5 horizontal.
5. The toe of a spoil-bank shall not be extended to any point within 100m of a mine opening, railway or other public works, public road or building or other permanent structure not belonging to the owner.
6. A suitable fence shall be erected between any railway or public works or road or building or structure not belonging to the owner and the toe of an active spoil bank so as to prevent unauthorized persons from approaching the spoil-bank.
7. No person shall approach or be permitted to approach the toe of an active spoil bank where he may be endangered from material sliding or rolling down the face.
8. Adequate precautions shall be taken to prevent failure of slopes of the spoil

2. Brief description of the mine:

Yekona-I and II block is located in Warora Tahsil of Chandrapur district of Maharashtra State and is named after nearby Yekona village. The area is bounded by latitudes N 20o 13' 42" to 20o 16' 10" N and longitudes E 78o 55' 00" to 78o 58' 30" and is covered by Survey of India Topo Sheet No.55L/15 & 55L/16.Yekona block is an under developed region of Chandrapur district. The Delhi Madras Grand Trunk railway line passes from the East of the Yekona-I & II block. The nearest railway station is Warora, situated at 7 km distance, S.E of the block. The Nagpur Chandrapur road is about 7 km to the East of the Yekona-I &II block. The block can be approached by a fair-weather road from Warora to Majri via Warora. This road passes through the eastern part of the block and joins Nagpur-Chandrapur road at Warora. Nagpur and Chandrapur townships are located at a distance of 110 km and 52 km from the block, respectively (Table. no. 1).

Table No.1: Geo-technical mining parameters.

S. No.	Parameters	Yekona I	Yekona II
1	Av. Thickness of seam (m)	9.24	9.94
2	Gradient of seam	1 in 7 to 1 in 14	1 in 4.8 to 1 in 8
3	Depth (m): Min. Max.	 30 160	 25 150
4	Av. Strike length (m) At surface At floor	 1700 1400	 3800 3200
5	Average Dip-Rise width(km) a) On floor b)On Surface	 1.2 to 2.0 1.5 – 2.4	 0.60 0.87
6	Area of the Quarry (Ha) a) On floor b)On Surface	 214.70 354.50	 238.64 339.74
7	Total mineable reserves (Mt)	25.04	32.81
8	GCV (kCal/kg) (without dilution at each contact point)	4714(G-9)	5053(G-8)
9	Total volume of OB (Mm3)	225.71	226.78
10	Average stripping ratio (m3/t)	9.01	6.91
11	Annual mine target (Mty)	1.00 to 1.25	1.25 to 1.50
12	Life of the mine	25	24

2.1. Mine boundary:

Yekona – I block:

- North - Sub crop of Composite Seam.
- South - Arbitrary line passing through BH CMWY-77, 76, 57, 56& MWN-9
- East - Fault F8-F8
- West - Fault F1-F1

Yekona – II block

- North - Sub crop of Composite Seam.
- South - 200 m Arbitrary Line from the last borehole drilled (CMWY-42, 44, 47 & 117 & 118 & MWM-21)
- East - Fault F1-F1.
- West - Eastern Bank of Wardha River

3. Geology:

3.1. Geological succession:

The general stratigraphic sequence and a typical bore-hole section of the Yekona-I opencast mine is shown in Fig. no. 1. Clay bands just above the coal seam or in between the sandstone beds provide a potential weak plane for sliding in some cases. (Jhanwar & Thote, 2011, 44:635-640). The presence of clay minerals results in the rapid decrease in cohesion during rainfall, as loss of surface frictional contact between the grains due to high absorption of water. The presence of clay minerals gives more plasticity to the soil which is one of the most important cause of slope failure. (Behera et.al, 2016, 88:725-735).

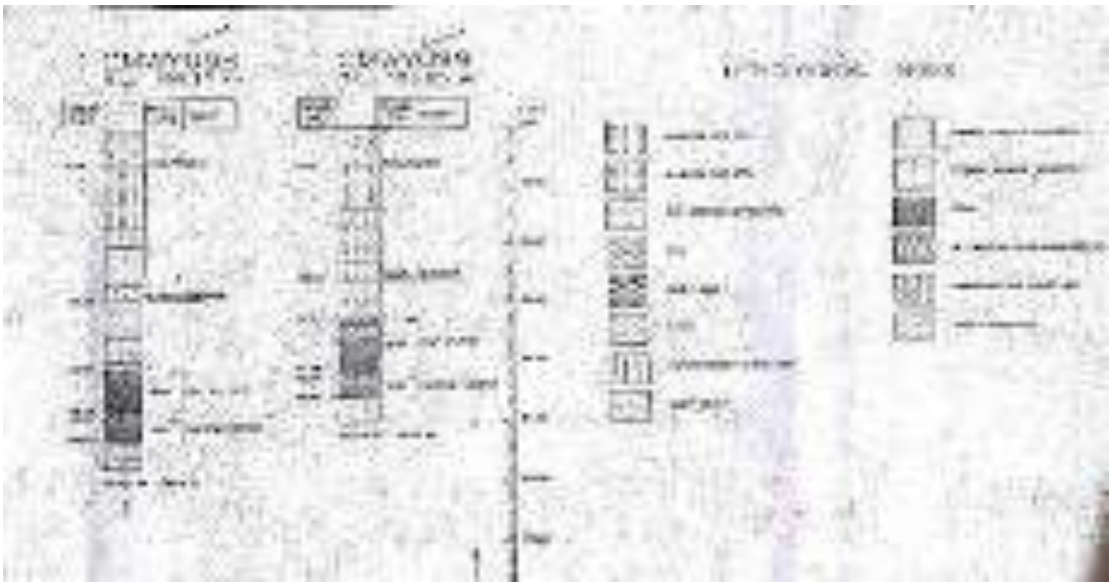

Fig. no.1: Lithology of bore hole CMEY098 and CMWY099.

3.2. Strike & Dip:

Yekona – I block

Coal Seam dips towards SE in the Western part and towards East in the Eastern part. The gradient of seam is 1 in 8 (60) to 1 in 17.5 (30) in the Western part and 1in 6 (90) to 1 in 8 (60) in general in the eastern part with local flattering. The strike of coal seam in the Western part is NE-SW whereas; in the eastern part it is N-S with minor swing.

Yekona – II Block

The general strike of the coal seam as determined from the floor contour plan of composite seam is WNW-ESE dipping SSW however local swings in strike also observed in the area. The dip of the formation in the block is in 1 in 4 to 1 in 7.5; a) Middle part dip is 11.3^{o} due SSW. b) Western part dip ranges from 7.6^{o} to 11.3^{o} due SSW. c) Eastern part dip is 14° due SSW (Gradient 1 in 4)

3.3. Faults:

Yekona – I Block

A total 10 Nos of fault (F1 to F10) have been interpreted in Yekona-I block based on the evidences such as reduction in seam thickness/parting floor difference in adjacent boreholes.

Table no.2: Details of Faults in Yekona-I Block.

Fault No	Extent Of Fault (Km)	Trend	Throw		Evidence
			Direction	Amount	
F1-F1	1.50	NW-SE	SW	95m-130m	Difference in floor level of coal seam in boreholes CMWY-84, 11, 73 in up thrown side and CMWY-82, 13 in downthrown side.
F2-F2	1.00	NW-SE	SW	0-20m	Difference in floor level of coal seam in boreholes CMWY-67, 27, in up thrown side and CMWY-11, 73 in downthrown side.
F3-F3	1.20	NW-SE	SW	0-20m	Difference in floor level of coal Seam in boreholes CMWY-28, 39and MWM-77 in downthrown sideCMWY-10 in up thrown side.
F4-F4	1.17	NW-SE	NE	0-15m	Difference in floor level of coal seam in boreholes CMWY-10 in Down thrown side. And CMWY-66, 55 on up thrown side.
F5-F5	0.45	NNW-SSE	WSW	10-15m	Difference in floor level of coal seam in boreholes CMWY-79, 5Inup thrown side and CMWY-71 in downthrown side.
F6-F6	1.30	NW-SE	SW	60-140m	Absence of Composite Seam in CMWY-24 & 63 Difference in floor level of coal seam in boreholes CMWY-3, 29, 34, MWM-10 in up thrown side and CMWY-33, 32, 52, 26 in downthrown side.
F7-F7	0.350	WNW-ESE	NNW	0-15m	Absence of Bottom Section in CMWY-51. Difference in floor level of coal seam in boreholes CMWY-74, 61 in up thrown side and CMWY-3, 64 in downthrown side.
F8-F8	2.50	NW-SE	SW	200m	Absence of Composite Seam in its up thrown side.

F9-F9	1.65	NW-SE	SW	10-20m	Difference in floor level of coal seam in boreholes CMWY-38, 56, MWM-12 in down thrown side andCMWY-9 in upthrow side.
F10-F10	1.40	NW-SE	SW	30-40m	Absence of Top Section and roof of Bottom Section is faulted in CMWY-58.
					Floor of Bottom Section is faulted in CMWY-54.

Yekona – II block

A total 5 number of faults (F1 to F5) have been interpreted in Yekona-II block based on the evidences such as reduction in seam thickness/parting floor difference in adjacent borehole. Details are in Table. no. 3.

Table No.3: Details of Faults in Yekona-II Block.

Fault no.	Extent of fault (Km)	Trend	Throw		Evidence
			Direction	Amount	
F1-F1	1.550	NW-SE	NE	125m	Motur Formation intersected in BH (cmwy-95,107,126, MWM15) on the downthrown side of the fault F1 -F1 lies in juxtaposition to middle and upper part of Barakar Formation in Borehole CMWY-91,118&123 MWM-36
F2-F2	0.170	NE-SW	NW	0-4m	Bottom section is faulted inCMWY-55
F3-F3	0.210	NE-SW	NW	0-4m	Bottom section is faulted inCMWY-55
F4-F4	1.035	WNW-ESE	SW	0-18m	Top section in CMWY-114 and bottom section floor is faulted inMWM-38. Based on FRL differences in boreholesCMWY105&122 in the up throw side and CMWY-113 in the downthrown side.
F5-F5	0.990	NE-SW	NW	20-30m	Based on FRL difference in borehole MWM-29 & 39 in upthrow side and CMWY -104 &124in the downthrown side

It was observed that when the workings reached within 10–30 m of the faults with strike parallel to the slopes, signs of the potential instability started appearing. **The opencast mine workings should therefore be laid in such a way that the fault planes do not strike parallel to the benches.** (Jhanwar & Thote,2011, 44:635-640)

3.4. Fold:

There is no fold encountered in this area, as reported.

3.5. Dyke:

There is no reported presence of dykes.

3.6. Physiography:

Almost entire area of the block is covered with black cotton soil. Area exhibits a gently undulating topography with general slope towards southwest. The altitude of area ranges between 188.10 m (Reduced level of borehole MWM32) and 204.42 m (Reduced level of borehole MWM25). Surface contour for the area are available at 1 m interval. The main drainage of area is controlled by Wardha River, which is flowing south-easterly and form western limit of block. Some small seasonal nallah are also flowing in south-westerly direction in the block area to join Wardha River.

3.7. Climate:

The study area falls under subtropical climate zone experiencing hot summer and mild winter. In summer, general maximum and minimum temperature around 43° C and 28° C respectively. However, rarely the summer temperature shoots up as high as 47° C in May/June. In winter, general maximum and minimum temperature around 29° C and 12° C respectively. However, minimum temperature seldom falls to as low as 7° C in December /January. Generally, monsoon starts by mid-June and continues till September, -August being the month of highest rainfall. Nowadays, there are instances of occasional medium to heavy rainfall even during non-rainy seasons. The annual rainfall (1984-2017) collected from WCL, Majri Area GM office is furnished in the following table no 4.

Table No.4: The annual rainfall during the period 1984-2017.

YEAR	ANNUAL RAINFALL (mm)	YEAR	ANNUAL RAINFALL (mm)
1984	846	2001	1349
1985	953	2002	893
1986	1992	2003	1043
1987	747	2004	631
1988	1392	2005	1761
1989	882	2006	1560
1990	1980	2007	1638
1991	1033	2008	1520
1992	1158	2009	1106

1993	1107	2010	2210
1994	2466	2011	1939
1995	1836	2012	1606
1996	852	2013	----
1997	712	2014	1349
1998	931	2015	1786
1999	1158	2016	2113
2000	1158	2017	1205

Table No.5: Progressive monthly rainfall and peak rainfall

YEAR	2017			2018		
MONTH	Progressive rainfall (mm)	Max. Max. (on a particular date)	Min. (on a particular date)	Progressive rainfall (mm)	Max. (on a particular date)	Min. (on a particular date)
JUNE	69	20	0	124	31	0
JULY	270	98	0	457	95	0
AUGUST	91	28	0	187	48	0
SEPTEMBER	176	56	0	203	133	0

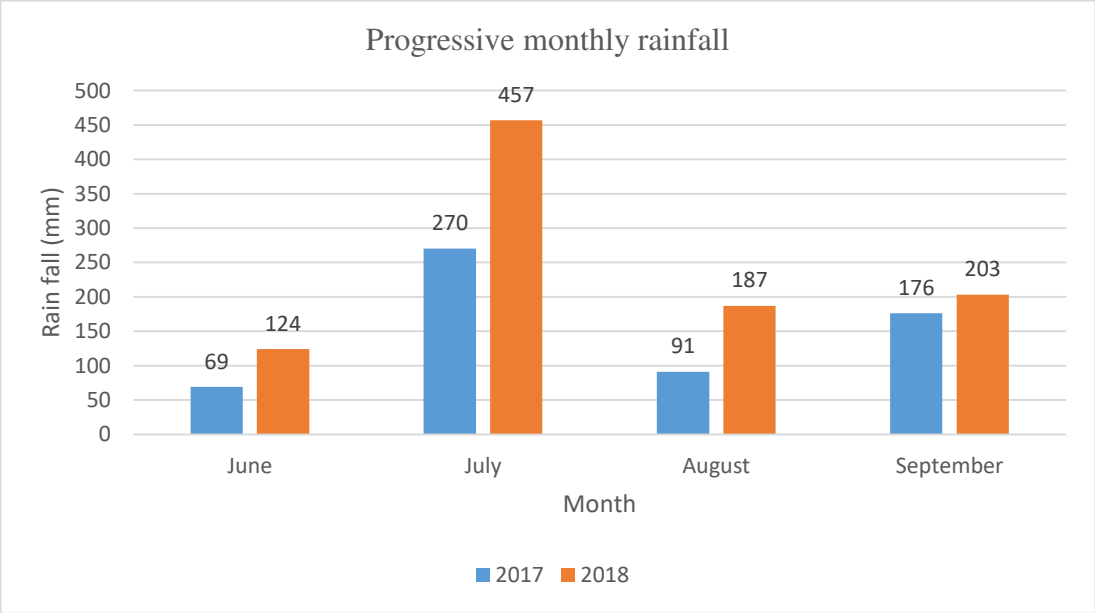

Fig. no.2: Graph showing progressive monthly rainfall.

It thus indicated that slope failure occurred, when there was a rainfall of an order of 70–130mm during the last 8 days of failure including the day of failure. A cumulative rainfall of an order of 150–

500 mm was found to be associated with either the development of the first signs of instability (in general) or an actual failure, where other extraneous factors played a major role in initiating the slope failures. A heavy rainfall of an order of 80 mm causes the transition of a slope from a steady state to an actively unstable state. (Jhanwar & Thote, 2011, 44:635-640). In table no.4 rainfall data is given.

3.8. Surface hydrology:

The area is principally drained by the Wardha River, flowing from north-west to south-easterly, located about 1 Km west of the block. This river is fluent and perennial. During summer the discharge dwindles considerably. Beside Wardha River, Daiwal River and some local nallahs are flowing through this area, which finally join the Wardha River. Few water conservation structure/ schemes such as bunds, canals are also available in this area.

3.9. Hydrogeology:

Ground water occur below water table in the inter-granular pour space of sand stone in semi-consolidated sediments of Gondawanas and also in weathered basalts and their secondary porous structure. Generally, sandstone horizons in Gondawanas serve as aquifer material and the impervious shale/clay beds act as aquicludes. The weathered /secondary zones in Kamptee and Barakar formations near a fault zone act as potential aquifer. The water seepage in the current working position at 180RL is shown in fig.no. 4. The delineation of the aquifers system is given below Table no. 6.

Table No. 6: Type of aquifer in and around Yekona II Block

Hydrogeological unit		Formation	Thickness Ranges (m)
Sallow Aquifer/ Unconfined Aquifer (potential Aquifer)		Kamptee Sandstone	10.00-39.50
Deeper Aquifer (Low to medium potential aquifer)	Aquicludes	Motur clay/Shale/ Sandstone/Coal seam	3.36-183.75
	Semi confined Aquifer	Barakar Sandstone (considered above coal seam)	10.97-106.40

The projected hydrogeological parameter of aquifer in Kamptee/ Barakar formation are as follows:

- Hydraulic conductivity : 2.2m/day
- Storage coefficient : 1.57×10^{-4} to 1.1×10^{-3}
- Specific yield : 0.05

4. Loose dump details:

The proposed height of overburden dumps has been envisaged as 90m above ground level. Presently nowhere in Majri area, dumping is done above 60m. Hence, it is proposed in the Prefeasibility report to conduct a slope stability study, for which capital provision has been made. Moreover, it is proposed to remove a thickness of 2.5m of black cotton soil from 120m wide trench along the periphery of external dump for better stability of dump. Out of total 456.03 Mm3 OB (452.49 Mm^3 from quarry and 3.54 from Trench cutting), 133.50 Mm^3 OB will be accommodated in External OB Dump and balance 322.53 Mm^3 will be dumped in decoaled void of the two quarries. Thus, 29.27% of total OB will be dumped externally and 70.73% OB will be accommodated in the Internal Dumps. The Dump Capacities of different OB Dumps are tabulated below:

Table No. 7: Available dump capacity.

S. No.	Type of Dump	Capacity (Mm^3)
1	External Dump	133.50
2	Temporary dump to be Re-handled	43.83
3	Internal Dump	322.53
	Total	456.03

The height of overburden hard dump can be made up to 90m keeping the benches 20m in height and width 25m with bench slope angle 35°. The height of OB black soil dump can be made up to 45m keeping the benches 10m in height and 15m width with bench slope 30°.

The loose or broken dumps of the mine consists of top BC soil and rocky overburden. BC soil dump is kept separately. In the mine there is one BC soil dump and another rocky overburden dump. Both these dumps require separate analytical treatment to determine slope stability parameters.

5. Mine bench details:

The mine has started just more than one year before i.e. in 2016-17, thus it has only five BC soil and mixed soil benches till now which is shown in fig.no.3. However, the coal seam is exposed currently in mid of October 2018.The details of existing benches are given below:

Table. No. 8: Existing mine bench in the mine. (As on date 15/10/2018)

Existing bench	Height	Width	Slope
Bench 1	**3**	Top	50
Bench 2	**3**	9	55
Bench 3	**3**	9	55
Bench 4	**3**	9	45
Bench 5	**3**	9	50

The proposed bench height and width of the mine benches are 10m each with a bench slope angle of 70° and overall slope angle of 35°. These bench parameters are taken on account of average geotechnical parameters (cohesion (c), internal angle of friction (φ) and unit weight (γ)) of slope material.

Fig. no. 3: Showing BC soil and hard OB layer (as on 15/10/2018).

Fig.no 4: Current working portion of mine. (As on date 15/10/2018)

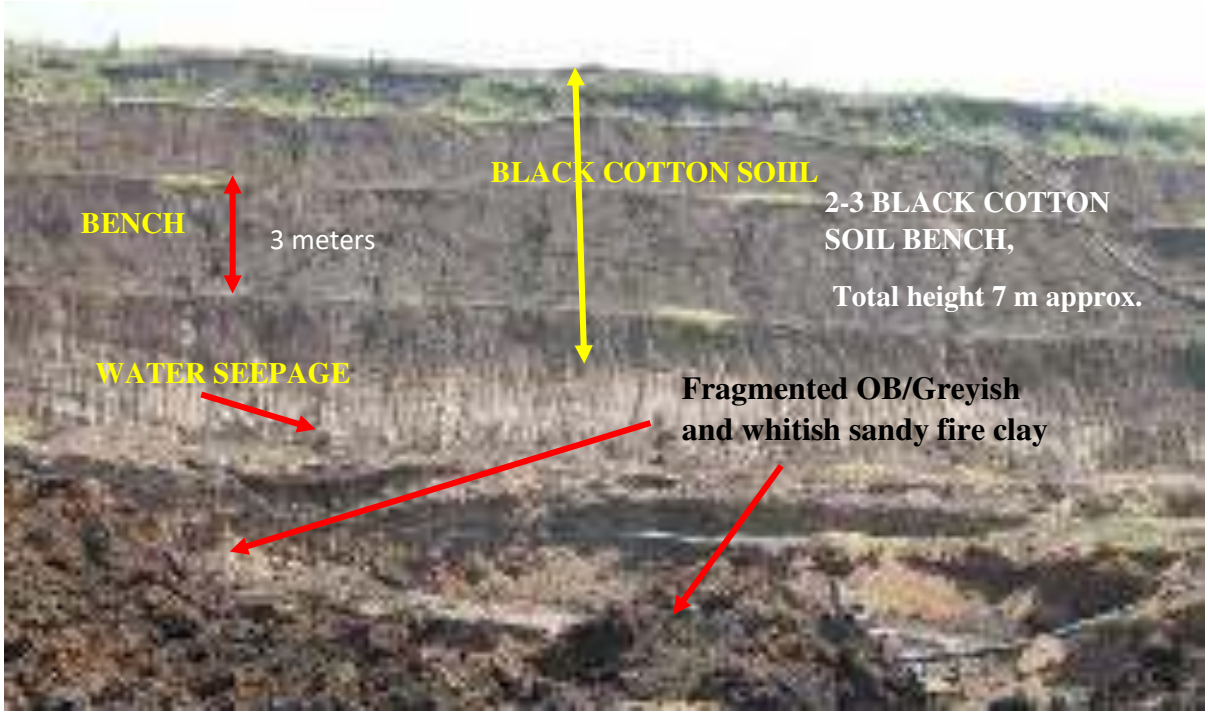

Fig. no. 5: No. of benches (as on 15/10/2018).

6. Slope failure related problems in the mine:

The slope failure in the mine is mainly induced by rain, the rainfall causes erosion of slope surface which contribute to slope failures, the rill and gully erosion are mostly encountered in this area. A type of rill and gully erosion is shown in fig. no. 6.
Slope failure can be controlled by reducing the length of the slope and the slope angle. However, the slope angle for broken material will finally assume the natural angle of repose, and hence the slope angle is a material property dependent on the size distribution of materials. However, we can control the height of slope. The other methods of reducing the slope failure due to water seepages are to reduce the influence of water are terracing, construction of diversion ditches and garland drains. Terracing is the technique of converting a slope into a series of horizontal step-like structures with the aim of

1. Controlling the flow of surface runoff by guiding the runoff across the slope and conveying it to a suitable outlet at a non-erosive velocity;
2. Reducing soil erosion by trapping the soil on the terrace;
3. Reducing the impact of slope failures by controlling the volume of slippage, and
4. Creating flat land suitable for plantation.
5. Terracing helps prevent the formation of rills, improves soil fertility through reduced erosion, and helps water conservation.

The three main types of terrace are bench, level or contour, and parallel or channel. We will discuss two varieties in detail.

Bench terraces are particularly suitable where marked seasonal variations exist in the availability of water. The approach consists of converting relatively steep land into a series of horizontal steps running across the slope. In the surface mines bench terraces with drain and ditches are applied (details later). These terraces can be constructed by dozing the existing slope and creating the terrace having a mild negative slope towards the diversion ditch as well as by constructed simply digging out the clayey soil, or they can be reinforced with locally available mud, stone, or brick. The terraces help conserve moisture during the long dry season, which is especially important where there are sandy and loam types of soil, and they help to slow and drain away runoff during the heavy rainfall monsoon season, which also helps counteract the tendency for sliding. There are three main types; outward, level, Inward sloping terraces, inward is the most suitable for steep slopes because they guide the surface runoff towards the hillside rather than down the slope. Rainwater can be drained from outward sloping terraces along a ditch constructed along the toe of the riser.
The main aim of contour terraces is to retain water and sediment. Contour terraces are similar to bench terraces, with the major difference that the terrace is formed along the contour, so that runoff flows across but not along the terrace. In addition, the terrace edge is planted with trees, small plants, and grass to stabilize it and trap sediment.

Fig. no. 6: Showing erosion in mine OB dump (as on 15/10/2018).

7. Slope stability Analysis:

7.1. Factor of Safety Calculation Methods:

Circular failure:

Circular failure criteria have been used for broken overburden and BC soil dumps. Under soil and rock dump slope conditions, one or more of the discontinuities normally defines the slide surface. However, in the case of a closely fractured or highly weathered rock, a strongly defined structural pattern no longer exists, and the slide surface is free to find the line of least resistance through the slope. Observations of slope failures in these materials suggest that this slide surface generally takes the form of a circle, and most stability theories are based upon this observation. For more details, see Annexure I.

Plane failure

Plane failure in a rock slope takes place where a block of rock has slid on a single plane dipping out of the face. **Plane failure criteria has been used for the solid coal and solid overburden slopes**. In order for this type of failure to occur, the following geometrical conditions must be satisfied:

A. The plane on which sliding occurs must strike parallel or nearly parallel (within approximately ±20◦) to the slope face.
B. The sliding plane must "daylight" in the slope face, which means that the dip of the plane must be less than the dip of the slope face, that is, $\beta < \psi_f$.
C. The dip of the sliding plane must be greater than the angle of friction of this plane, that is, $\beta > \varphi$.
D. The upper end of the sliding surface either intersects the upper slope, or terminates in a tension crack.
E. Release surfaces that provide negligible resistance to sliding must be present in the rock mass to define the lateral boundaries of the slide. Alternatively, failure can occur on a sliding plane passing through the convex "nose" of a slope.

For more details, see Annexure II.

Once the physical, technical and geotechnical parameters are obtained then the slope stability calculations begin. Considering different types of slope failure like circular failure, wedge failure, plane failure and toppling failure, the factor safety is calculated on the basis of cohesion, pore water pressure, water saturation and internal angle of friction. For a slope here we have considered a minimum factor of safety of 1.0 at 100% saturation level, i.e., this is the minimum level of safety against slope failure even when the soil has reached 100% saturation, due to rain or water seepages. Normally, before 90% saturation, liquefaction of the slope can begin and so the values of slopes of broken material are calculated with 90% saturation.

7.1.1. Broken rock/soil benches:

7.1.1.1. For Over-burden dump:

Table No.9: FOS calculation parameters for OB dump benches/proposed height and width of dump benches.

Cohesion, kPa	Angle of internal friction	Bench Height (m)	Bench Width (m)	Bulk density (kN/m$^{3)}$	FOS			Saturation condition %	Comments
					Min.	Max.	Average		
65	24	20.0	25.0	24	2.03	2.05	2.03	5	At normal operational level at all season the water saturation level will be between 5 to 50%. At 75% the FOS will begin to drop substantially. This is a condition that has to be monitored closely by the mine authorities.
61	23	20.0	25.0	24	1.51	1.59	1.55	25	
57	21.5	20.0	25.0	24	1.08	1.27	1.17	50	
48	20	20.0	25.0	24	1.01	1.15	1.08	75	
45	**19**	**20.0**	**25.0**	**24**	**1.01**	**1.02**	**1.01**	**90**	Factor of safety is likely to decrease substantially during heavy rain situations. In these slopes terracing, ditches, garland drains and horizontal pipe drains will be applied as shown in figs 18-35

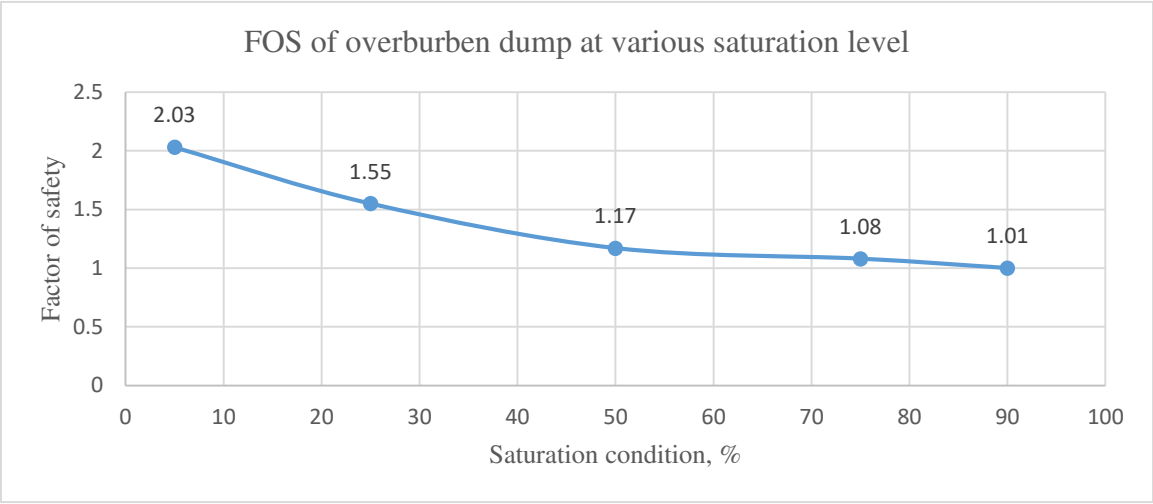

Fig.no.7: FOS of overburden for different saturation level.

7.1.1.2. Black cotton soil dump:

Cohesion being less and due to granular shapes of particles, the BC soil dumps would characteristically have less factor of safety. Moreover, disturbance by digging and transportation, would encourage loss of organic material and fine particulates, when exposed to the Sun and rain under different episodes.

Table No.10: FOS calculation parameters for BC soil dump.

Cohesion, kPa	Angle of internal friction	Bench Height (m)	Bench Width (m)	Bulk density, kN/m^3	FOS			Saturation condition %	Comments
					Min.	Max.	Average		
55	30	10.0	15.0	18	2.99	3.26	3.12	5	At normal operational level at all season the water saturation level will be between 5 to 50%. At 75% the FOS will begin to drop substantially. This is a condition that has to be monitored closely by the mine authorities.
45	27	10.0	15.0	18	2.40	2.49	2.44	25	
35	25	10.0	15.0	18	1.81	1.98	1.90	50	
30	22	10.0	15.0	18	1.48	1.50	1.49	75	
20	**20**	**10.0**	**15.0**	**18**	**1.07**	**1.16**	**1.11**	**90**	Factor of safety is likely to decrease substantially during heavy rain situations. In these slopes terracing, ditches, garland drains and horizontal pipe drains will be applied as shown in figs,17-25

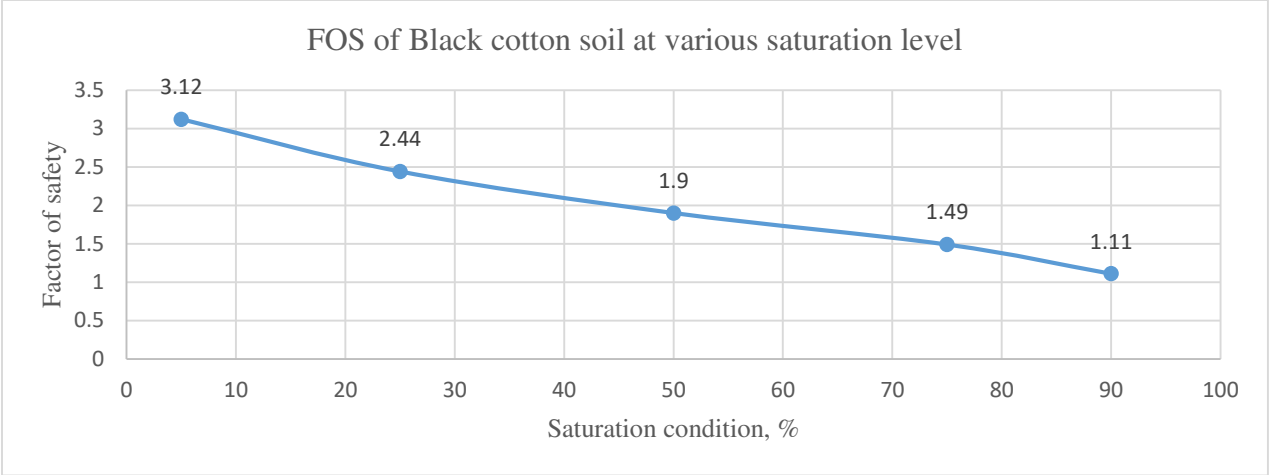

Fig.no.8: FOS of black cotton soil for different saturation level.

7.1.2. Solid mine benches:

Solid mine benches in the mine are 3 types: coal benches, rocky over burden benches and BC soil plus rocky overburden benches. Cohesion being higher than broken rock, it will have high FOS when dry and free of major geological disturbances and when, there is a good confinement. Depending on the material property, porosity and permeability, presence of water, geological features like slip plane, and localized vertical load due heavy machinery, solid bench slopes can become unstable.

7.1.2.1. Solid Overburden bench:

In the intact overburden bench, rainfall led saturation of the overburden material, though continuously reduces the factor of safety, but does not decrease normally beyond the acceptable limit. However, formation of cracks, presence of loose soil like material can substantially reduce the factor of safety. During the rainfall seasons of June to September, particularly the Slope Stability Team would ensure that if the overburden shows signs of slope failures as given in **Sections 9 & 12** of this Report, it must propose appropriate actions to the mine management, to save men and property.

Table No. 11: FOS calculation parameters for mine working OB bench:

Cohesion, kPa	Angle of internal friction	Bench Height (m)	Bench Width (m)	Bulk density (kN/m^3)	FOS			Saturation condition %
					Min.	Max.	Average	
102	24	5.0	7.0	26	3.26	3.71	3.49	5
102	24	5.0	7.0	26	3.22	3.56	3.39	20
102	24	5.0	7.0	26	2.96	3.20	3.08	30
102	24	5.0	7.0	26	2.61	3.19	2.91	35
102	**24**	**5.0**	**7.0**	**26**	**2.54**	**3.08**	**2.81**	**40**

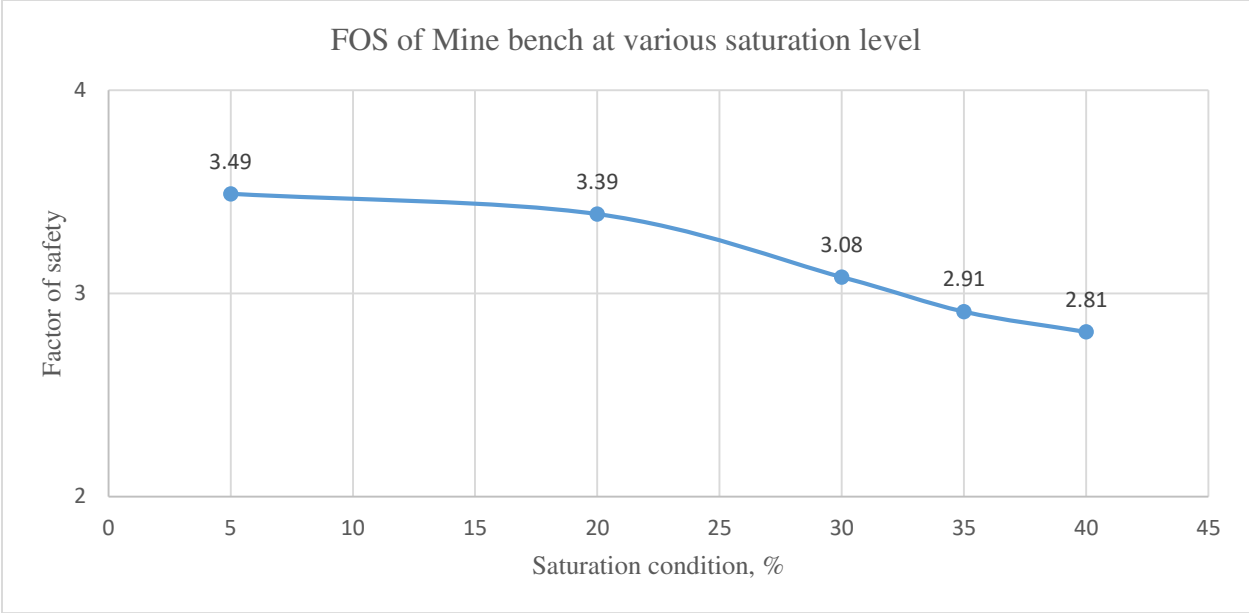

Fig.no.9: FOS of mine bench for different saturation level.

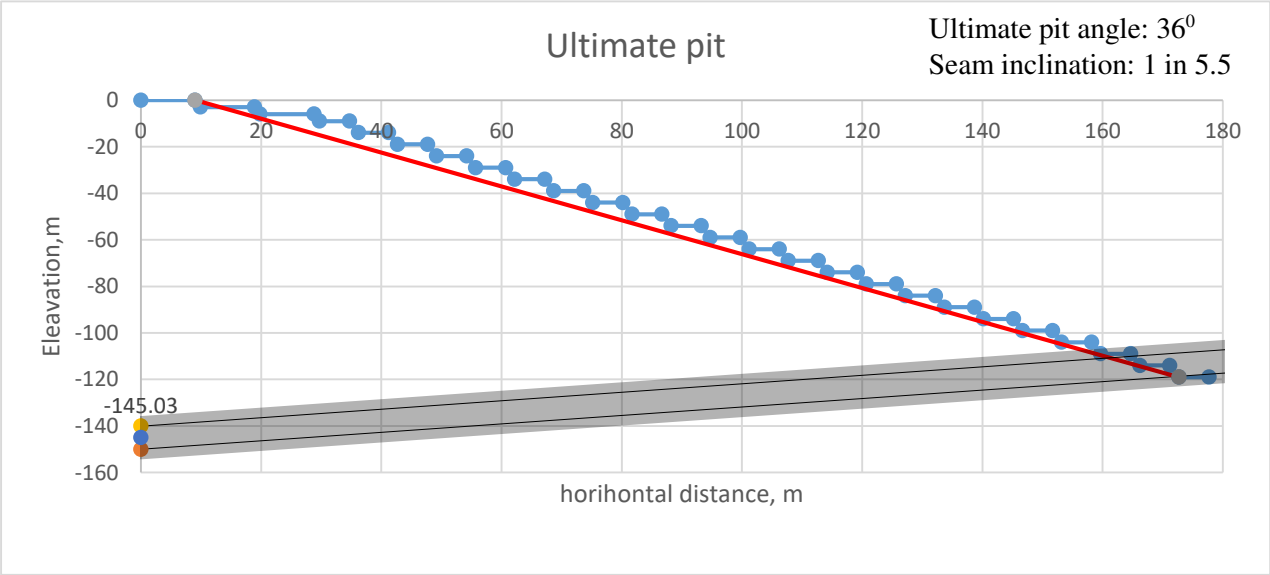

Fig no. 10: Ultimate pit of the mine.

7.1.2.2. Solid Coal bench:

The values are given in Results and Discussion.

8. Results and Discussions:

One the basis of the slope stability calculations the following operating values of the parameters is considered:

Place	Cohesion kPa	Angle of internal friction	Bulk density kN/m³	FOS			Saturation condition (%)	Bench Height (m)	Bench Width (m)	Comments
				Min.	Max.	Average				
OB broken dump	**45**	**19**	**24**	**1.01**	**1.02**	**1.01**	**90**	**20.0**	**25.0**	In these slopes terracing will be applied. Movements will be measured by Total Station. Other measures can be found in the recommendations
BC soil dump	**20**	**20**	**18**	**1.07**	**1.16**	**1.11**	**90**	**10.0**	**15.0**	In these slopes terracing will be applied. Movements will be measured by Total Station. Other measures can be found in the recommendations
Mine OB Bench (hard rock)	**102**	**24**	**26**	**2.54**	**3.08**	**2.81**	**40**	**5.0**	**7.0**	For these slopes poles will be used for measurement of movement by Total station. The bench width shall not be less than the bench height.
Mine Coal Bench (hard)	**35**	**15.3**	**13.6**	**1.56**	**2.10**	**1.83**	**20**	**10.0**	**12.0**	The bench width shall not be less than the bench height.
BC Soil benches/fragmented benches	**39**	**28**	**19**	**1.95**	**2.17**	**2.06**	**40**	**3.0**	**9.0**	For these slopes poles will be used for measurement of movement by Total station. Other measures can be found in the recommendations

9. Slope Failure Indications:

The slope stability team under the mine management must look into the indicators as mentioned below on a regular basis and report the same to the mine management for appropriate actions.

An indicator is defined as a sign, a state or a contributing factor that points out or suggests that the rock mass may be prone to damage or failure. Usually, indicators suggest that the properties of the effected rocks are different from the surrounding rock mass. In general, potential slope failure is indicated by geotechnical features or mining operational factors.

A. Geotechnical indicators may include:

1. Structural features such as faults, shear zones or slickensides planes (Fig. no. 11),

Fig. no 11: A slicken sided plane facilitating failure of a slope. In the interfaces of weak and jointed rocks with soil in contact with a massive block of rock with sharp surfaces, the failure can take place along the sharp surface, when wet.

2. Geological disturbance in the form of folds and dykes
3. Cracks on a slope occurs with creeps. It is a horizontal crack that appears at the top of a slope where parts of the soil and rock layer break away from the main slope, also known as a tension crack.
4. A change in the mechanical properties of the rock mass,
5. Layers of weak soil or rocks,
6. Poor ground conditions, e.g. jointed blocky ground.
7. Movement across faults or sets of joints,
8. Seismic activity,
9. An increase in water inflow or a change in the water table. Bulging ground appearing at the base of a slope or retaining wall, which indicates increasing water pressure. The water needs to be drained.
10. Water breaking above the ground surface in areas near a slope that is called ponding. It indicates water from above and at the foot of the slope is not flowing along proper channels and pools in unexpected areas.
11. Water appearing at the base of a slope also indicates ponding.
12. Floor heave at the toe of the slope in open pits,
13. Wall slumping in open pits (Fig. no. 12), and
14. Bulging (outward and upward) near the toe of slopes.
15. Cracks near the crest of the slope (Fig. no. 13),

16. Fences, retaining walls, utility poles or trees tilting or shifting from their original positions are signs of ground movement. It can move very slowly and is classified as a form of slope failure, called a creep.
17. Cracks appear on the ground or in the foundation of houses, buildings and other structures. However, cracks sometimes develop due to reasons not related to slope movement so look around for other tell-tale signs.
18. Collapsed pavement, fallen rocks and earth, land movement and mudflow are among the indications that may lead to larger trouble later.
19. Sunken or down-dropped road beds can indicate ground movement.
20. Widening cracks appear on the ground or on paved areas such as streets or driveways.

Fig. No .12: Slumping of weak rock at the bottom of an open pit. The cracks show local failures have occurred in the area and can spread.

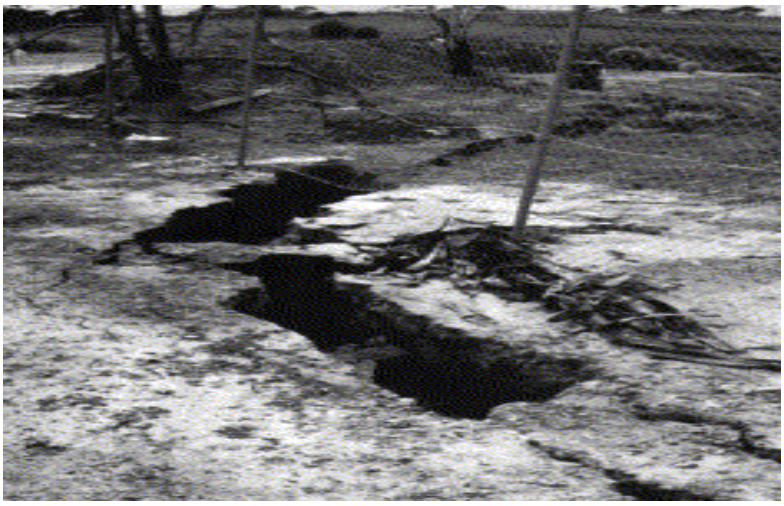

Fig. No 13. Progressive opening of cracks at a periphery of an open pit. If the cracking spreads even after filling, the signs are dangerous and must be monitored.

B. In addition to geological indicators, analysis of operational indicators can draw attention to possible rock mass structural damage. Such operational indicators include:

1. blast damage,
2. an accumulation of water in nearby excavations,
3. steep slopes in open pits, and
4. Undercut slopes.
5. Unbalanced surface mining.
6. Little or no mechanical soil control like terracing or construction of ditches.
7. Little or no greening and mulching activities.

10. Recommendations on the basis of the study:

10.1. Method of Work:

One the basis of the studies we recommend the following working height of different benches and slopes in the mine:

Places	Cohesion kPa	Angle of internal friction	Bulk density kN/m^3	FOS			Saturation condition (%)	Bench Height (m)	Bench Width (m)	Comments
				Min.	Max.	Average				
OB broken dump	45	19	24	1.01	1.02	1.01	90	20.0	25.0	In these slopes terracing will be applied. Movements will be measured by Total Station. In these slopes terracing, ditches, garland drains and horizontal pipe drains will be applied as shown in figs,18-25
BC soil dump	20	20	18	1.07	1.16	1.11	90	10.0	15.0	In these slopes terracing will be applied. Movements will be measured by Total Station. In these slopes terracing, ditches, garland drains and horizontal pipe drains will be applied as shown in figs,17-25
Mine bench (OB hard rock)	102	24	26	2.54	3.08	2.81	40	5.0	7.0	The bench slope angle should not exceed 70º under any circumstances. For these slopes poles will be used for measurement of movement by Total station. Other details can be found in recommendations
Mine coal bench (hard)	35	15.3	13.6	1.56	2.10	1.83	20	10.0	12.0	The bench width shall not be less than the bench height.
BC Soil benches/ fragmented benches	39	28	19	1.95	2.17	2.06	40	3.0	9.0	For these slopes poles will be used for measurement of movement by Total station. Other details can be found in recommendations

10.1.1. Mine Coal Bench:

Since the thickness of the coal seam is 10.21 m, therefore the total height of the coal seam can be worked by single lift with surface miner and without leaving any bench. The width of the bench must not be less than 12 m. However, in places where the coal seam height is more than 10.21m a different consideration of benching with the approval of regulating agencies, is to be adopted.

The coal strength of the benches in the mine is between 60 to 100 kg/cm^2 (6-10 MPa). At this strength the coal bench is supposed to remain standing and stable. But precautions of safety have to be maintained as per the observations on day to day basis. Any signs of local weakening of strength and excessive vertical and lateral load accumulation will be dealt with responses like removing man and property.

In order to reduce the scope of spontaneous combustion the cut coal cannot be kept stored on the bench and have to be evacuated within 24 hours of cutting the coal. In addition, the provisions for dousing the coal fire must be kept for use immediately upon a fire.

The coal benches can suffer from weaknesses of joints, faults and folds, etc. Different igneous intrusions of sills and dykes can also weaken the coal seam. As a result, in some parts of the rather solid coal seam there can be occurrences of burnt soil, coal and rocks which may have flow-able property leading to slope failure. In addition, such parts or locations can have old fire and also can catch fire as soon as they are exposed.

It will be the responsibility of the management of the mine to identify such occurrences and to caution the working personnel and manager of the property to take required safety measures. In cases of repeated occurrences of such geological problems (e.g. 5 such occurrences in 1 km of the bench length), the mine management will inform the appropriate regulatory authority to review the condition of working and if need be the bench height and other operating conditions can be again reviewed. Under regular operating conditions the points enumerated in **Sections 9 & 12** of this report must be watched, assessed, and precautionary steps to avoid unsafe conditions for men and property to be avoided.

10.1.2. Height and width of mine working OB benches:

1. Height and width ratio of the BC soil slope will remain 1:3 (3m height and 9m width) up to total 7.00m thickness of BC soil.
2. Height and width ratio of benches (other than BC soil benches) slope will remain 1:1(5m height and 5m width). Same pattern will be followed in the coal benches.
3. The height of the benches in overburden consisting of alluvial soil, morum, gravel, clay, debris or other similar ground shall not exceed 3 meters and the width thereof shall not be less than three times the height of the bench.

In the intact mine bench, rainfall led saturation of the overburden material, though continuously reduces the factor of safety, does not decrease beyond the acceptable limit. However, formation of cracks, presence of loose soil like material can substantially reduce the factor of safety. During the rainfall seasons of June to September, particularly the Slope Stability Team would ensure that if the overburden shows signs of slope failures as given in **Sections 9 & 12** of this Report, it must propose appropriate actions to the mine management, to save men and property.

10.2. Ultimate pit slope of the mine:

In the top benches, up to the width of BC soil, up to 7.0 m, the OB bench height and bench width will be 3.0 m and 9.0 m, respectively. After 7.0 m the OB bench height and bench width will be 5.0 m and

7.0 m, respectively. The coal bench height and width shall be always 10.0 m and 12.0 m, respectively. The ultimate pit will look like as in figure 14.

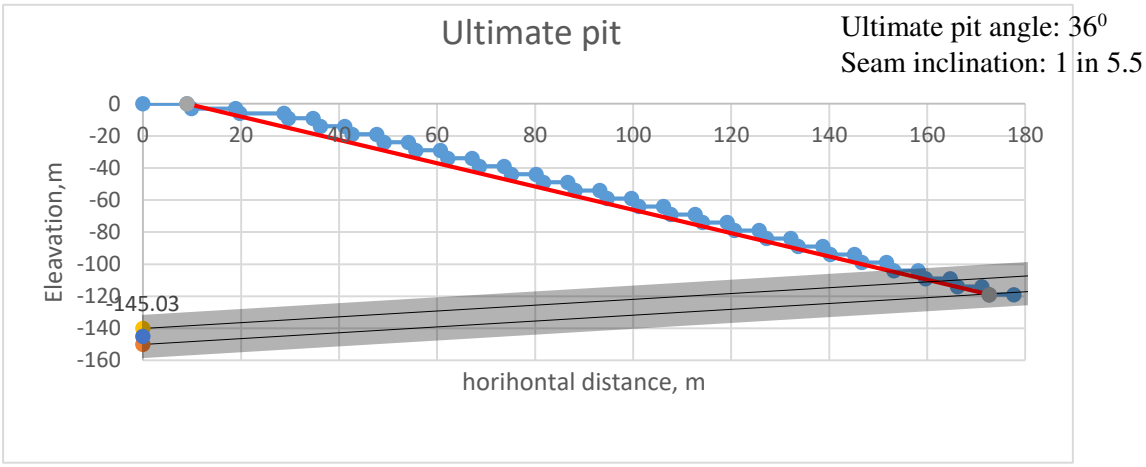

Fig.no. 14: Ultimate pit of the mine

10.2.1. Height and width of OB rock dumps:

Height and width ratio of the other bench dumps (other than BC soil dump) will remain 1:1.25 (20 m height and 25 m width) till the height of the other benches reach 60 m. After 60 m, for further dumping up to maximum 90m, height and width ratio of 1:2 (10m height and 20 m width) will be followed. In all such times available dump area for vegetation will be as far as possible vegetated with all season large tree green plantation, interspersed with patches of grass lands. However, the height of the benches in overburden consisting of alluvial soil, morum, gravel, clay, debris or other similar ground shall not exceed 3 meters and the width thereof shall not be less than three times the height of the bench.

10.2.2. Height and width of BC soil dumps:

Height and width ratio of the BC soil dump will remain 1:1.5 (10 m height and 15 m width) till the height of BC soil dump reaches 30 m. After 30 m, for further dumping up to maximum 45m, height and width ratio of 1:2 (10m height and 20 m width) will be followed.
However, the height of the benches in overburden consisting of alluvial soil, morum, gravel, clay, debris or other similar ground shall not exceed 3 meters and the width thereof shall not be less than three times the height of the bench.
In all such times available dump area for vegetation will be as far as possible vegetated with all season large tree green plantation, interspersed with patches of grass lands.
In the dumps, rainfall led saturation of the overburden material, continuously reducing the factor of safety, might decrease beyond the acceptable limit. However, formation of cracks, presence of loose soil like material can substantially reduce the factor of safety. During the rainfall seasons of June to September, particularly the Slope Stability Team would ensure that if the dumps show signs of slope failures as given in **Sections 9&12** of this Report, it must propose appropriate actions to the mine management, to save men and property.

10.2.3. Internal dumping:

Internal dumping can be done as soon as sufficient space is made available in the mine. Internal dumping can be done, keeping the toe of the dump at least 100m away from the active working or the maximum height of the working, whichever is more. Internal dumping shall be started from bottom upwards so that the dumped material is made compact. Before starting the internal dumping, the floor should be blasted by drilling 2 to 3 m holes or made level by ripping, if needed, so as to increase the surface friction. Internal dumping should not be done on the slippery wet or water accumulated floor. Height and width ratio of the bench dumps will remain 1:1.5 (20m height and 30m width) till the height of all the benches together reach 60m. It is recommended that each of the slope length for the OB dump should be 33.25m with a minimum of 30.0m terrace before another slope. After 60m for further dumping up to 90m height and width ratio of 1:1.5(10m height and 15m width) will be followed. Here, it is recommended that each of the slope length for the OB dump should be 16.25m with a minimum of 15.0m terrace before another slope. Above 90m for further dumping there should be a scientific study to assess the performance of the method till 90m and to suggest the appropriate method post 90m.

It is advised to construct a protective barrier at the edge of the bottom of the internal dump, not less than the height of 2m.

In all such times available dump area for vegetation will be as far as possible vegetated with all season large tree green plantation, interspersed with patches of grass lands.

10.3. Monitoring of Loose OB and BC soil slope:

It is recommended that long poles/pegs with cement blocks at the bottom are to be left during of the preparation of slope. The interval between the poles/pegs should be in grid of 100m x100m (in staggering pattern). The position of the pole/peg will be measured from a reference point to observe any displacement by Total Station method of surveying. The objective of such assessment is to observe whether there is any abrupt disturbance on the slope during normal working period. For all black cotton soil dump slopes the top of the poles/pegs will be monitored for displacement once in every 30 days during dry period of October to May. For all other waste slopes also the monitoring will be done once in every month. During the times of heavy rainfall, normally between the months of June to October the pole/peg displacements should be monitored once in every 7 days in all waste slopes. In the case of excess rainfall under extraordinary conditions the monitoring should be done twice in every week, with approval of the mine manager.

Once the waste dumps, particularly the black cotton soil dumps are vegetated with all season green plants of at least 2.0 m height the frequency of Total Station survey of the slopes can be done once in 3 months. Extra precaution requiring more frequent Total Station surveying during rainy season should be taken in consultation with mine manager.

10.4. Monitoring of bench slope:

It is recommended that long poles/pegs with cement blocks/iron pegs at the bottom are to be left during of the preparation of bench. The interval between the poles/pegs should be in grid of 100m x100m (in staggering pattern). At least 2m of the poles/pegs should be below ground and 2.0 m above ground. The poles /pegs should be of such construction that they remain intact for at least 5years in position. The position of the pole/peg will be measured from a reference point to observe any displacement by Total Station method of surveying. The objective of such assessment is to observe whether there is any

abrupt disturbance on the bench during normal working period. For all black cotton soil benches, the top of the poles/pegs will be monitored for displacement once in every 30 days during dry period of October to May. For all other benches also the monitoring will be done once in every month. During the times of heavy rainfall, normally between the months of June to October the pole/peg displacements should be monitored once in every 7 days in all benches. In the case of excess rainfall under extraordinary conditions the monitoring should be done twice in every week, with approval of the mine manager.

10.5 Continuous machine based slope monitoring system

The mine management to implement a continuous machine based slope monitoring system across the mine to monitor the OB benches and dump benches for instantaneous detection of any movement or impending failure of overburden bench/dump slope.

10.6 Deployment of machines and code of practices

The mine should follow CMR 110 in regards of deployment of machines whereby a code of practices is to be framed and followed. In case surface miner etc. is planned to be used, **CMR 110(1), 215,216** and other appropriate CMR 2017 provisions as required will have to be followed.

10.7 Ease of compliance to maintain registers

The mine management is asked to keep updated mine plans, slope data: height and width of the benches and slopes as well as updated internal and external reports, that are also required under various laws, rules under CMR 2017. Further the mine management is asked to conform to the procedures and practice laid out, pertaining to the provisions under Mines Act, 35 of 1952 in the official gazette no. 126 dated 21/02/2017.

11.Slope Stability Engineering:

11.1. Terracing of the slope of broken materials:

All slopes, more particularly the loose slopes, must be treated with terracing and diversion ditches. The slopes and terraces will be preferably planted with all-weather local green varieties of trees with grasses in between.

Bench terraces are particularly suitable where marked seasonal variations exist in the availability of water. The approach consists of converting relatively steep land into a series of horizontal steps running across the slope. The width of the terraces is determined based on the soil depth, slope, amount and distribution of rainfall, and intended farming practices. In general, inward sloping terraces are constructed in areas of heavy rainfall and less permeable soils. The depth of cut and fill have to be balanced, thus the interval is equal to double the depth of cut. At the edge of the terrace there will be a berm. The berm will have 0.5m of height with a foundation of 1m below ground. A schematic diagram is attached as a guideline.

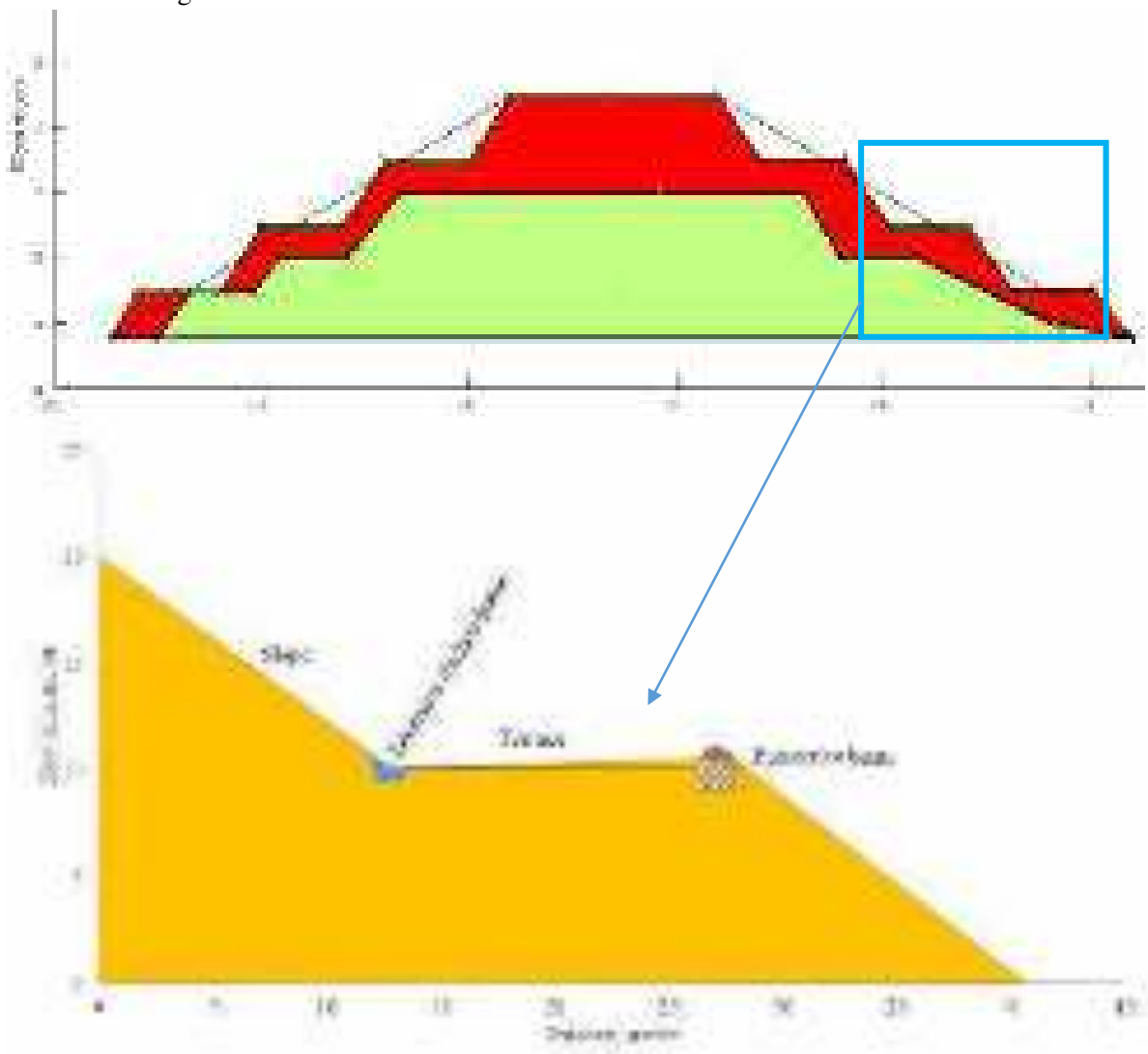

Fig. no. 15: Formation of terracing of a dump.

11.2. Slope/Diversion Ditches:

The diversion/slope ditches can have different shapes: V-shaped, rectangular, trapezoidal, and half-circled. Experience demonstrates that material characteristics and construction method play a very important role in ensuring that the drainage system will last for many years. In the mine area the ditches will be normally made of boulders, rock and stone-all compacted. But to give the ditches a good life concrete filling at the top will be necessary.
In some cases, high quality reinforced concrete may be used for the drainage system. The characteristics of the concrete which is made to last are: high compressive strength, minimum characteristic strength f^{ck} is 20 MPa, low water-cement ratio less than about 0.5, high cement dosage, greater than 350 kg/m3. The minimum concrete thickness is 150 mm and construction is to be carried out with cast in place concrete. Precast concrete has demonstrated that it is not as long lasting, as water tends to underflow ditches. Figure 16. shows an example of V-cross section channel geometry.

The sidewall collapse and filling of the ditches are common. The ditches and drains are to be cleaned at the end of every monsoon season of the boulder, dirt and sediment settled on them. This is crucial to their performance.

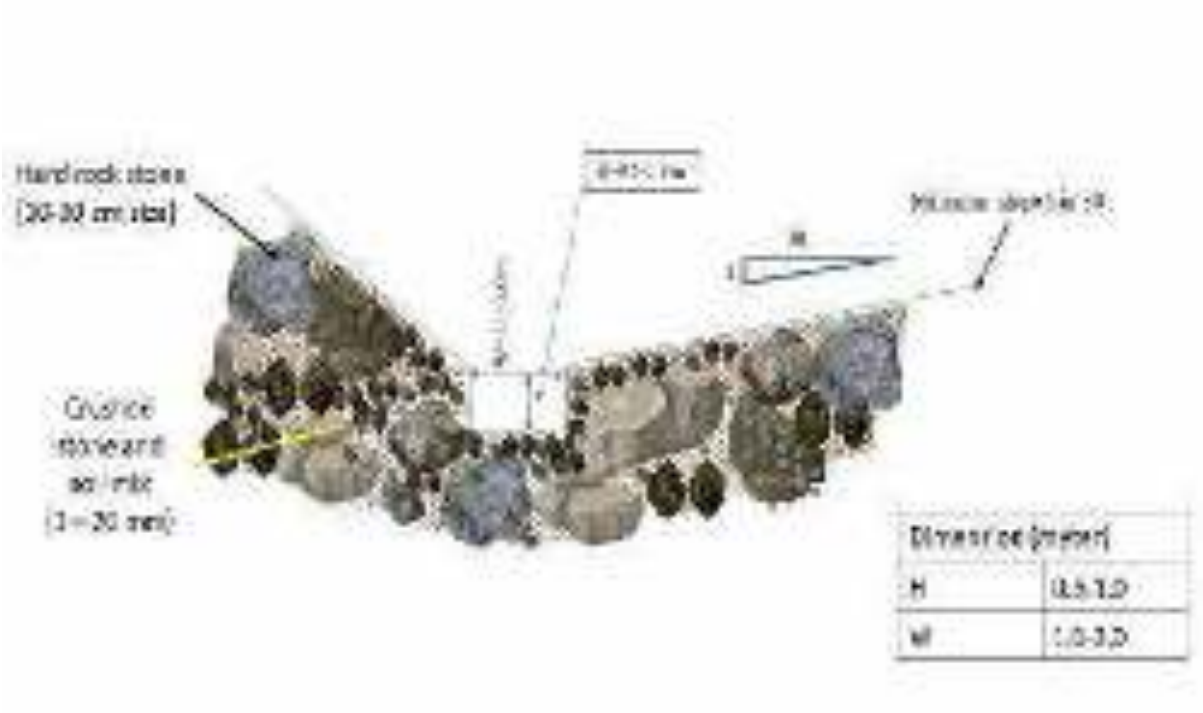

Fig. no 16: Design and construction of normal Slope/Diversion ditch in a mine

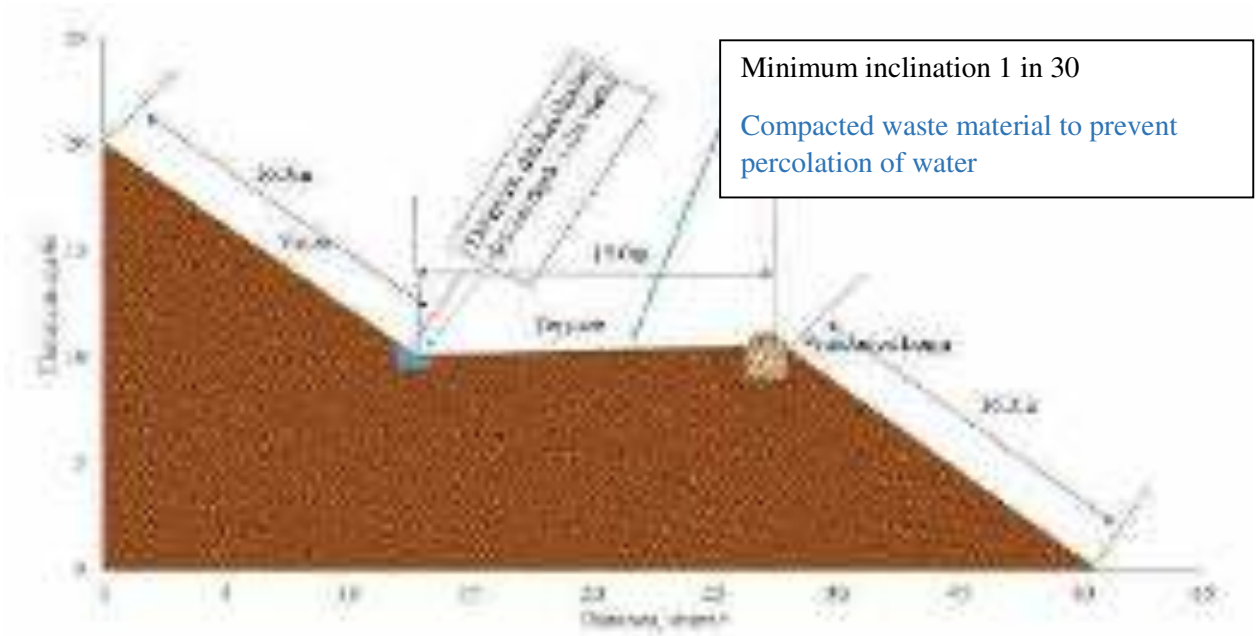

Fig no. 17: Terracing of Top black cotton dump

It is recommended that the slope length for the OB dump should be 32.5m with a minimum of 25.0m terrace before another slope. It is also recommended that the slope length for the BC soil dump should be of 16.3m with minimum of 15.0 m terrace before another slope.
It is also recommended that both OB and BC soil dump slopes and terraces are vegetated with large plant and grasses as per procedure mentioned below. Please see figure no's 23, 24 &25, more details.

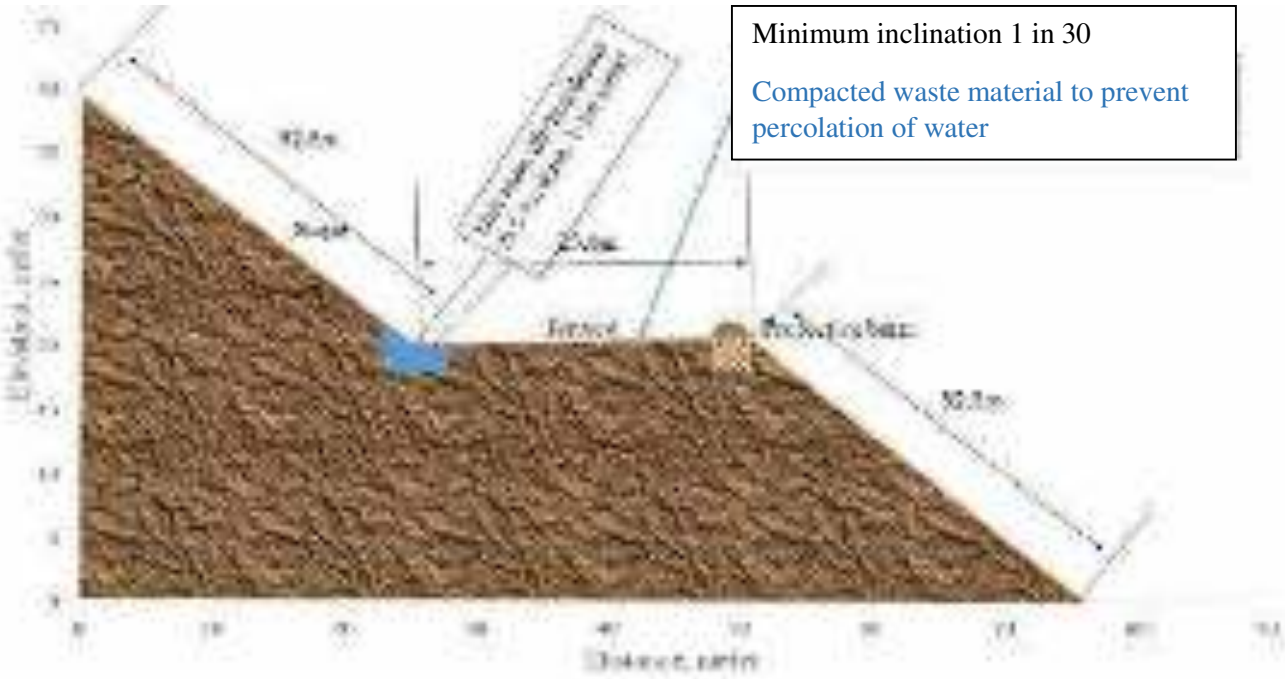

Fig.no.18: Terracing of Overburden waste dump

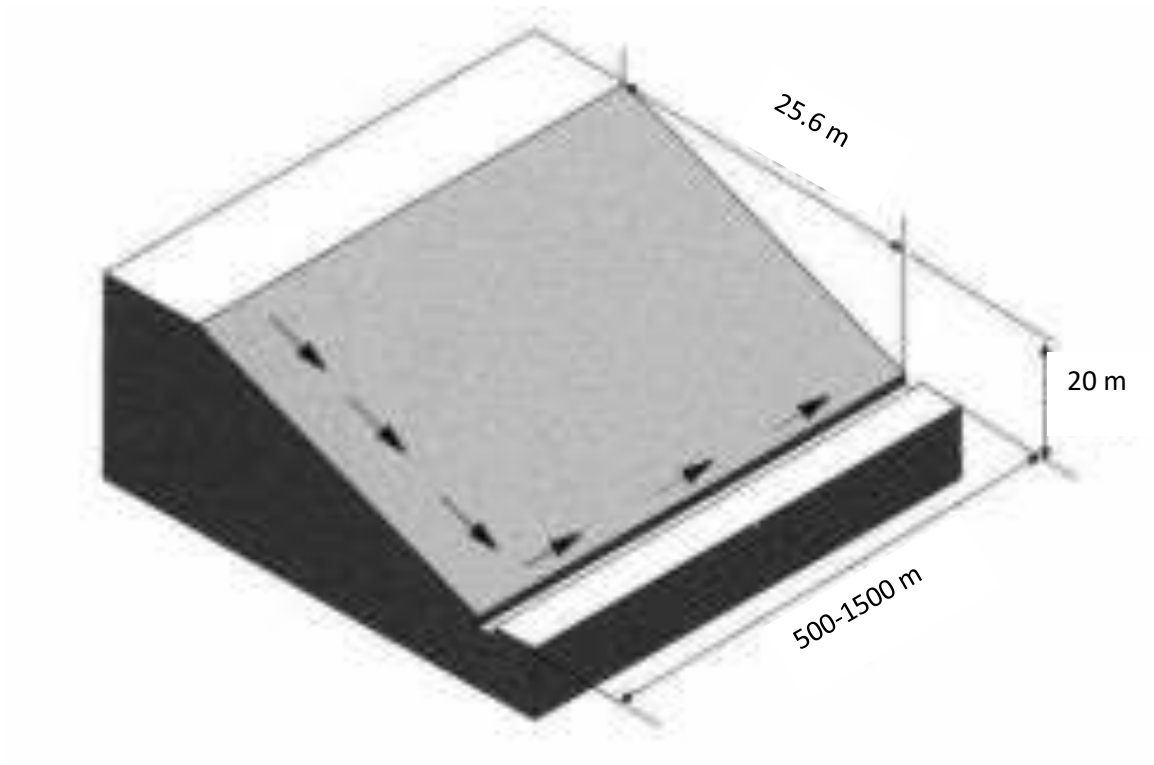

Fig.no 19: Suggestive Slope drainage design (will be applied as per terracing – diversion ditch combination)

11.3. Catch pits

Catch pits are to be made at the end of every 3 slopes to reduce the impact of turbulence of speedily running water in the connected diversion ditches. Catch pits are used at junctions of channels with different slopes, to minimize the inevitable turbulence and splashing that occur at these points. At these junctions, the channels should be deepened with an added freeboard allowance to contain this turbulence. As a result, catch pits are vulnerable to blockage by debris, and therefore must be cleaned seasonally. Catch pits, usually made of reinforced concrete, can be opened or closed, but with removable lids to allow maintenance works. The catch pit cover can be built with concrete slabs or with metallic grids. This latter alternative is also recommended as a filter, which may prevent large particles obstructing the channel (Fig. no. 20)

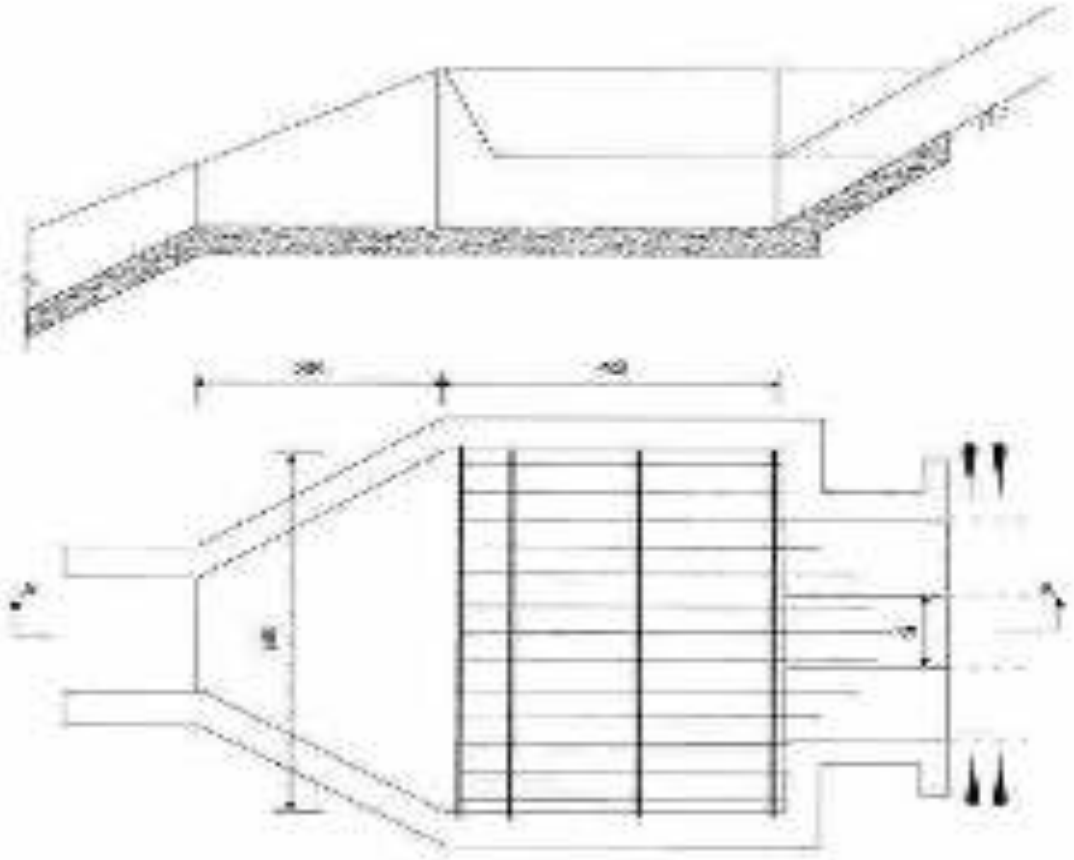

Fig. no. 20: Catch pit with large particles trap

The catch pits are to be cleaned at the end of every monsoon season of the boulder, dirt and sediment settled on them. This is crucial to their performance.

11.4. Application of Horizontal Drains:

In the initial years of loose material dump development, subsurface drainage is recommended. Subsurface drainage systems are simple and easily built. Most drains are made of 7.5-cm to 10-cm-diameter PVC perforated pipes, wrapped in filter fabric, which are introduced in pre-drilled holes at gradients of about 10% uphill, as indicated in Fig. no. 21. To avoid blockage of holes by vegetation, the first 1.5 m of the outlet end of the perforated pipe should not be perforated. If the slope profile consists of heterogeneous soil and/or fractured rocks, the length of the horizontal drains must traverse as many permeable materials as possible. A previous survey of the fracturing system and dip angle to enable a good understanding of the geological complexity is strongly recommended.

As a general rule, long drains with larger spacing are more efficient than short drains with less spacing. Moreover, the smaller the slope angle, the longer should be the drain. PVC pipe drains should not exceed 40 m in length; for longer drains stiffer pipe materials (stainless or galvanized) are recommended. Horizontal drain life time depends on the chemical composition of the water, installation method and above all a subsequent maintenance program. Placing of PVC perforated pipes in critical areas as and when required. The critical area will be designated where there is a possibility of high water accumulation and the slope material looks loose. Such areas have to be identified by the mine authorities in times of inspection during monsoon and occasional heavy shower. Between two row of drains, the positon of the pipes will be kept staggered. It is of primary importance to install regular field instrumentation to assess pressure head reading fluctuation, in order to adjust drains spacing to reach pore water pressures specified in the drainage design.

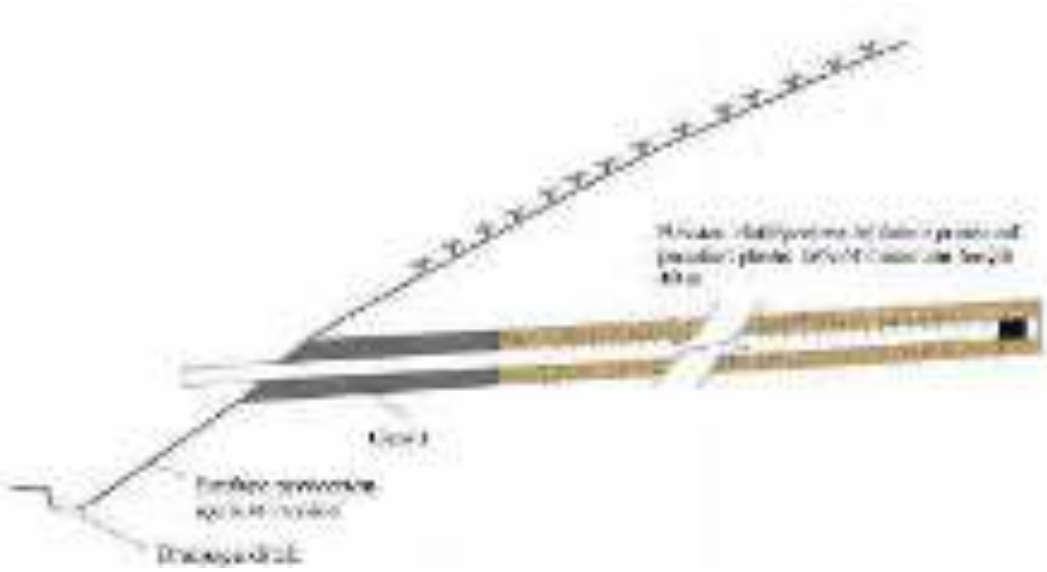

Fig.no.21: PVC perforated pipes, wrapped in filter fabric inserted in a dump slope.

The filling of the pipes and obstruction are common. The pipes are to be cleaned at the end of every monsoon season of the boulder, dirt and sediment settled on them. This is crucial to their performance.

11.5. Concrete Slope Drainage

In some cases, where heavy vehicles and HEMMs would play on the loose material slope bench for a considerable time (on a regular basis for more than 3 months), slope drainage should be concrete type. High quality reinforced concrete may be used for the drainage system. The characteristics of the concrete which is made to last are: high compressive strength, minimum characteristic strength f^{ck} is 20 MPa, low water-cement ratio less than about 0.5, high cement dosage, greater than 350 kg/m3. The minimum concrete thickness is 150 mm and construction is to be carried out with cast in place concrete. Figure 22.a shows an example of U-cross section channel geometry. with surface protection and some design guidelines. Figure 22.b presents the rectangular cross-section. The design sequence starts with the cross section definition and channel gradient determination. It is always recommended to have a channel slope coincident with ground slope, to prevent additional earthworks. The next steps are the evaluation of the maximum discharge and the admissible flow velocities, respective to the different channel heights, and evaluation of the flow regime (Froude number). If channel design results in flow

velocity higher than the admissible value, it is recommended to introduce energy dissipaters, as shown in Fig. 20.

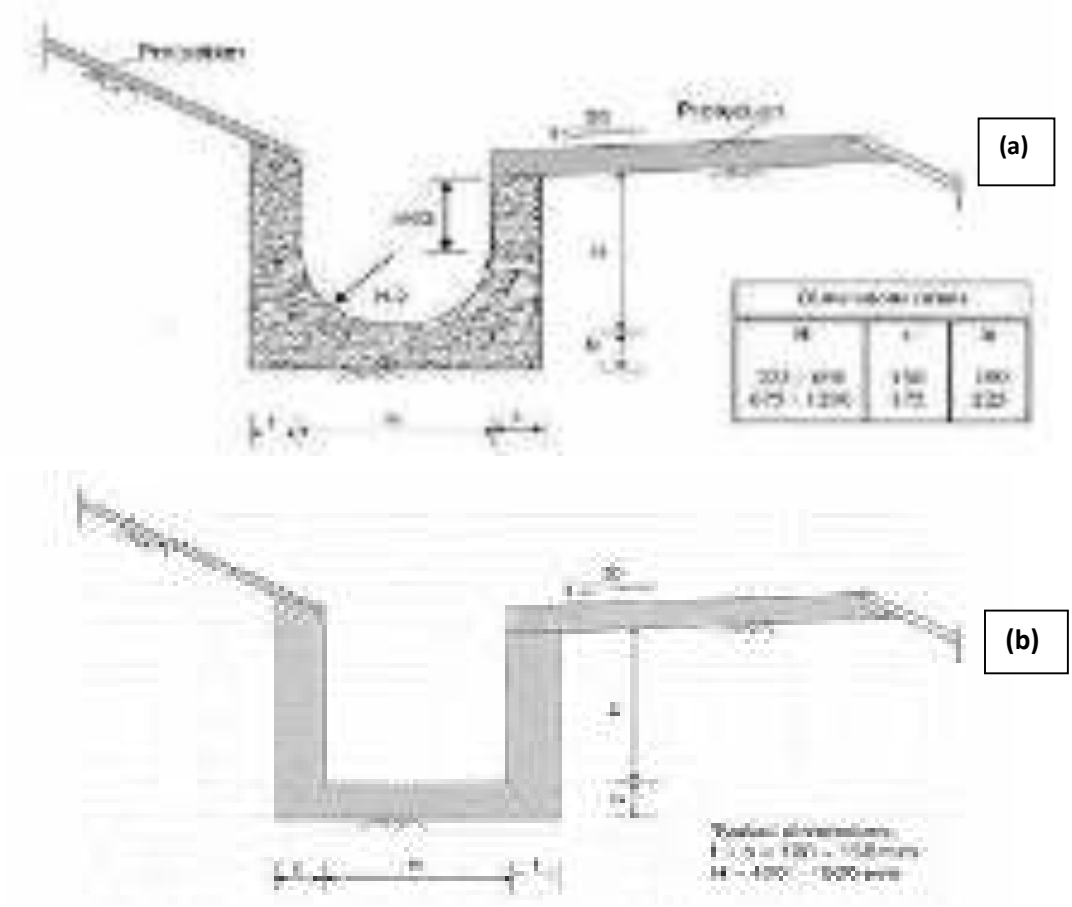

Fig. no 22: Concrete slope drainage structures: a) U shaped concrete ditch, b) Rectangular concrete ditch.

11.6. Plantation:

1. Spread fallen leaves/rice straw etc. on top of both BC soil dumps and OB dump waste dumps as well as on the terraces. Such material can be collected locally on a regular basis.
2. Plant seeds/saplings of local large trees in consultation with local forest personnel in a manner that the plants survive. In 1.0 m x 1.0 m spacing along columns and rows. Make sure that more than 50% of the plants survive and grow in each plantation cycle in each site of OB spoil dumps and BC soil dumps.
3. Between the plantations of trees spread common grass of the area in consultation with local forest personnel
4. Continue 1 to 3 steps for more than 4 years so that all the available dump surfaces are covered with tress and grasses.
5. Take necessary precautions so that the plantations, seeds and saplings are protected from herds, fire and cutting of trees.
6. Use bamboo and other green fencing methods but preferably not wire fencing.

The vegetation cover has positive effect on the cohesion of the dump soil in fact cohesion increase with increase in the area of vegetation and the root length of the plants. Thus FOS for OB dump slope will increase remarkably. For fully drained condition increases in FOS can be seen at different percentage of vegetation cover and root length of plants in table no. 12. Figures 23, 24 &25 show how the plantation will look after 2-3 years of the dumping.

Table no. 12: Effect of vegetation cover on factor of safety dump slope.

Vegetation covers	**OB broken dump (Hard rock)**	**BC dump soil**
	FOS	
30%green cover with root length 5 cm cohesion increase 5%	1.02	1.17
30%green cover with root length 10 cm cohesion increase 10%	1.05	1.19
50%green cover with root length 10 cm cohesion increase 20%	1.08	1.26
50%green cover with root length 15 cm cohesion increase 30%	1.12	1.31
75%green cover with root length 10 cm cohesion increase 40%	1.19	1.38
75%green cover with root length 15 cm cohesion increase 50%	1.24	1.46
100%green cover with root length 15 cm cohesion increase 60%	1.28	1.48
100%green cover with root length 20 cm cohesion increase 70%	1.46	1.61

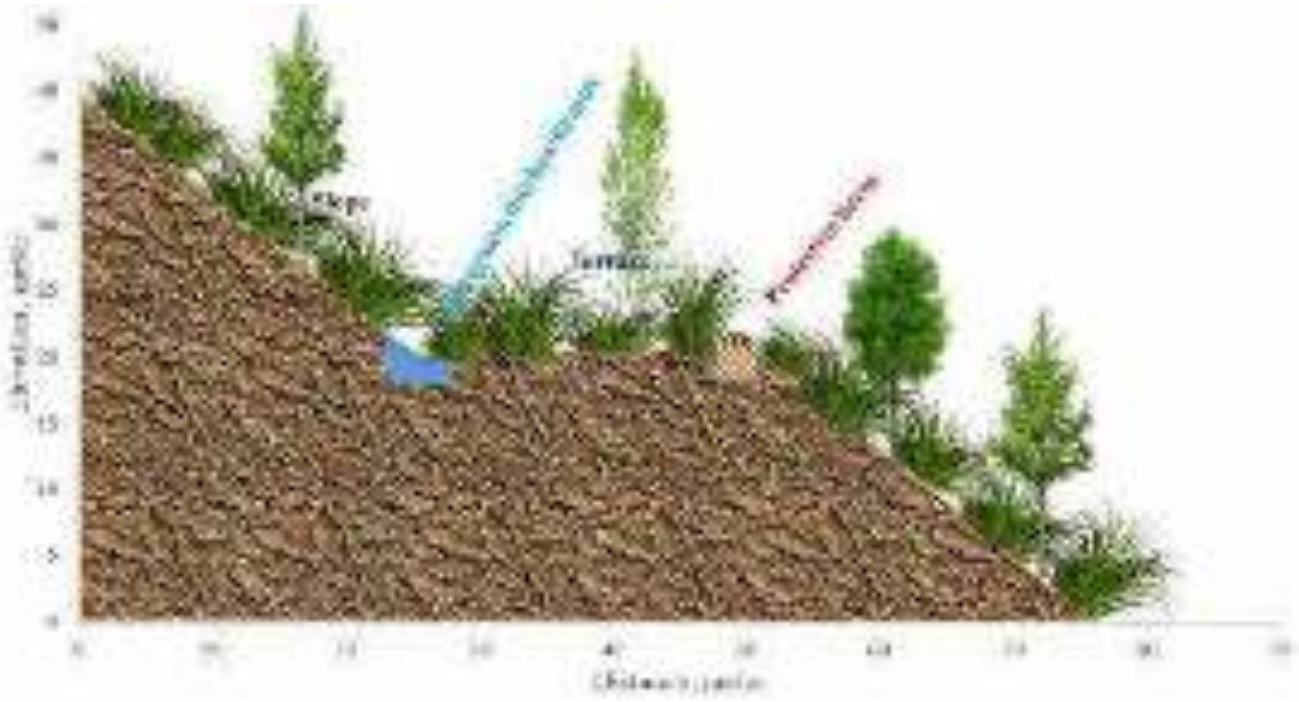

Fig. no 23: Plantation in the OB dump bench.

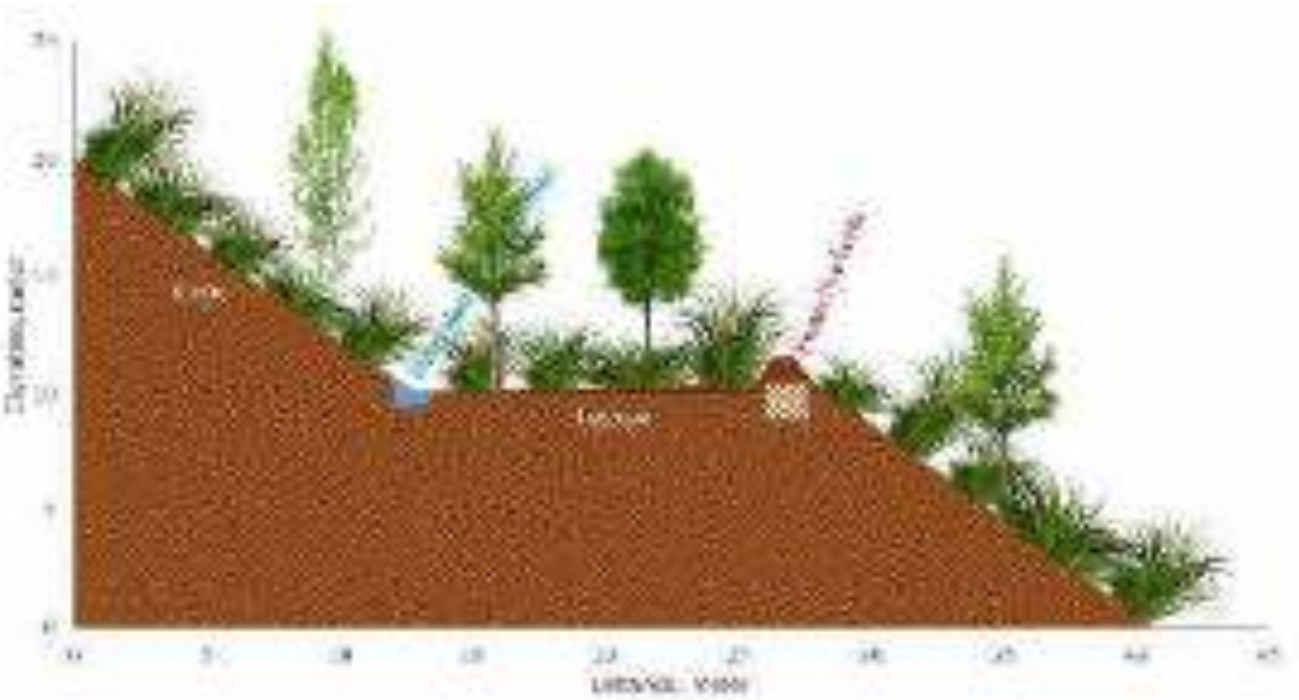

Fig. no 24: Plantation in the Black cotton soil dump.

11.7. Drainage through interconnected ditches

Drainage ditches can be constructed with different shapes and sizes. The appropriate size and shape for a particular site depends upon such factors as the expected runoff, site condition, and availability of resources and construction materials. Usually a waterway can be triangular, trapezoidal, or parabolic. A parabolic shape is hydrologically more efficient and easier to construct. Usually, a gradient of less than 5% is preferred; in a normal course it should not exceed 10%.

The diversion drainage/ditches are to be connected to form garland drain that would lead to the sediment pond. The diversion ditches are liable to collapse due to slope movement and collection of particles on drain surface. These drains must be maintained regularly particularly before and during monsoon season, the water drainage through the drain must also be checked for capacity and flow of drainage.

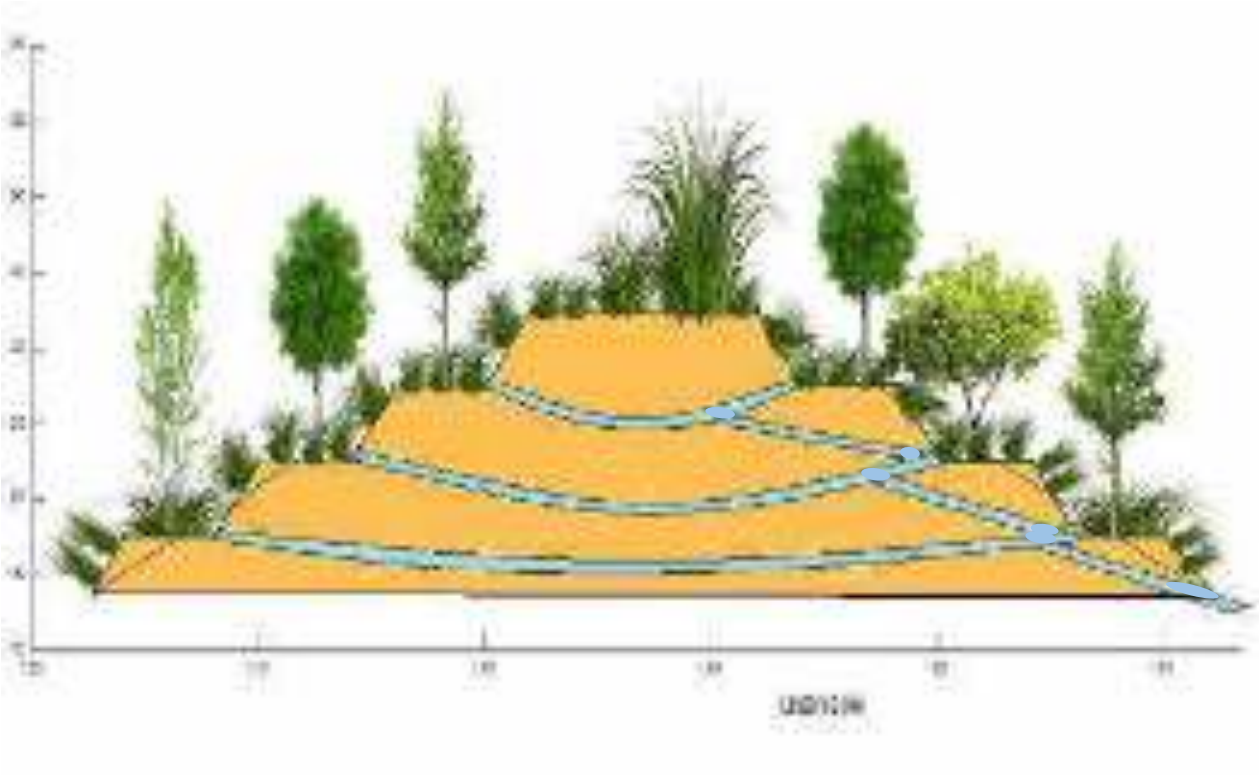

Fig. no. 25: Drainage and plantation in the OB and BC soil dump. All the diversion ditches in the terraces have to be connected in a manner so that the water collected in the ditches, via drains now looking like a garland, finally go to the sediment pond outside the dump area.

12.Slope Stability Management on the basis of the CMR ,2017

1. Mine manager in consultation with the Safety Officer and other mine officials shall appoint a team of qualified persons including assistant managers and above, having at least 2nd class Mine Managers Certificate of competency, and with one or two qualified Civil Engineers to periodically review the conditions of the mine slopes: ultimate and operating unbroken mine and overburden slopes and benches, broken overburden dump slopes and top soil benches and slopes.
2. The Slope stability team must work in close liaison with the Safety Committee.
3. The period of review on dry months of October to May, should be once in a month whereby every slope will be assessed for safety inspection and assessment that will be properly recorded and signed, and shall remain with the office of the Manager. The Manager will be reported of the details every time in writing of whether the slope conditions have changed off late or changing rapidly.
4. The period of inspection for predominantly rainy and wet months of June to September shall be nominally carried out once in every two weeks. In cases of continuous heavy rain in any of the last 3 days there shall be an immediate inspection on the 4th day. The Manager will be reported of the details every time in writing of whether the slope conditions have changed off late or changing rapidly. The period between successive inspections by the team will change as per the demands of the situation.
5. The features of impending slope failure indications are:
   I. High water seepage from wide areas on the slope areas and from the toe,
   II. Continuous rolling down of rock blocks from the top.
   III. Excessive and increasing slurry flow from one place or from several places in the toe and face of the slope.
   IV. Increasing number of rill and gullies in short period of time of few hours,
   V. Visible swelling of soil, particularly black cotton soil, and separation from the layers, and
   VI. Visible cracks developed and extending in short period of times from one part to another.
6. The mine management must make a checklist of indications of slope failure or collapse that need to be looked into in situations where the slope un-stability can be out of control.
7. The history of slope failures in the Majri area point that most of the failures have taken place in the period of incessant rains or immediately after such rain episodes. Events of short period (up to 1 hour) heavy rainfalls and events of medium to heavy rainfalls for longer period (up to 24 hours or more) are to be particularly taken care of. The office of Area Safety Officer shall heed to such forecasts, now reliably available on the net and media, and direct and participate with the team to make at least one inspection every 12 hours or less, as found necessary. In such events, all operational places should be considered for immediate clearing of workmen, property and asset. The team should document and report any such instances to the manager of the mine and if they are unanimous in voicing dangers of slope failure, the Manager should take immediate action to save workmen and property and restrict work till all clearance reports are tabled.
8. Any alarm or alert raised by the team and the guidance by the team headed by the Safety Officer must be reported in writing to the Manager to take actions, as may be found necessary, related to stoppage, and evacuation of people, equipment and other assets. In no occasions, the manager should either take or encourage unsafe acts or daredevilry to maintain production at the cost of workmen and property.
9. The team should also listen to the mine workers on the sites, and should engage discussions to look for features that can be considered dangerous and that need appropriate actions.
10. All such actions must have to be reported appropriately to DGMS as per the law prescribed.
11.

13. Conclusions

A through study has been conducted on the slope stability of amalgamated Yekona mine of WCL, India. The study reports that for the slope stability both engineering and observation and inspection management will be the key. Quality of engineering in the slope stability control particularly during the rainy periods and occasional high rainfalls, and to be prepared of it, and management have been highlighted.

Acknowledgement: Authors are thankful for the kind help provided by WCL management at Nagpur and Majri towards the fruitful completion of the report.

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Project Coordinator:

Prof. Jayanta Bhattacharya, Department of Mining Engineering and

School of Environmental Science and Engineering

Indian Institute of Technology, Kharagpur

Annexure I

Circular failure method:

Under soil and rock dump slope conditions, one or more of the discontinuities normally defines the slide surface. However, in the case of a closely fractured or highly weathered rock, a strongly defined structural pattern no longer exists, and the slide surface is free to find the line of least resistance through the slope. Observations of slope failures in these materials suggest that this slide surface generally takes the form of a circle, and most stability theories are based upon this observation.

The **circular failure charts** describe the use of a series of charts that can be used to determine rapidly the factor of safety of circular failures and were produced by running a search routine to find the most critical combination of slide surface and tension crack for each of a wide range of slope geometries and ground water conditions. Provision was made for the tension crack to be located in either the upper surface, or in the face of the slope.
These charts have been developed by running many thousands of circular analyses from which a number of dimensionless parameters were derived that relate the factor of safety to the material unit weight, friction angle and cohesion, and the slope height and face angle. It has been found that these charts give a reliable estimate for the factor of safety, provided that the conditions in the slope meet the assumptions used in developing the charts. In fact, the accuracy in calculating the factor of safety from the charts is usually greater than the accuracy in determining the shear strength of the rock mass. (Jhanwar JC, 2011).

Use of the stability charts presented in this chapter requires that the conditions in the slope meet the following assumptions:

A. The material forming the slope is homogeneous, with uniform shear strength properties along the slide surface.
B. The shear strength τ of the material is characterized by cohesion: c and a friction angle φ, that are related by the equation $\tau = c + \sigma \tan \varphi$.
C. Failure occurs on a circular slide surface, which passes through the toe of the slope.
D. A vertical tension crack occurs in the upper surface or in the face of the slope.
E. The locations of the tension crack and of the slide surface are such that the factor of safety of the slope is a minimum for the slope geometry and ground water conditions considered.
F. Ground water conditions vary from a dry slope to a fully saturated slope under heavy recharge; these conditions are defined in Figure 8.4.
G. Circular failure charts are optimized for a rock mass density of 18.9 kN/m^3. Densities higher than this give high factors of safety, densities lower than this give low factors of safety. Detailed circular analysis may be required for slopes in which the material density is significantly different from 18.9 kN/m^3.

The charts presented in this chapter correspond to the lower bound solution for the factor of safety, obtained by assuming that the normal load is concentrated on a single point on the slide surface

Use of the circular failure charts

In order to use the charts to determine the factor of safety of a slope, the steps outlined here should be followed.

***Step 1*:** Decide upon the ground water conditions which are believed to exist in the slope and choose the chart which is closest to these conditions.
***Step 2*:** Select rock strength parameters applicable to the material forming the slope.
***Step 3*:** Calculate the value of the dimensionless ratio $c/(\gamma H \tan \varphi)$ and find this value on the outer circular scale of the chart.
***Step 4*:** Follow the radial line from the value found in step 3 to its intersection with the curve which corresponds to the slope angle.
***Step 5*:** Find the corresponding value of $\tan \varphi$/FS or $c/(\gamma H$ FS$)$, depending upon which is more convenient, and calculate the factor of safety

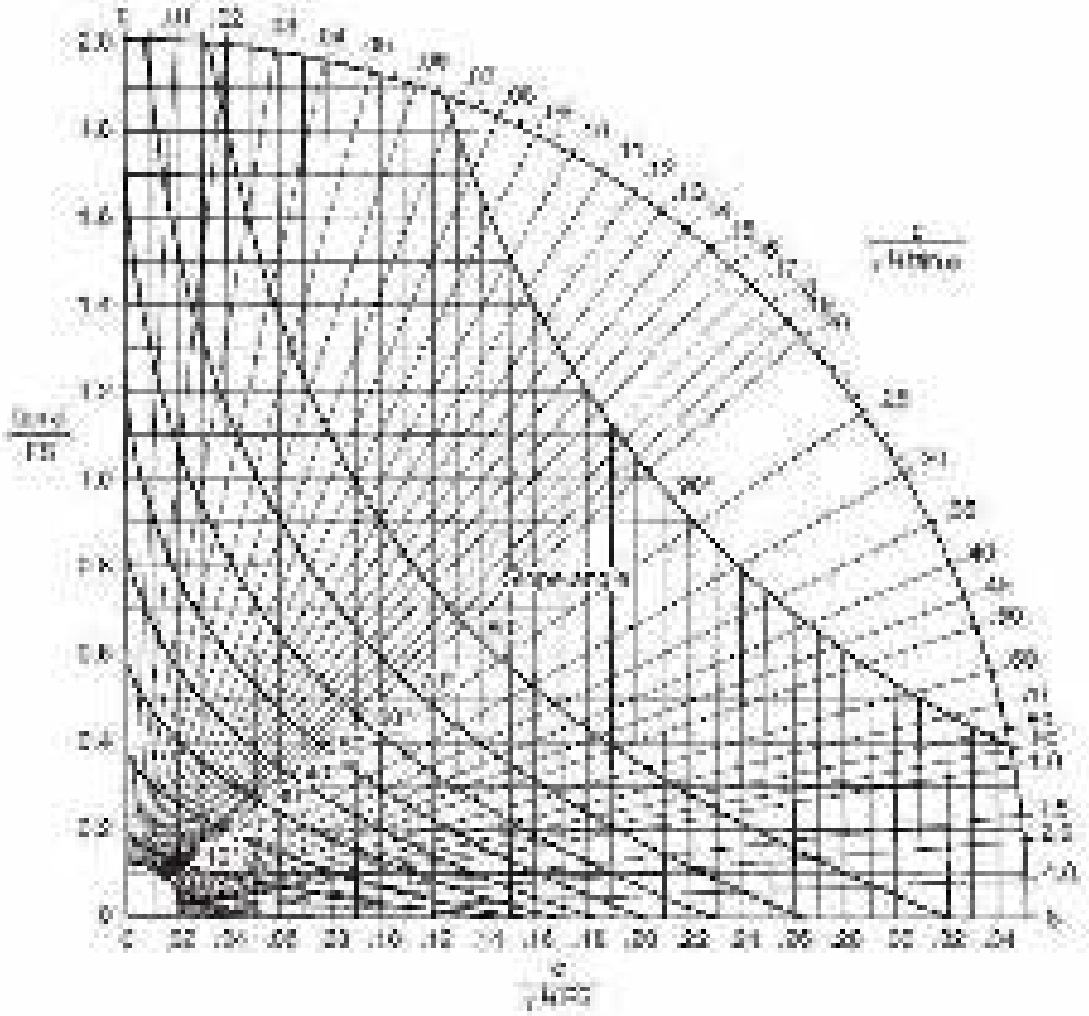


Fig. no. 1: Circular failure chart number 1-Fully drained

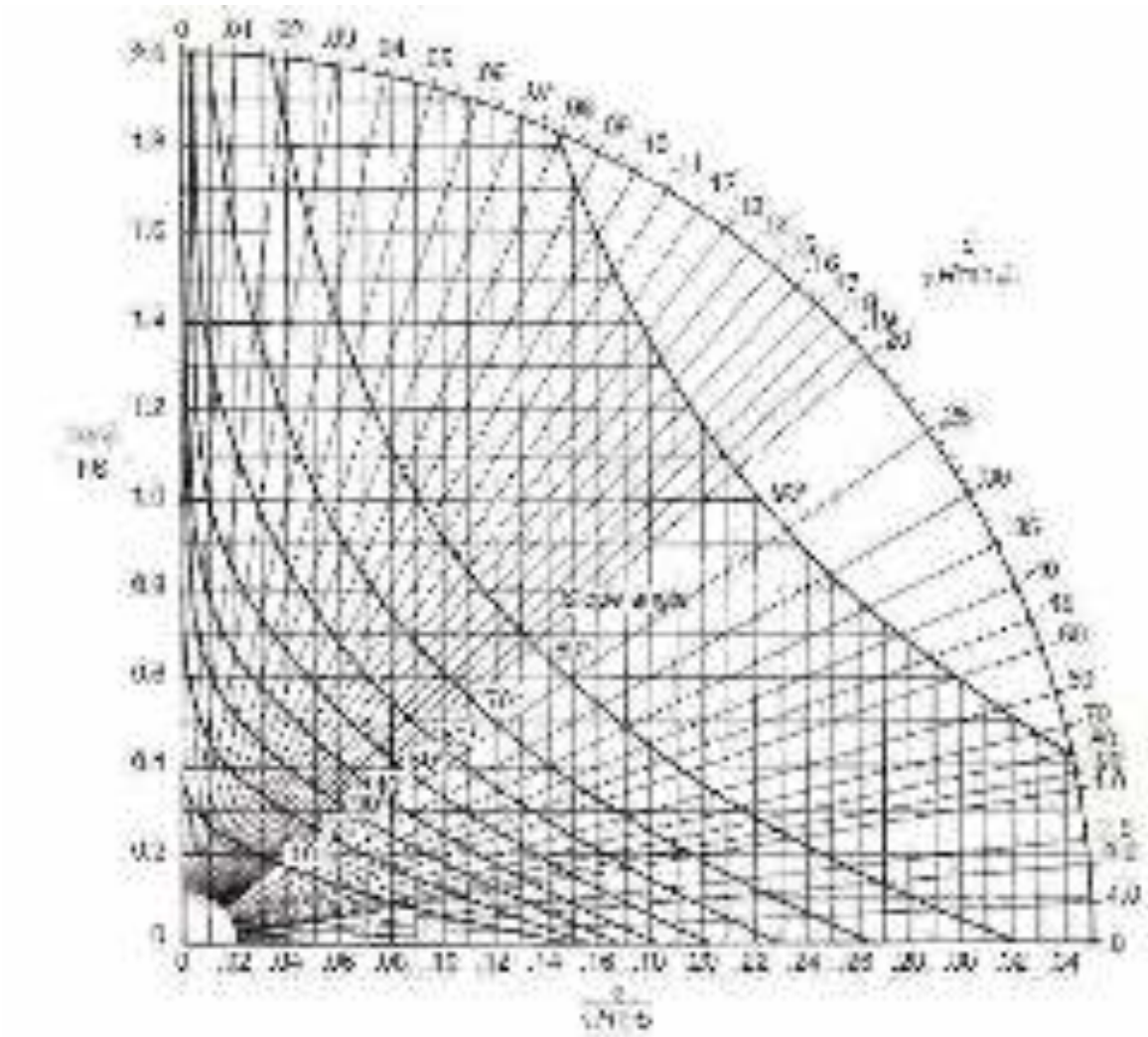


Fig. no. 2: Circular failure chart number 2-25% saturation

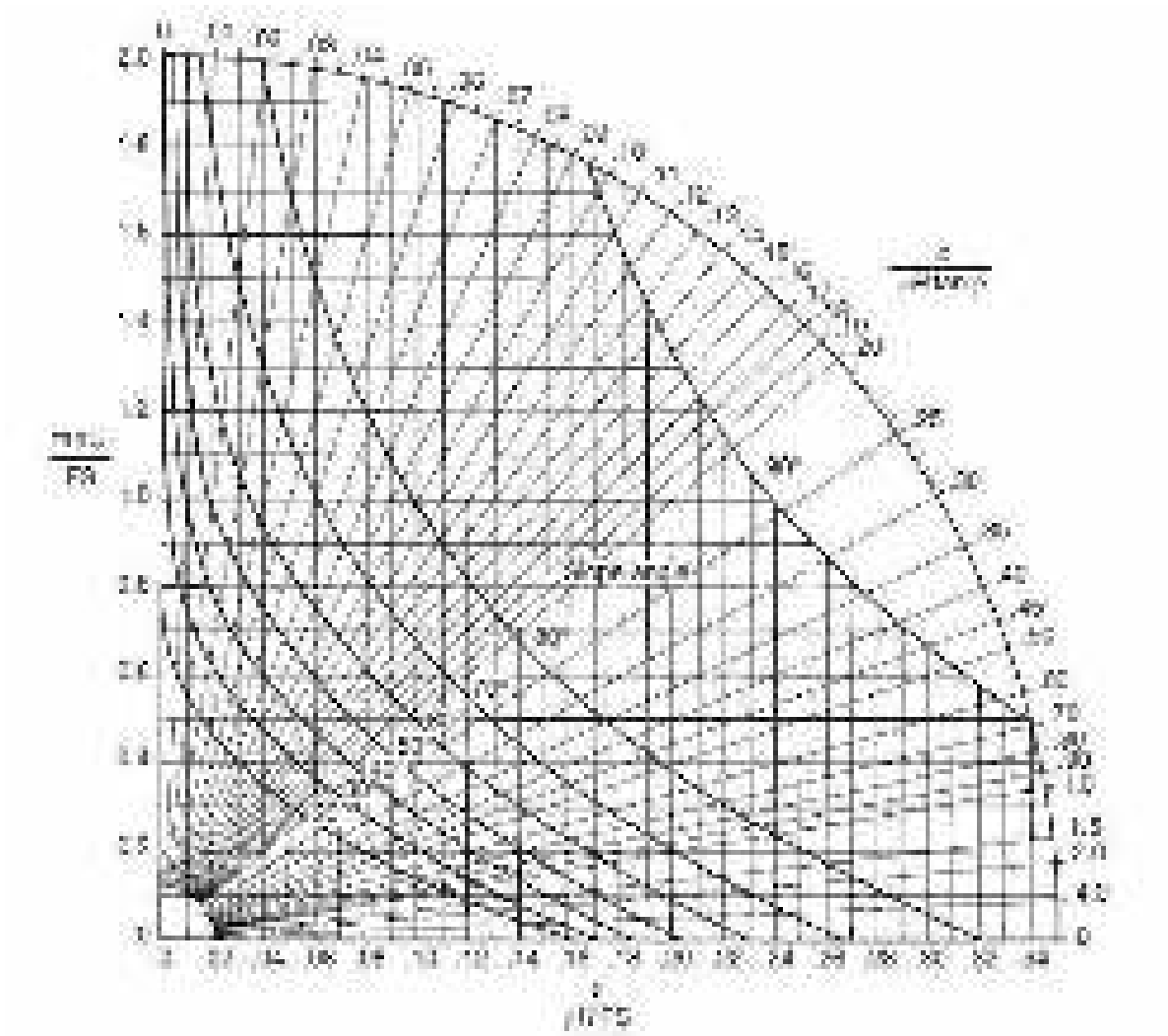


Fig. no. 3: Circular failure chart number 3-50% saturation

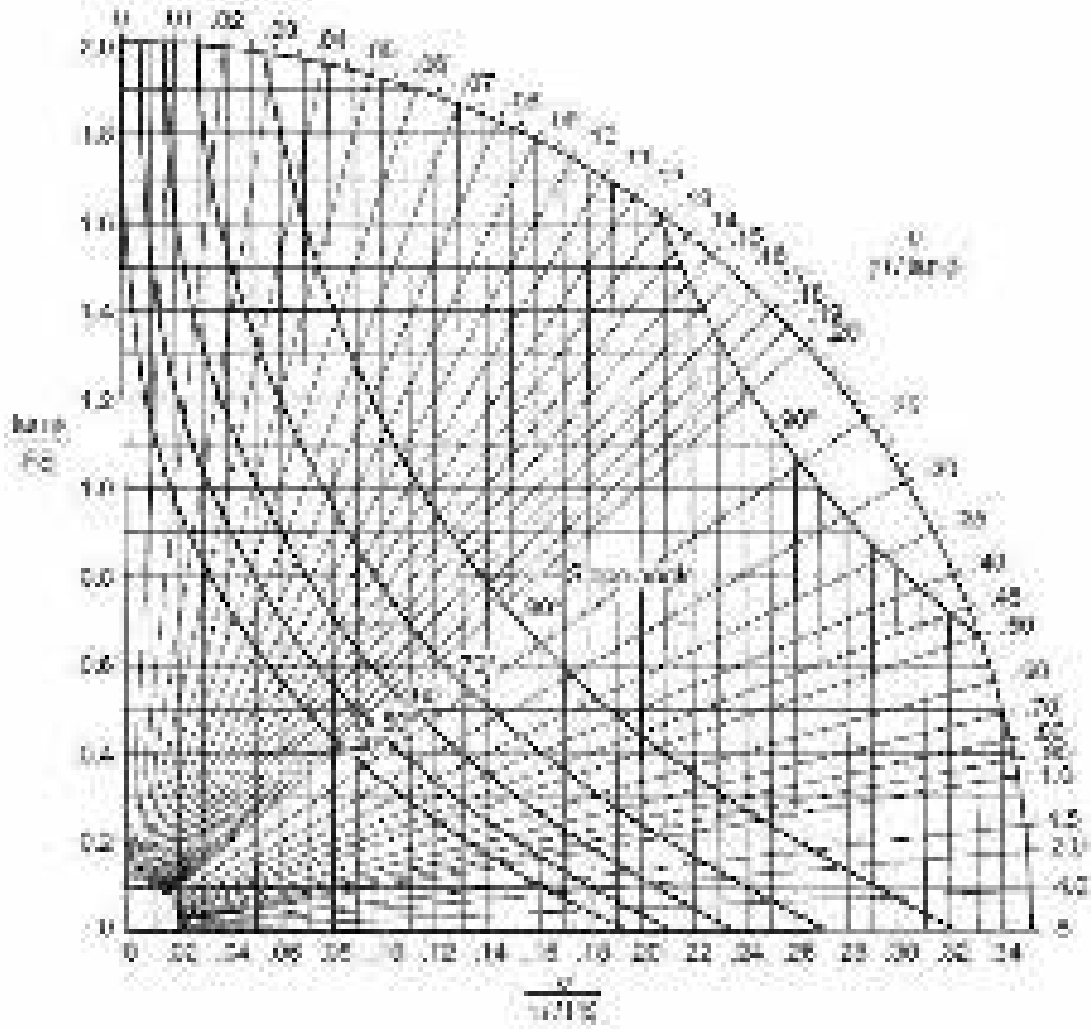


Fig. no. 4: Circular failure chart number 4-75% saturation

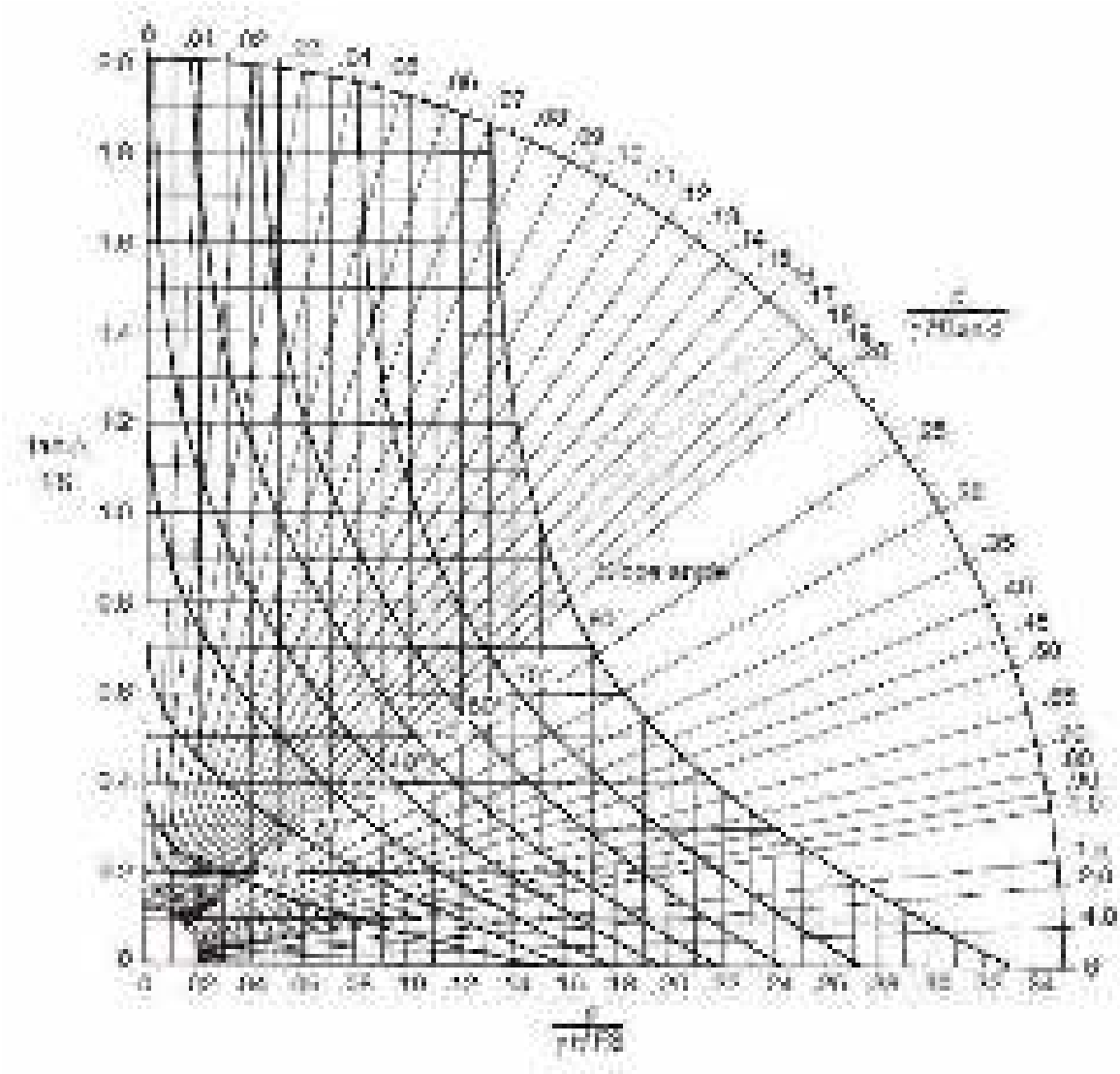


Fig. no. 5: Circular failure chart number 5-100% saturation.

Sample calculation:

***Step 1*:** For Yekona mine OB dump, considering 100 percent saturation level, for this we will use chart no. 5.

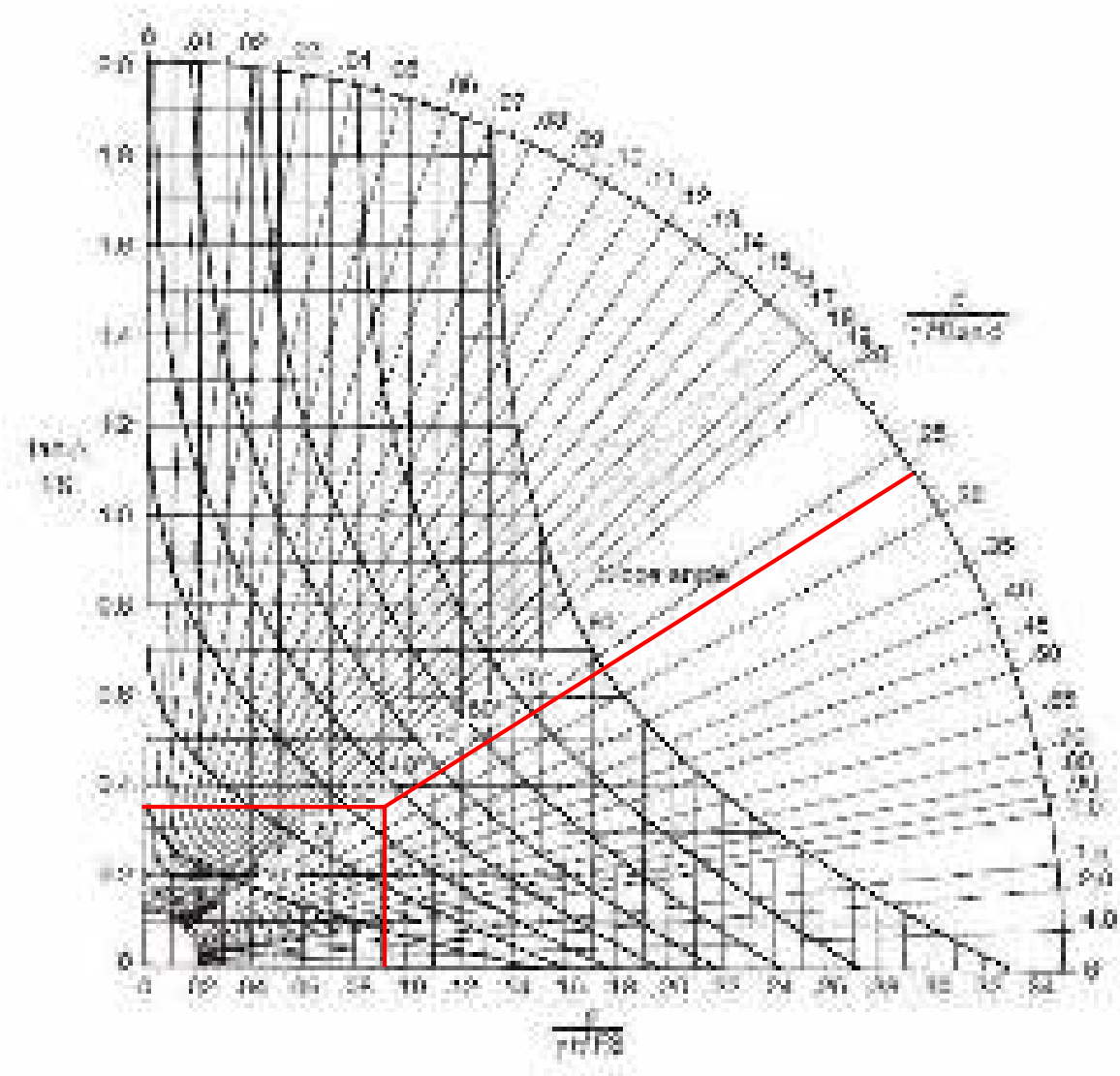
***Step 2*:** Select rock strength parameters applicable to the material forming the slope.

Cohesion (c) = 45 kN/m^3
Angle of internal friction (φ) = 19°
Unit weight (γ) = 24 kN/m^3
Height of bench (H) = 20 meter
Width of bench = 25 meter
Bench slope angle = 35°

***Step 3*:** Calculate the value of the dimensionless ratio:

$$\frac{c}{\gamma\, H\ \tan\varphi} = 0.27$$

***Step 4*:** Follow the radial line from the value found in step 3 to its intersection with the curve, which corresponds to the slope angle i.e. 35°.



***Step 5*:** Find the corresponding value of tan φ/FS or $c/(\gamma H \text{FS})$ from the chart no.5

- $\frac{\tan\varphi}{FS} = 0.34$

  FS= $\frac{\tan 19}{0.34}$ =1.01 (min.)

- $\frac{c}{\gamma * H * FS} = 0.091$

  FS= $\frac{45}{24*20*0.091}$ = 1.02 (max.)

Average FS= $\frac{1.01+1.03}{2}$ =1.01 ($Table\ no.$ 9 in the report)

Annexure II

Plane failure:

General conditions for plane failure

Plane failure in a rock slope where a block of rock has slid on a single plane dipping out of the face. In order for this type of failure to occur, the following geometrical conditions must be satisfied:

F. The plane on which sliding occurs must strike parallel or nearly parallel (within approximately ±20◦) to the slope face.
G. The sliding plane must "daylight" in the slope face, which means that the dip of the plane must be less than the dip of the slope face, that is, $\beta < \psi_f$.
H. The dip of the sliding plane must be greater than the angle of friction of this plane, that is, $\beta > \varphi$.
I. The upper end of the sliding surface either intersects the upper slope, or terminates in a tension crack.
J. Release surfaces that provide negligible resistance to sliding must be present in the rock mass to define the lateral boundaries of the slide. Alternatively, failure can occur on a sliding plane passing through the convex "nose" of a slope.

$$FOS = \frac{C * A + W * \cos\beta * \tan\varphi}{W * \sin\beta}$$

Sample calculation for Yekona mine working bench slope:

Parameters,

Cohesion (c) = 102 kN/m^3

Angle of internal friction (φ) = 24°

Unit weight (γ) = 26 kN/m^3

Height of bench (H) = 5 meter

Width of bench = 7 meter

Bench slope angle (ψ_f) = 73°

Weak plane angle (β) = 45°

A = $\frac{H}{\sin\beta} = \frac{5}{\sin 45} = 7.07$ m^2 (assuming unit thickness)

W=$\frac{1}{2} * H^2 * \gamma \left[\frac{1}{\tan\beta} - \frac{1}{\tan\psi_f}\right]$ = 225.70 kN (assuming unit thickness)

$$FOS = \frac{102 * 7.07 + 225.7 * \cos 73 * \tan 24}{225.7 * \sin 73} = 3.49 \ (Table\ no.\ 11 \text{ in the report})$$

The following assumptions are made in plane failure analysis:

A. Both sliding surface and tension crack strike parallel to the slope.
B. Water enters the sliding surface along the base of the tension crack and seeps along the sliding surface, escaping at atmospheric pressure where the sliding surface daylights in the slope face. The pressure distributions induced by the presence of water in the tension crack and along the sliding surface.
C. The forces W (the weight of the sliding block), U (uplift force due to water pressure on the sliding surface) and V (force due to water pressure in the tension crack) all act through the centroid of the sliding mass. In other words, it is assumed that there are no moments that would tend to cause rotation of the block, and hence failure is by sliding only. While this assumption may not be strictly true for actual slopes, the errors introduced by ignoring moments are small enough to neglect. However, in steep slopes with steeply dipping discontinuities, the possibility of toppling failure should be kept in mind.
D. The shear strength τ of the sliding surface is defined by cohesion c and friction angle φ that are related by the equation $\tau = c + \sigma \tan \varphi$. In the case of a rough surface or a rock mass having a curvilinear shear strength envelope, the apparent cohesion and apparent friction angle are defined by a tangent that takes into account the normal stress acting on the sliding surface. The normal stress σ acting on a sliding surface can be determined from the curves.
E. It is assumed that release surfaces are present so that there is no resistance to sliding at the lateral boundaries of the failing rock mass.
F. In analyzing two-dimensional slope problems, it is usual to consider a slice of unit thickness taken at right angles to the slope face. This means that on a vertical section through the slope, the area of the sliding surface can be represented by the length of the surface, and the volume of the sliding block is represented by the cross-section area of the block.

C.B.C. WARD

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Test temp: (RT-300°C) 3rd hour Difference

Date	Time	Weight	Size	Diff	Wt%	Sl
[illegible]	[illegible]	[illegible]	[illegible]	—	—	—
[illegible]	[illegible]	[illegible]	211.610	0.010	0.010	[illegible]
[illegible]	[illegible]	[illegible]	211.614	0.015	0.012	[illegible]
[illegible]	[illegible]	[illegible]	211.616	0.017	0.001	[illegible]
[illegible]	[illegible]	[illegible]	211.619	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	211.607	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	211.612	0.009	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	211.616	0.012	0.001	0.001
[illegible]	[illegible]	[illegible]	211.616	0.012	0.001	0.001
[illegible]	[illegible]	[illegible]	211.619	0.015	0.008	[illegible]
[illegible]	[illegible]	[illegible]	211.616	0.013	0.009	0.001
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[illegible]	[illegible]	[illegible]	211.614	0.007	0.012	[illegible]
[illegible]	[illegible]	[illegible]	211.618	0.016	0.015	0.003

Date	Time	Weight	Size	Diff	Wt%	Sl
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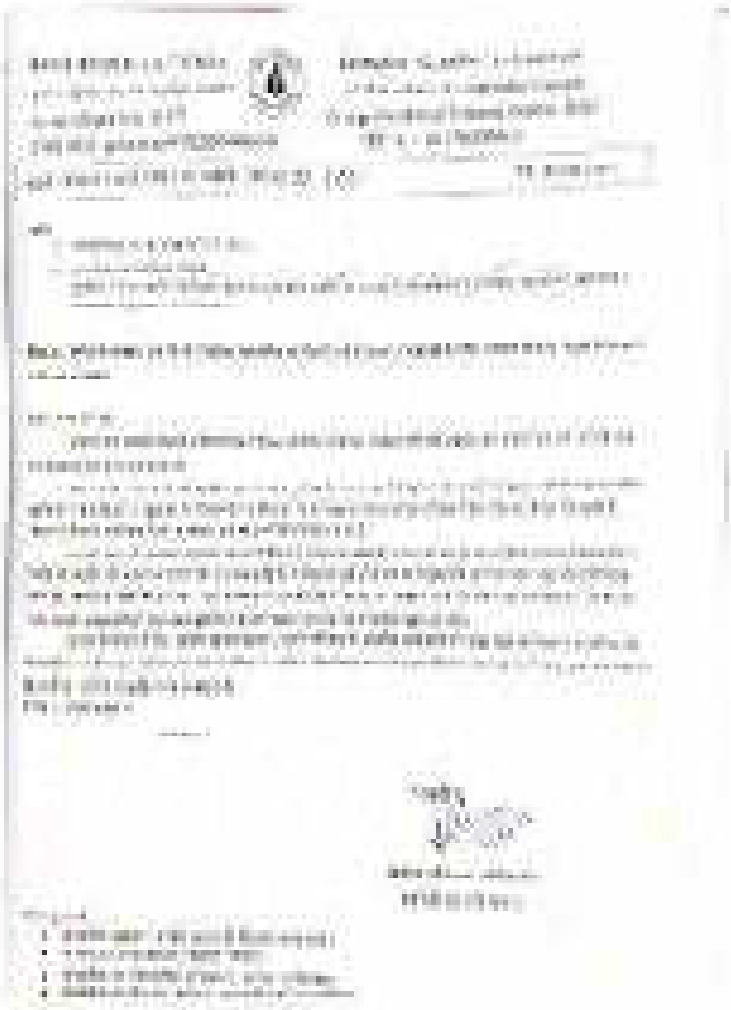
ANNEXURE 25



ANNEXURE 26

LIST OF PAP OF MAIRI AREA TRAINED IN "HEAVY TRUCK DRIVER" IN THE SCHEME " PAP-SKILL DEVELOPMENT" SPONSORED BY HRD, WCL IN THE YEAR 2022-23

Sl. No.	NAME	ADDRESS	NAME OF TRADE	PLACE OF TRAINING
1	RAHUL VIJAY DESHKAR	WARD NO-4, MAIRI, DI-CHANDRAPUR	HEAVY TRUCK DRIVER	ASHOK LEYLAND DRIVING INST, CHINDWARA
2	KUNAL SURESH SINGH	NEW MAIRI, SHIVNAGAR, CHANDRAPUR	HEAVY TRUCK DRIVER	ASHOK LEYLAND DRIVING INST, CHINDWARA
3	NARENDRA GOVARDHAN PRASAD	NEW MAIRI, SHIVNAGAR, CHANDRAPUR	HEAVY TRUCK DRIVER	ASHOK LEYLAND DRIVING INST, CHINDWARA
4	SANJAY KUMAR GAUTAM	SAMAJ NAGAR, DEARTUNA, WARDHA	HEAVY TRUCK DRIVER	ASHOK LEYLAND DRIVING INST, CHINDWARA
5	RUPESH KUMAR BHARTI	CHAITANYA COLONY, NEW MAIRI, SHIVNAGAR, CHANDRAPUR	HEAVY TRUCK DRIVER	ASHOK LEYLAND DRIVING INST, CHINDWARA
6	ASHISH PASWAN	GHODA DARA, NEW MAIRI, SHIVNAGAR, CHANDRAPUR	HEAVY TRUCK DRIVER	ASHOK LEYLAND DRIVING INST, CHINDWARA
7	MAHESH SAHAY	WARD NO-3, NEW MAIRI, SHIVNAGAR, CHANDRAPUR	HEAVY TRUCK DRIVER	ASHOK LEYLAND DRIVING INST, CHINDWARA
8	ANOOP KUMAR GAUTAM	LOHORI-36, NEW MAIRI, SHIVNAGAR, CHANDRAPUR	HEAVY TRUCK DRIVER	ASHOK LEYLAND DRIVING INST, CHINDWARA
9	MD GOSH	WARD NO-2, NEW MAIRI, SHIVNAGAR, CHANDRAPUR	HEAVY TRUCK DRIVER	ASHOK LEYLAND DRIVING INST, CHINDWARA

10. Amit Nishad Naya Colony, Ward No. 2 Heavy Truck Driver
11. Sagar Motu Kosarkar Ghosla Tekri, Ward No. 2 Heavy Truck Driver

A.T.O.
MAIRI AREA

Scanned with OKEN Scanner

cmpdi
A Miniratna Company

Central Mine Planning & Design Institute Limited
(A Subsidiary of Coal India Limited / Govt. of India Public Sector Undertaking)
Gondwana Place, Kanke Road, Ranchi - 834 031, Jharkhand (INDIA)
CORPORATE IDENTITY NUMBER - U74210JH1975GOI001073

ANNEXURE 27

पत्रांक: सीएमपीडीआई/विभाग/2020-21/ (B3)-[illegible] दिनांक: 02.11.2020

सेवा में,
General Manager (P&P)
Western Coalfields Limited
Coal Estate, Civil Lines
Nagpur – 440001 (M.S.)

विषय : Report on "scientific study for conducting controlled blasting in Amalgamated Yekona I & II OC mine of Majri Area, WCL (Job No: 20442003)

महोदय,

This is in reference to letter no WCL/MA/GM/HS/20-21/380 dated 29.08.2020 sent by Area Safety Officer, Majri Area, to carry out scientific study for conducting controlled blasting in Amalgamated Yekona I & II OC mine of Majri Area, WCL (Job No: 20442003). Study has been conducted by Blasting Division of CMPDI (HQ) on the above mentioned subject. One copy of report is hereby submitted for kind perusal.

भवदीय

अरुण कुमार राय
महाप्रबंधक (विस्फोटक प्रभाग)
General Manager (Blasting Division)

प्रतिलिपि सादर प्रेषित :

1. ARM, Majri Area
2. Area Safety Officer, Majri Area, WCL - Along with 1 Copy of report
3. SUB AREA MANAGER, MUSRI AREA, WCL - Along with 3 Copies of report
4. TS to CMD, P&P, WCL
5. HJ, R-IV, CMPDIL, RANCHI
6. Senior Manager (Min), P&P, WCL
7. HOD, SD, CMPDIL
8. Office copy - Along with 1 Copy of report

दूरभाष/Tel. No. : +91-651-2231140
फैक्स/Fax No. : +91-651-2231140
ई-मेल/E-mail : [illegible]
वेबसाईट/Website : www.cmpdi.co.in

ANN 27

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FOR COMPANY USE ONLY

The information given in this report is not to be communicated either directly or indirectly to the press or to any person not holding an official position in the CIL/ Government.

WESTERN COALFIELDS LTD. (WCL)

REPORT ON SCIENTIFIC STUDY FOR CONDUCTING CONTROLLED BLASTING AT AMALGAMATED YAKONA I & II MINES OF MAJRI AREA, WCL

[Job No. 284420086]

October 2020

BLASTING DIVISION
CENTRAL MINE PLANNING & DESIGN INSTITUTE LIMITED
(A Subsidiary of Coal India Limited)
GONDWANA PLACE, KANKE ROAD, RANCHI – 834 031, JHARKHAND, INDIA

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3.0	Scope of work	1
4.0	Details of blasting site	2
5.0	Brief of ground vibration	4
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15.0 OBSERVATIONS OF TRIAL BLASTS

a) Total eleven trial blasts in OB benches were conducted at Amalgamated Yakona-I & II OCM, Majari Area, WCL

b) Trial blasts were conducted using Non-Electric initiation system and monitored beyond 100m and Within 500m Distance.

c) The blast induced ground vibration as observed at various locations (i.e 50 m to 525 m) varies from 0.831 mm/sec at 525 m distance to 23.97 mm/sec at 50 m distance.

d) Maximum % of the Frequency of Ground vibrations were observed in the Medium range i.e 8-25 hz as shown in Table 8.

e) The air overpressure was observed at various location varies from 88 dB at 475 m distance to 133.6 dB at 200 m distance.

16.0 RECOMMENDATIONS

Based on the data collected from field trial blasts and its analysis for safe charge/delay various blast patterns were designed to conduct safe blasting for various distances from surface structures.

From the on-site measurements of Peak Particle Velocity (PPV) and analysis of results of trial blasts at Amalgamated Yekona I & II OC, Majari Area, WCL, under the prevailing geo-mining conditions, it may be recommended that the workings of Amalgamated Yekona I & II OC, Majari Area, WCL can be safely extended beyond 100 m but within 500 m from nearby villages/hutments or dwellings/ PWD Road etc. not belonging to owner with a **maximum explosive charge per delay as shown in Table: 6.**

Proper muffling of blast holes with sand bags or belt conveyors is to be implemented beyond 100m but within 300m from nearby villages/hutments or dwellings or PWD Road etc for both not belonging to owner and belonging to owner.

The mine management can also design drilling parameters and blast patterns considering strictly the maximum explosive charge weight per delay as provided in Table 6. The Drill Pattern, Charge Pattern, Delay Sequence, initiation system and Initiation etc. for all the recommendations are provided below. All other safety precautions as stated in the statute regarding drilling, charging and blasting operations shall be followed strictly.

ANNEXURE 28

Tel: (800) 303-4500 THEMIS INSTRUMENTS INC. Fax: (800) 303-4249

Vibration Report

Event Name: [illegible]
Recording Time: 14:18:18
Recording Date: [illegible]

Project Information

Project Information: [illegible]
Client: BLASTING OFFICER
Location: [illegible]
Operator: Charles
Notes:
Record Serial Number: [illegible]

Peak Measurements

	Vertical	Transverse	Radial
PPV (mm/s)	1.7	1.8	0.0
Freq (Hz)	13.1	9.3	12.2
Time (ms)	36	400	300
PPA (g)	0.01	0.01	0.02
PPD (mm)	0.02150	0.00251	0.00051
PVS (mm/s)	3.401 @ 305.9 ms		
PSPL (Pa)	1.25 (Mic 100.00) @ 171.9 ms		
PSPL (Hz)	28.4 Hz		
Status Test	Passed	Passed	Passed

System Configuration

Serial Number: [illegible]
Calibration Date: April 19, 2002
Model: [illegible]
Geo Trigger: 1.27 (mm/s)
Mic Trigger: Disabled
Manual Trigger: Disabled
Record Time: 1 second(s)
Software Version Used For Download: 02.01.0000
Firmware Version: [illegible]

ANN 28

Tel: (800) 532-4567 DIGIVAS INSTRUMENTS INC Fax: (603) 383-4719

Vibration Report

Event No: V2K0202031 (08/23-16:33:33)
Rec. Start Time: 16:33:33
Recording Date: 08-01-23

Project Information

Project: [illegible] Kelowna Lot 0001
Client: BLASTING OFFICER
Location: Kelowna-Rt old top of BC dump
Operator: Christ
Notes:
Blast to Sensor Distance (ft.): 750 MTR

Peak Measurements

	Vertical	Transverse	Radial
PPV (mm/s)	1.88	3.31	2.10
Freq (Hz)	9.1	13.4	10.4
Time (ms)	122	906	729
PPA (g)	0.01	0.03	0.01
PPD (mm)	0.04905	0.03817	0.03214
PVS (mm/s)	3.366 @ 000.4ms		
PSPL (PA)	77.03 (131.715 dB) @ 1120.1ms		
PSPL Freq	34.1Hz		
Sensor Test	Passed	Passed	Passed

System Configuration

Serial Number: V2K0202031
Calibration Date: April 13, 2023
Model: VM32000P
Geo Trigger: 1.27 (mm/s)
Mic Trigger: 2.1511620 (PA)(101 dB)
Manual Trigger: Disabled
Record Time: 2 seconds(s)
SoftWare Version Used For Download: 02.01.0000
Firmware Version: 2.12

Tel: (603) 383-4600

THOMAS INSTRUMENTS INC

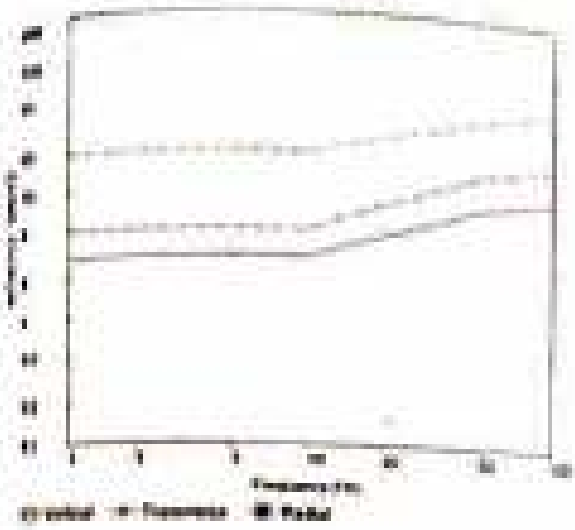
VIBRATION REPORT

Fax: (603) 383-4249

Event Number: V0K0282031-1:2022-144418
Recording Time: 14:44:18
Recording Date: 11-20-22
Project Name: GRANITED YIKONA 16 II OC MINE
Client: WCL MAJIBI AREA
Location: YIKONA-II NEAR VILLAGE
Operator: BLASTING OFFICER
Notes: INSTRUMENT IS IN WORKING ORDER
Distance to Sensor Distance (Mtrs.): 700
Maximum Weight per Delay (Kg): 14000

Peak Measurements

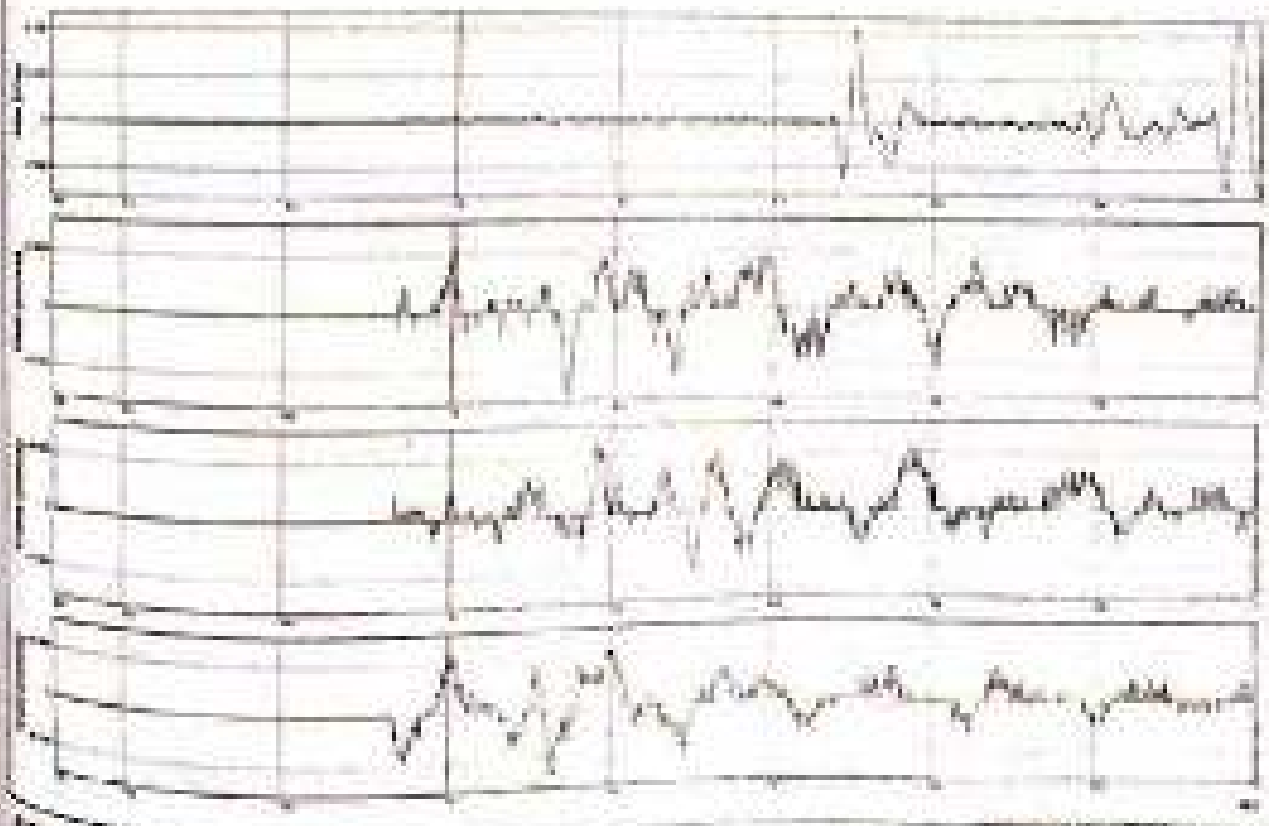
	Vertical	Transverse	Radial
PPV (mm/s)	0.04	0.06	0.77
Freq (Hz)	7.3	8.8	24.4
Time (ms)	2	160	140
PPA (g)	0.00	0.00	0.01
PPD (mm)	0.01401	0.01194	0.03439
PVC (mm/s)		0.970 @ / 0ms	
PSPL (Pa)		0.30 (134.46) @ 0.74 0ms	
PSPL (dB)		25.91C	
Sensor Test	Passed	Passed	Passed



THOMAS
Instruments for
SeismoWatch

Sensor Configuration

Serial Number: V0K0282031
Calibration Date: March 17, 2022
Model: VM3000P
Geo Trigger: 0.15 (mm/s)
Mic Trigger: 0.000312 psi (101 dB)
Manual Trigger: Disabled
Record Time: 1 second(s)
SeisWare ver. used for download: 01.00.0029
Current SeisWare version: 01.00.0029



P.O. BOX 50 ROUTE 9
BROOKFIELD, NH 03872

ANN 28

Tel. (800)-363-4690 THOMAS INSTRUMENTS INC. Fax: (800)-363-4649

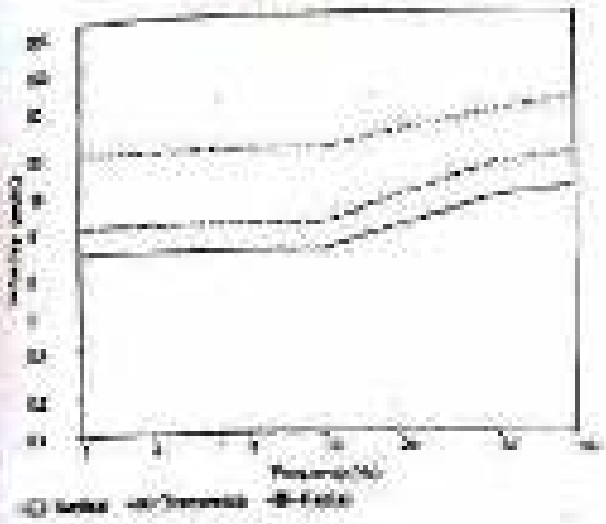
VIBRATION REPORT

Event Name: VSKG262031-112022-110347
Recording Time: 1:20:47
Recording Date: 11-22-22
Client: AMALGAMATED YEKONA IS A OC MINE
Location: VIC, MAJRI AREA
Location: YEKONA-I NEAR YEKONA VILLAGE (PLANTATION SITE)
Operator: BLASTING OFFICER
Notes: INSTRUMENT IS IN WORKING ORDER
Blast to Sensor Distance (Mins.): 700

Peak Measurements

	Vertical	Transverse	Radial
PPV (mm/s)	0.33	0.55	0.55
Freq (Hz)	22	43	0.2
Time (sec)	.04	151	0
PPA (g)	0.00	0.00	0.00
PPD (mm)	0.07041	0.0[illegible]7[illegible]	0.0[illegible]
PVS (mm/s)	0.503 @ 69.1ms		
PSI-1 (PVS)	0.51 (90.7 in dB) @ 11.3ms		
PSI-1 Freq	3 Hz		
Status Test	Passed	Passed	Passed

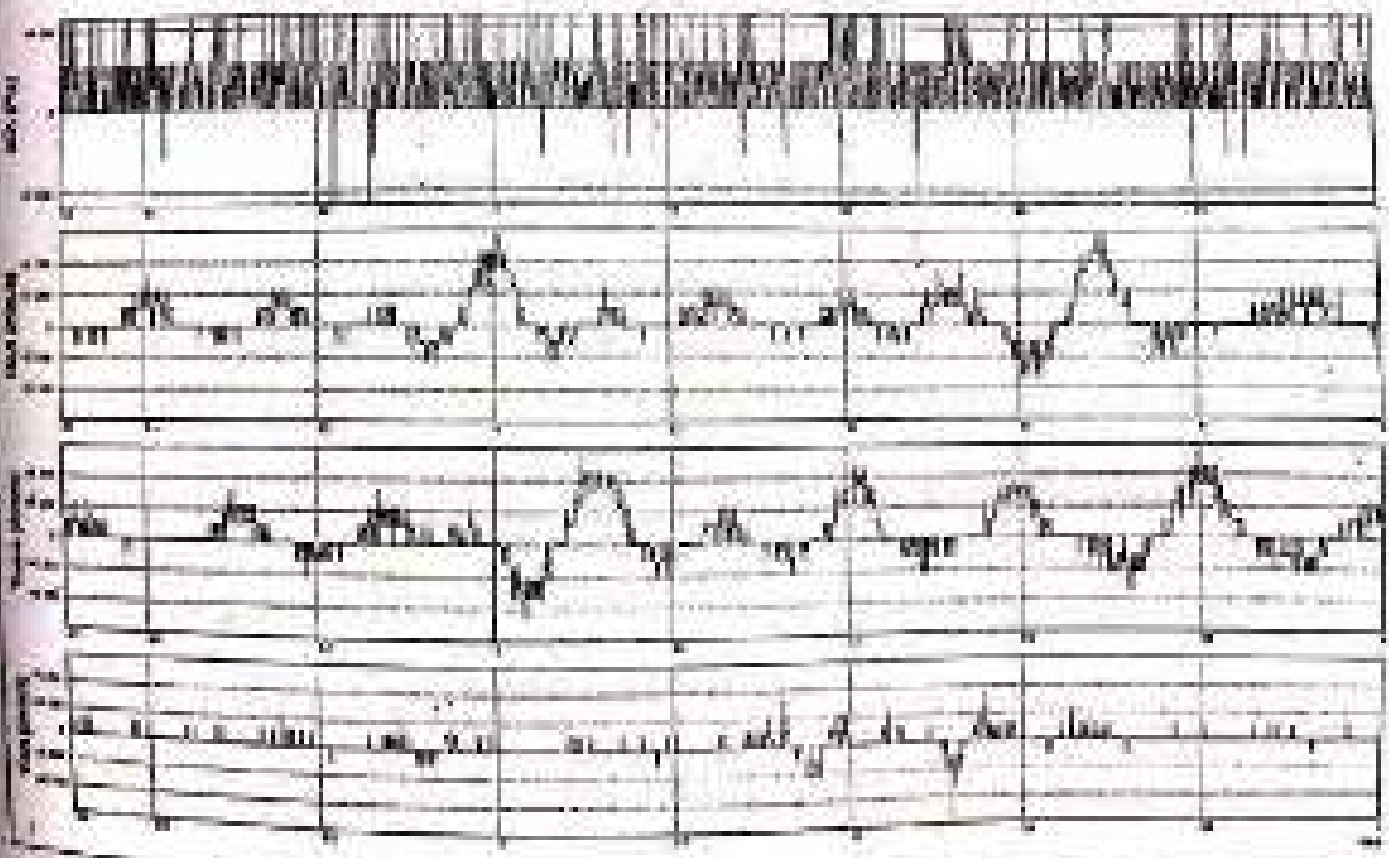
DIN 4150 Analysis



THOMAS INSTRUMENTS INC. Seismograph

System Configuration

Serial Number: VSKG262031
Calibration Date: March 17, 2022
Model: VM6202DP
Geo Trigger: 0.51(mm/s)
Mic Trigger: 0.000512 psi (101 dB)
Manual Trigger: Disabled
Record Time: 1 second(s)
Set/Mon Ver. used for download: 01.04.0029
Current SetMon version: 01.00.0028



P.O. BOX 66 ROUTE 9 SPOFFORD, NH 03462

Tel: (800)-363-4500 THOMAS INSTRUMENTS INC Fax: (800)-363-1245

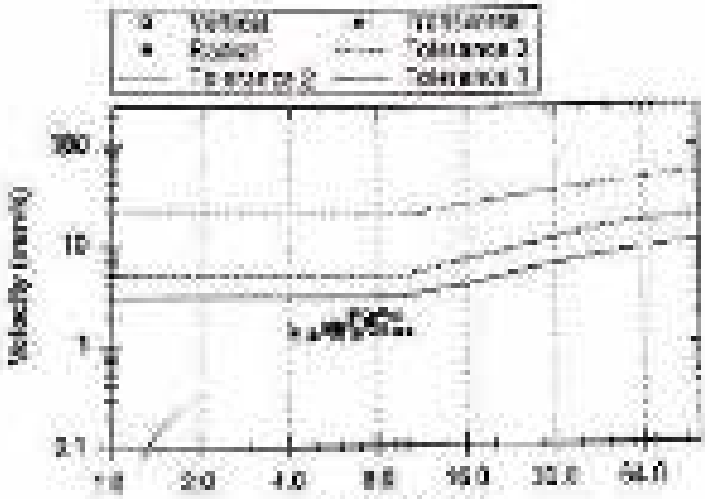
Vibration Report

Peak Measurement

Event Name: V2K0252001-061723-151602
Recording Time: 15:16:02
Recording Date: 06/17/23
Project and geophone serial number: 1 58-0004
Client: [illegible] INC OFFICER
Location: Vista Yolona Village Yolona 1
Operator: LEO IAR
Notes:
Blast to Sensor Distance (ft.): 800 MTR

	Vertical	Transverse	Radial
PPV (mm/s)	1.68	1.00	2.10
Freq (Hz)	7.1	7.1	8
Time (sec)	0.63	0.63	0.7
PPA (g)	0.21	0.07	0.31
PPD (mm)	0.04451	0.0403	0.0[illegible]
PVS (mm/s)	2.345 @ 0.0[illegible] Hz		
PSPL (Pa)	68.1 @ 120.946 Hz		
PSPL Freq	58.6 Hz		
Sensor	Passed	Passed	Passed

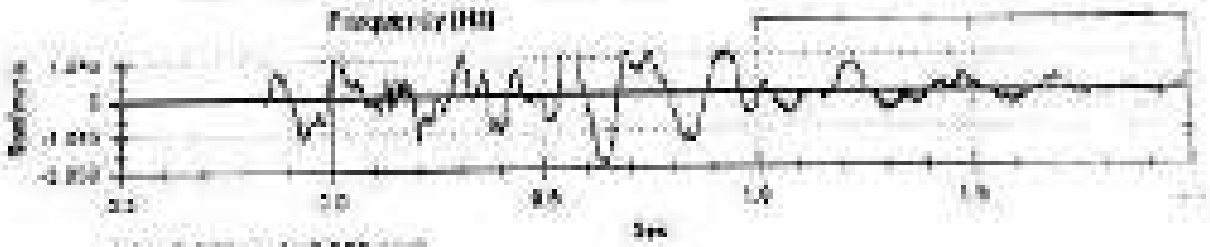
DIN 4150 Analysis: V2K0252001-061723-151602



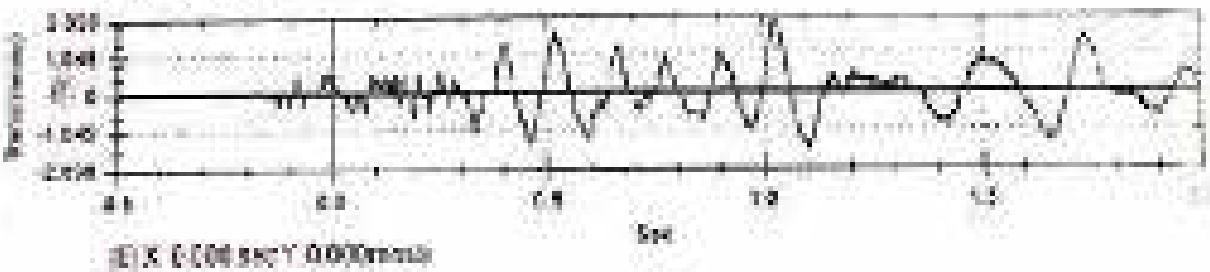
THOMAS

System Configuration

Serial Number: V2K0252001
Calibration Date: April 10, 2023
Model: VM5000P
Geo Trigger: 1.27 (mm/s)
Mic Trigger: 2.10/1600 (Pa/Hz)
Manual Trigger: Disabled
Record Time: 2 seconds(s)
Data/Acq Version Used For Download: 02.21.0001
Firmware Version: 2.12



[X: 0.00] sec Y: 0.000mm/s



[X: 0.00] sec Y: 0.000mm/s

[X: 0.00] sec Y: 0.000mm/s

भारत सरकार
जल शक्ति मंत्रालय
जल संसाधन, नदी विकास
और गंगा संरक्षण विभाग
केन्द्रीय भूमि जल प्राधिकरण
Government of India
Ministry of Jal Shakti
Department of Water Resources,
River Development & Ganga Rejuvenation
Central Ground Water Authority

(भूजल निकासी हेतु अनापत्ति प्रमाण पत्र)

NO OBJECTION CERTIFICATE (NOC) FOR GROUND WATER ABSTRACTION

Project Name:	M/s Amalgamated Yekona I And II OCP		
Project Address:	Near Village Marda, Majri Area, Wardha Valley Coalfield, WCL		
Village:	Marada	Block:	Chandrapur
District:	Chandrapur	State:	Maharashtra
Pin Code:	442402		
Communication Address:	General Manager (env), Wcl(hq), , Nagpur, Nagpur, Maharashtra - 440001		
Address of CGWB Regional Office :	Central Ground Water Board Central Region, N.S. Building, Civil Lines, Nagpur, Maharashtra – 440001		

1.	**NOC No.:**	CGWA/NOC/MIN/ORIG/2019/6689			
2.	Application No.:	21-4/1001/MH/MIN/2017	3.	Category:	Mining
4.	Project Status:	New Project	5.	NOC Type:	New
6.	**Valid from:**	19/11/2019	7.	**Valid up to:**	18/11/2021

8. Ground Water Abstraction Permitted:

Fresh Water		Saline Water		Dewatering		Total	
m³/day	m³/year	m³/day	m³/year	m³/day	m³/year	m³/day	m³/year
10.00	3650.00			4320.00	1576800.00	4330.00	1580450.00

9. Details of ground water abstraction /Dewatering structures

Total Existing No.:3						**Total Proposed No.:0**				
	DW	DCB	BW	TW	MP	DW	DCB	BW	TW	MP
Abstraction Structure*	0	0	1	0	2	0	0	0	0	0

*DW- Dug Well; DCB-Dug-cum-Bore Well; BW-Bore Well; TW-Tube Well; MP-Mine Pit

10.	Quantum of ground water recharge/harvesting(m³/year):	42672.00

11.	Number of Piezometers (Observation wells) to be constructed/ monitored & Monitoring mechanism.	No. of Piezometers	Monitoring Mechanism		
			Manual	DWLR**	DWLR With Telemetry
	**DWLR - Digital Water Level Recorder	2	0	1	1

(Compliance Conditions given overleaf)

Digitally signed by
NANDAKUMARAN P
Date: 2019.12.06 17:24:27 +05'30'

सदस्य (केन्द्रीय भूमि जल प्राधिकरण)
Member (CGWA)

18/11, जामनगर हाउस, मानसिंह रोड, नई दिल्ली - 110011 / 18/11, Jamnagar House, Mansingh Road, New Delhi-110011
Phone: (011) 23383561 Fax: 23382051, 23386743
Website: cgwa-noc.gov.in

पानी बचाये – जीवन बचाये
SAVE WATER - SAVE LIFE

Validity of this NOC shall be subject to compliance of the following mandatory conditions:

1. No additional ground water abstraction and/or de-watering structures shall be constructed for this purpose without prior approval of the Central Ground Water Authority (CGWA).
2. The proponent shall seek prior permission from CGWAfor any increase in quantum of groundwater abstraction (more than that permitted in NOC for specific period).
3. All new as well as existing ground water abstraction/ de-watering structures shall be fitted with digital water flow meters by the firm at its own cost immediately on completion of their construction or grant of NOC as the case may be. In case of renewal of NOCs, all existing ground water abstraction structures shall continue to be fitted with digital water flow meters. Intimation of installation of flow meters shall be sent by the proponent to the Regional Director of CGWB within 6 months of grant of NOC. Daily ground water abstraction data shall be monitored / continue to be monitored (in case of renewal) by the firm and recorded in a log book. Details of month-wise ground water abstraction shall be submitted to the Regional Director, CGWB, once every year.
4. In case the ground water abstraction is more than 10 m^3/day, monthly water level monitoring data shall be maintained and submitted annually to the Regional Office of CGWB. Wherever groundwater withdrawal is more than 500 m^3/day,the firm shall install telemetry system in one of the piezometers and share USER ID and password of the telemetry system with the Regional Director, CGWB.
5. In case ground water abstraction is more than 10 m^3/day, ground water quality shall be monitored once in a year (during pre- monsoon period) and the report submitted to the Regional Office, CGWB. Wherever the extraction is less than 10 m^3/day, ground water quality report shall be submitted by the proponent at the time of submission of self-compliance report.
6. Ground water augmentation/harvesting measures, as stipulated in the NOC, shall be implemented (in new cases) / continue to be maintained (in case of renewal) in consultation with the concerned Regional Director, CGWB.
7. Proof of recharge/water harvesting structures constructed (photographs of structures) shall be submitted to the concerned Regional Director, CGWB within 6 months from the date of issue of NOC. The firm shall also undertake periodic maintenance of recharge/water harvesting structures at its own cost.
8. **The firm shall submit a report on the impact of ground water withdrawal on the ground water regime in and around the project area within six months.**
9. The project proponent shall take all necessary measures to prevent contamination of ground water in the premises failing which the firm shall be responsible for any consequences arising thereupon.
10. In case of industries that are likely to contaminate the ground water, no recharge measures shall be taken up by the firm inside the plant premises. The runoff generated from the rooftop shall be stored and put to beneficial use by the firm.
11. The firm shall optimize water use through recycling/ reuse of waste water after proper treatment.
12. Wherever the NOC is for abstraction of saline water and the existing wells (s) is /are yielding fresh water, the same shall be sealed and new tubewell(s) tapping saline water zone shall be constructed within 3 months of the issuance of NOC. The firm shall also ensure safe disposal of saline residue, if any.
13. In case of mining projects, additional key wells shall be established in consultation with the Regional Director, CGWB for ground water level monitoring four (4) times a year (January, May, August and November) in core as well as buffer zones of the mine.
14. Unexpected variations in inflow of ground water into the mine pit, if any, shall be reported to the concerned Regional Director, Central Ground Water Board.
15. The firm shall report compliance of the NOC conditions online in the website (www.cgwa-noc.gov.in) within one year from the date of issue of this NOC.
16. This NOC is subject to prevailing Central/State Government rules/laws/norms or Court orders related to construction of tube well/ground water abstraction structure / recharge or conservation structure/discharge of effluents or any such matter as applicable.
17. This NOC does not absolve the proponents of their obligation / requirement to obtain other statutory and administrative clearances from appropriate authorities.
18. The issue of this NOC does not imply that other statutory / administrative clearances shall be granted to the project by the concerned authorities. Such authorities would consider the project on merits and take decisions independently of the NOC.
19. This NOC is being issued without any prejudice to the directions of the Hon'ble NGT/court orders in cases related to ground water or any other related matters.
20. Application for renewal can be submitted online from 90 days before the expiry of NOC. Ground water withdrawal, if any, after expiry of NOC shall be illegal & liable for legal action as per provisions of Environment(Protection)Act,1986.

(Non-compliance of the conditions mentioned above is likely to result in the cancellation of NOC and legal action against the proponent.)

ANNEXURE 31

Gmail

Yekona OC <yekonaoc@gmail.com>

Decision of 67th Internal EAC _ 21-4/1001/MH/MIN/2017 (AMALGAMATED YEKONA I AND II OCP)

3 messages

Central Ground Water Authority <cgwa@nic.in> Wed, Jul 26, 2023 at 4:10 PM
To: yekonaoc@gmail.com, nvjpriya@yahoo.co.in

Sir,

You are herewith requested to find the below decision for the mentioned application.

Deliberation:

-

1. PP has submitted the revised application for GW quantum of 5709 KLD (2083785 KLY) [(abstraction 100 KLD (36500.00 KLY) + Dewatering 5609 KLD (2047285 KLY)].
1. Hydrographs and WL data of piezometers constructed as per compliance of NOC is to be incorporated in the report.
2. Impact assessment report is to be updated and revised.

Decision:

The EAC is of considered opinion that CHR is as per SOP and application is approved for GW quantum of 5709 KLD/ 2083785 KLY subject to submission of revised CHR within 7 days (i.e 31.07.2023) as communicated during EAC meeting.

Regards,

O/o सदस्य सचिव Member Secretary,
केंद्रीय भूजल प्राधिकरण Central Ground Water Authority
जल शक्ति मंत्रालय, भारत सरकार Ministry of Jal Shakti, Govt. of India
18/11, जामनगर हाउस, मानसिंह रोड, नई दिल्ली-110011
18/11, Jamnagar House, Mansingh Road, New Delhi-110011
Ph- (011) 23383824; Fax- (011) 23382051; e-mail: cgwa@nic.in

Yekona OC <yekonaoc@gmail.com> Fri, Jul 28, 2023 at 9:39 PM
To: gmenvironment.wcl@coalindia.in
Cc: Amol Badukale <amolbadukale58@gmail.com>, samyekona@gmail.com, GORAK4866 <gorakvenkatesh@gmail.com>, hydrogeologyri4@gmail.com
Bcc: Ojaswini Chamarthi <ojaswini92@gmail.com>

Sir,

With reference to the trailing email from CGWA reg. submission of additional information in respect of CGWA NOC renewal of Amalg. Yekona OC Mine

This is for your information pls.

Regards,
ANO ENV, MA
[Quoted text hidden]

GM ENVIRONMENT and FOREST, HOD <gmenvironment.wcl@coalindia.in> Mon, Jul 31, 2023 at 10:45 PM

To: Central Ground Water Authority <cgwa@nic.in>
Cc: N Varadaraj <rdcr-cgwb@nic.in>, tscr-cgwb <tscr-cgwb@nic.in>, ELYAS HUSEN SHEIKH <agmmajri.wcl@coalindia.in>, envmajri <envmajri@gmail.com>, yekonaoc <yekonaoc@gmail.com>

Sir,
This has reference to the directives of 67th Internal EAC of CGWA (held on 24.07.2023) and trailing mail vide dated 26.07.2023 from CGWA in respect of application no. 21-4/1001/MH/MIN/2017 pertaining to Amalgamated Yekona I & II OC mine of WCL Majri Area.

In this regard following is submitted for kind perusal:

As directed in the 67th Internal EAC meeting (held on 24.07.2023), the Comprehensive Hydrogeological Report with modelling report thereby considering the rainwater component has been revisited and revised CHR with modelling report has been prepared by the Accredited consultant thereby fulfilling the requirement of EAC. Copy of revised CHR with modelling report and corresponding application (as desired) are enclosed herewith for ready reference.

It may be mentioned here that, CHR with modelling is being submitted for the groundwater abstraction/dewatering of 5709 KLD or 20,83,785 KLY thereby considering the rainwater component.

Due to size constraint the report is enclosed in the drive link
https://drive.google.com/drive/folders/1KcqgfLWl5Nr6FhK-S-1KVUl_QCFXh5Jx?usp=sharing

In view of the above, it is sincerely submitted that our application (21-4/1001/MH/MIN/2017) for grant of CGWA NOC renewal in respect of Amalgamated Yekona I & II OC mine of WCL Majri Area.

Encl.as above

Regards
GM(Environment)/HOD
WCL-HQ

From: yekonaoc@gmail.com
To: "GM ENVIRONMENT and FOREST, HOD" <gmenvironment.wcl@coalindia.in>
Cc: amolbadukale58@gmail.com, samyekona@gmail.com, gorakvenkatesh@gmail.com, hydrogeologyri4@gmail.com
Sent: Friday, July 28, 2023 9:39:28 PM
Subject: Fwd: Decision of 67th Internal EAC _ 21-4/1001/MH/MIN/2017 (AMALGAMATED YEKONA I AND II OCP)
[Quoted text hidden]

AMALGAMATED YEKONA I & II OC MINE

ANNEXURE 32

GEOTAGGED PHOTOGRAPHS OF CATCH DRAIN AND GARLAND DRAIN ALONG WITH SILTATION POND

CATCH DRAIN ALONG ROADS OF DIMENSION : WIDTH 2.5 M and DEPTH 2 MTR

CATCH DRAIN ALONG COAL TRANSPORTATION ROAD OF DIMENSION : WIDTH 1 M and DEPTH 1 M

AMALGAMATED YEKONA I & II OC MINE

GEOTAGGED PHOTOGRAPHS OF CATCH DRAIN AND GARLAND DRAIN ALONG WITH SILTATION POND

GARLAND DRAIN ALONG DUMP

SILTATION POND TO CATCH RUNOFF FROM DUMPS

महाराष्ट्र सरकार

Western Coalfields Limited

(A Subsidiary of Coal India Limited)

पर्यावरण विभाग

Environment Department

Office of the Area General Manager, Majri Area

P.O. Kuchna, Tq. Bhadravati, Dist. Chandrapur – 442300

संदर्भ संख्या/ Ref. No. वेकोलि/मजरी क्षेत्र/पर्यावरण/2023/233

दिनांक/ Date 30.11.2023

प्रति,

संचालक विभाग,

केन्द्रीय भूमि जल बोर्ड (CGWB),

मेहर विभिका, नए इंडस्ट्रियल विभिन्न,

डी.के. जी. 3125, विंग-सेक्टर, नवी मुंबई-400001

विषय: Ground Water Level Monitoring Report for the period December 2022 to August 2023 for the mines of Majri Area, WCL located in Maharashtra State - regarding

महोदय,

In compliance of condition stipulated in Environment Clearance of coal mines of Majri Area, WCL, ground water level (GWL) in villages falling in buffer zone of respective mines of Majri Area located in the state of Maharashtra is monitored through M/s Anacon lab & a copy of the report for the period December 2022 to August 2023 of the mines of Majri Area, WCL is enclosed herewith for your kind information & ready reference.

धन्यवाद,

भवदीय

30/11/2023

संजीव केशरवाणी (पर्यावरण),

मजरी क्षेत्र

संलग्नक : यथोपरि

प्रतिलिपि :

- GZ&Ex - DA-II (केंद्रीय खनिज विभिन्न, खान मंत्रालय, पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, इंदिरा पर्यावरण भवन, नए दिल्ली, सी.जी.ओ. कॉम्प्लेक्स, लोदी रोड, नई दिल्ली - 110 003
- सदस्य सचिव, केन्द्रीय भूजल प्राधिकरण (CGWA), बेसमेंट 2, विंग-B, केकड़ी-1, आर के पुरम, नई दिल्ली - 110022
- सदस्य सचिव, केन्द्रीय प्रदूषण नियंत्रण बोर्ड (CPCB), परिवेश भवन, East Arjun Nagar, शाहदरा, दिल्ली - 110032...with copy of report
- Addl. Principal Chief Conservator of Forest, वन बल प्रमुख, वन एवं जलवायु परिवर्तन मंत्रालय, क्षेत्रीय कार्यालय (WCZ), रामदेव पेठ, इंदिरा गांधी, नए विभिन्न, नागपुर 440001, (महाराष्ट्र)...with copy of report
- जिलाधिकारी, चंद्रपुर, महाराष्ट्र सरकार, जिला कलेक्टर, चंद्रपुर, महाराष्ट्र - 442 401
- क्षेत्रीय महाप्रबंधक, मजरी क्षेत्र
- महाप्रबंधक (पर्यावरण), वे.को.लि. मुख्यालय, नागपुर

Western Coalfields Limited

REPORT ON

MONITORING OF GROUND WATER LEVEL

OF

AMALGAMATED YEKONA I & II OC MINE,

MAJRI AREA

(M.S)

WESTERN COALFIELDS LTD.

PERIOD- DEC 2022 (POST-MONSOON), JAN-FEB -2023 (WINTER) , MAY-2023 (PRE-MONSOON) & AUG-23 (MONSOON)

M/s Anacon Laboratories Pvt. Ltd., Nagpur

MoEF&CC (GOI) and NABL Recognized Laboratory
ISO 9001:2015, ISO 14001:2015, ISO 45001:2018
Lab. & Consultancy: FP-34, 35, Food Park,
MIDC, Butibori, Nagpur – 441122
Mob: +91-9372960077
Email: ***ngp@anacon.in***
Website: ***www.anaconlaboratories.com***

Report No. ANqr /PD/20A/2023/199

2022-23 & 2023-24

The Ground water Level monitoring & Water Quality Analysis has been carried out with due diligence and the Monitoring of Ground Water Level of all observation wells Report have been prepared as per the scope of work order no. वेकोलि/मुख्यालय/पर्यावरण/14-L/77 on date: 08.12.2022.

The report encompasses the Monitoring of Ground water level & Water Quality Analysis reports of observation wells pertaining to the AMALGAMATED YEKONA I & II OC MINE, of the Majri area, Chandrapur District, Maharashtra State.

Anacon Laboratories Pvt. Ltd. gratefully acknowledges the full cooperation rendered by concerned WCL Officials for timely completion of the project.

Ajinkya Nakod
(Geologist)

Gyanchand Bohra
NABET Accredited EIA Expert
for Hydrogeology & Geology

Nagpur.
September-October-2023

(Dr. D. G. Garway)
Head of Organization
Anacon Laboratories Pvt. Ltd., Nagpur

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TABLE/FIGURE	**NAME OF SUB MINE PROJECT**	**GROUND WATER MONITORING DETAILS OF WELL**	**Page No.**
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III	AMALGAMATED YEKONA I & II OC MINE,	ANALYSIS REPORT	14

INTRODUCTION

WCL is one of the eight Subsidiary Companies of Coal India Limited (CIL) which is under administrative control of Ministry of Coal. The Company incorporated under the Companies Act, 1956 has its registered office at Coal Estate, Civil Lines, Nagpur–440001. WCL has been conferred "Mini-ratna" status on 15 March 2008. It has mining operation spread over the states of Maharashtra (in Nagpur, Chandrapur & Yeotmal Districts) and Madhya Pradesh (in Betul and Chhindawara Districts). It has been divided into 10 administrative areas. The Company is a major source of supplies of coal to the industries located in Western India in the States of Maharashtra, Madhya Pradesh, Gujarat and also in Southern India in the States of Andhra Pradesh, Tamil Nadu, Karnataka and Kerala. A large numbers of Power Houses under Maharashtra, Madhya Pradesh, Gujarat, Karnataka, Punjab and Uttar Pradesh - Electricity Boards are major consumers of its coal along with cement, steel, chemical, fertilizer, paper and brick Industries in these states.

M/s Anacon Laboratories Pvt. Ltd. has been awarded the Work of "Groundwater level Monitoring (i.e. bore well / piezometer Water levels) and Water quality analysis (as per IS10500) for 76 projects / mines of WCL (situated in the state of Madhya Pradesh – Chhindwara & Betul districts and Maharashtra – Nagpur, Chandrapur & Yeotmal districts) for one year as per condition stipulated in Environmental Clearance letters issued by MoEF & CC & NOC issued by CGWA" vide work order वेकोलि/मुख्यालय/पर्यावरण/14-L/77 on date: 08.12.2022.

This Ground Water Level Monitoring report is prepared for AMALGAMATED YEKONA I & II OC MINE, of Majri Area of WCL for 4 seasons i.e PERIOD- DEC 2022 (POST-MONSOON), JAN-FEB -2023 (WINTER) , MAY-2023 (PRE-MONSOON) & AUG-23 (MONSOON). These mines are located in Chandrapur District of Maharashtra

GENERAL HYDROGEOLOGICAL CONDITION

The major water bearing formations in the district are Alluvium, Lower Gondwana Sandstones, Deccan Trap Basalt, Vindhyan Limestone and Archean metamorphic. Amongst these, the lower Gondwana Sandstones, particularly Kamthi Sandstone forms the most potential aquifer.

A. HARD ROCK FORMATIONS

ARCHEAN METAMORPHICS

Archeans, which comprise granite and granitic gneiss, occur in most of the eastern part of the district extending north-south from Nagbhid to Gondpipri. 6 These rocks are generally devoid of primary porosity, but weathering, jointing, fracturing, shearing etc., create secondary porosity, within which the ground water generally occurs in phreatic conditions. The depth of weathering ranges from 4 to 12 m bgl and dugwells are generally tapping this zone with yields of up to 30 m3 /day. Contrary to the general perception, the possibility of deep seated fracture zone exists in the area because of tectonic disturbances manifested in the form of dykes observed in the area. Therefore borewells in the depth range of 40-70 m bgl are also successful in this formation at suitable places with yield of 1000 to 35000 lph. High yielding dugwells are generally located in fractured granites.

VINDHYAN LIMESTONE

In Vindhyans, Limestones are water bearing formation while Sandstone due to their hard and compact nature, has poor ground water potential. The Vindhyan sediment mainly occur in north

central part of the district around Tadoba and Nagbhid in parts of Chimur, Sindewahi, Bhadravati and Nagbhid talukas and in south eastern part of the district in parts of Chandur and Rajura talukas. Limestones as such are massive but wherever they are cavernous and fractured they are capable of holding water and the ground water generally occurs under phreatic condition in these formations and the discharge in general is poor (up to 15 m3 /day). The borewells drilled by State Govt. agencies in the depth range of 30 to 40 m bgl are successful only at few places where discharge of 10000 lph or above has been observed.

DECCAN TRAP BASALT

Deccan Trap Basalt is observed in small area in the north eastern and south eastern peripheral parts of the district and does not form a promising aquifer in the district. Weathered, jointed and fractured Massive and Vesicular Basalt forms the aquifer in the area. Ground water occurs in phreatic conditions within the depth of 10-15 m, however, borewells drilled have shown presence of fracture zones and thus forming deeper confined and semi-confined aquifers at places. The dugwells yield varies from 15-30 m3 /day when favourably located, whereas borewells yield 1 to 3 lps.

B. <u>SOFT ROCK FORMATIONS</u>

GONDWANA SANDSTONE

Gondwana formation comprising of Kamthi and Barakar Sandstone and Maleri and Talchir Shale occupy north-south extending elongated stretch in cental and southern parts of the district in parts of Warora, Bhadravati, Chandrapur, Ballarpur, Rajura and Gondpipri talukas. Sandstone is usually friable and possesses primary porosity due to its granular nature. They are most productive water bearing formations in the district. The ground water occurs under phreatic as well as confined conditions in Kamthi Sandstone up to the depth of 80 to 120 m bgl with thickness varying from 34 to 102 m. Barakar Sandstone occurs below Kamthi formation and three granular zones are observed with cumulative thickness of about 72 m within a 300 m thick sandstone-shale sequence. Comparatively Kamthi Sandstone has more ground water potential with yields of up to 20 lps. The other Gondwana formations i.e., Maleri Series (upper Gondwana) and Talchirs (lower Gondwana) have very poor ground water potential and ground water occurs in phreatic condition.

ALLUVIUM

Alluvium of fluvial origin occurs in narrow patches along the banks of Wardha and Wainganga Rivers and consists of clay, silt with lenticular bodies of sand and gravel. Ground water generally occurs under phreatic conditions down to the depth of 10-15 m. The area in the north eastern part of the district near Brahmapuri along the western bank of Wainganga River and having a spread of about 100 sq. km. forms the most potential alluvial area. The Allluvium in this part is occurs down to 30-35 m and the basement is reported to be formed by Granitic Gneisses. The dugwells yield up to 50 m3 /day when favourably located, whereas shallow tubewells yield varies from 5 to 15 lps.

AMALGAMATED YEKONA I & II OC MINE,

MAJRI AREA

WESTERN COALFIELDS LTD.

PERIOD- DEC 2022 (POST-MONSOON), JAN-FEB -2023 (WINTER) , MAY-2023 (PRE-MONSOON) & AUG-23 (MONSOON)

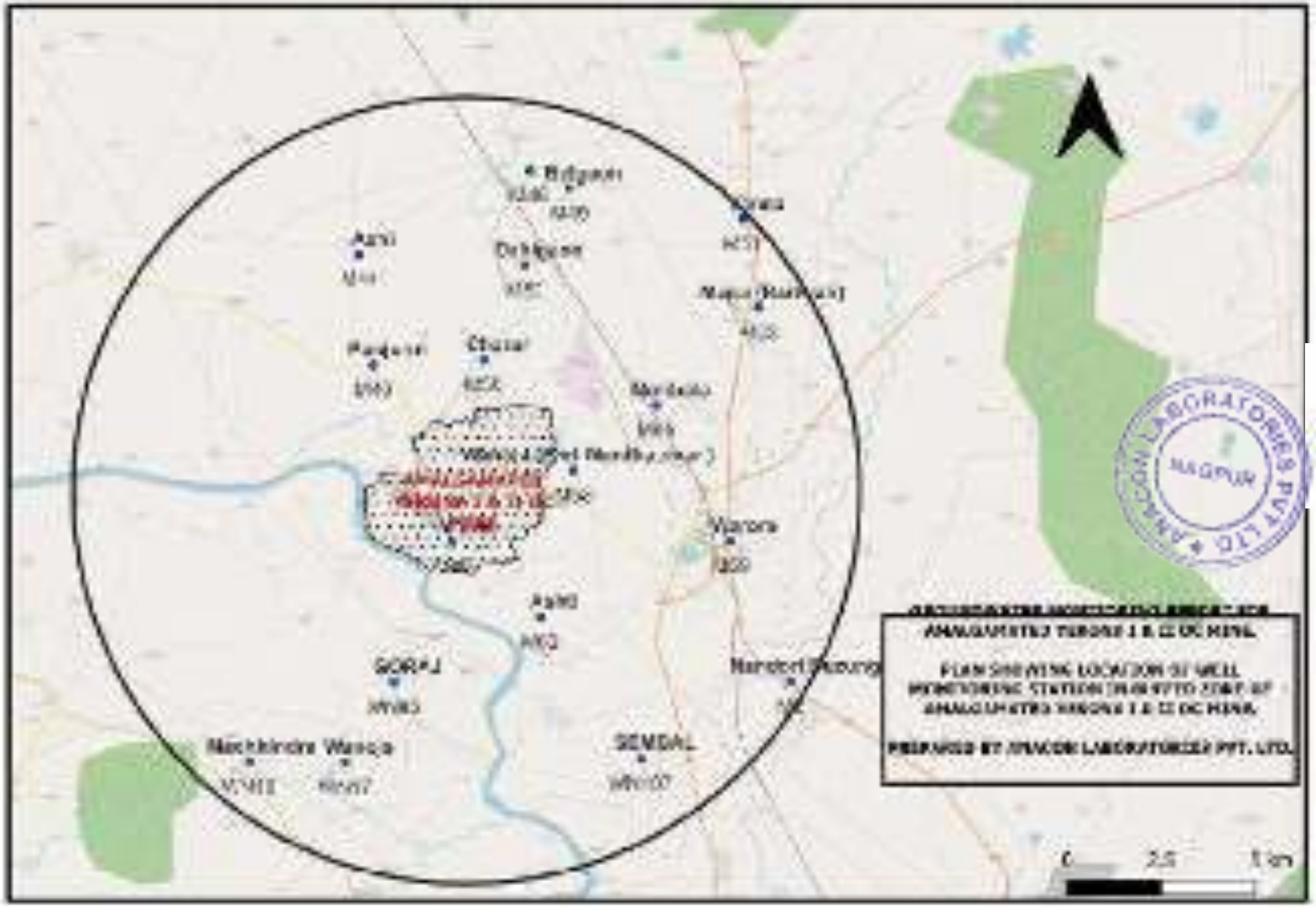


FIGURE-I: GROUND WATER MONITORING STATION (OBSERVATION WELLS IN AND AROUND OF Amalgamated Yekona I & II OC Mine)

Table: I Ground Water Level Monitoring Data from Dugwells in Buffer Zone of Amalgamated Yekona I & II OC Mine, Majri Area, WCL

Sr. No.	Well No.	Name of village	Well location	Latitude	Longitude	R.L. in m	Well dia (m)	Well depth (m bmp)	Height of measuring point (m agl)	Depth to Water Level (m bgl)				Utility / Owner	Formation Tapped
										DEC-22	JAN - FEB-23	MAY-23	Aug-23		
1	M2	Nandori Buzung	W of Nagpur - Chandrapur road near old Toll Tax naka	20°12'2.33909 264129437"	79°1'54.08251 32053294"	196	2.24	9.11	0.63	1.1	3.4	4.2	2.90	IRRIGATION	SHELLY LIMESTONE
2	M44	Ashi	Adjacent to road, about 1 km south of the village in field	20°18'32.4893 667534866"	78°55'19.5370 341986064"	205	3.47	9.21	0.75	2.45	4.1	6.2	2.00	DOMESTIC	BASALT
3	M46	Panjurni	200m E of village in the field	20°16'51.8310 474612903"	78°55'32.1711 372876338"	215	3.54	11.54	1.15	1.8	5.1	8.2	2.90	IRRIGATION	BASALT
4	M48	Dongargaon	NE of village, near Ram Mandir	20°19'49.3838 939729031"	78°57'54.8583 092546711"	212	3.96	9.57	0.54	4.6	3.6	8.5	2.30	IRRIGATION	BASALT
5	M49	Belgaon	About 100m E of village in the field	20°19'33.3502 703529291"	78°58'31.8030 302417992"	208	3.25	9.25	0.45	3.9	4	6.6	1.20	IRRIGATION	BASALT
6	M51	Yensa	C of village, near Vittal Rukmai Mandir	20°19'5.30751 275143331"	79°1'10.15412 98891698"	211	4.24	8.24	0.95	3.4	4.1	7.2	2.80	DOMESTIC	BASALT
7	M52	Dahigaon	SE of village, adjacent to Dongargaon road & nalla	20°18'23.0359 004114121"	78°57'50.8759 845603312"	224	3.12	9.36	0.85	4.2	4.5	6.1	2.10	DOMESTIC	BASALT

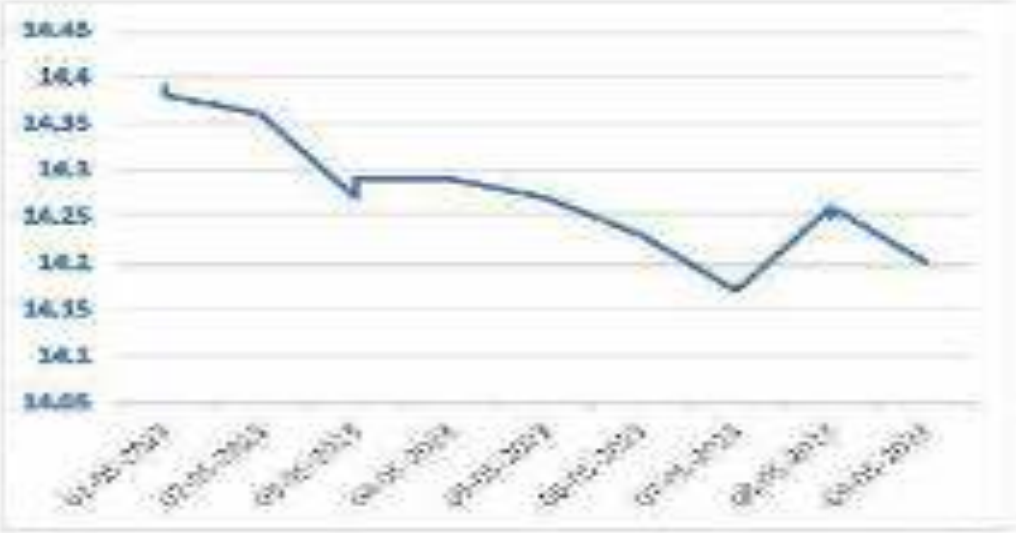
Sr. No.	Well No.	Name of village	Well location	Latitude	Longitude	R.L. in m	Well dia (m)	Well depth (m bmp)	Height of measuring point (m agl)	Depth to Water Level (m bgl)				Utility / Owner	Formation Tapped
										DEC-22	JAN - FEB-23	MAY-23	Aug-23		
8	M53	Majra (Raitwari)	S of village in the field , about 120 m E of Nagpur road	20°17'43.7733246113652"	79°1'24.6630249609632"	197	3.11	6.95	0.3	2.2	2.6	3.9	1.80	DOMESTIC	BASALT
9	M55	Mohbala	Adjacent to Warora - Dongergaon road, SE of the village	20°16'14.729711032318"	78°59'51.4142921840552"	198	4.65	9.78	0.45	2.9	3.15	5.2	3.40	IRRIGATION	SHELLY LIMESTONE
10	M56	Charur	Center of the village , near the School	20°16'56.289027529867"	78°57'13.5151934400018"	224	4.36	8.26	0.97	2.7	3.2	6.9	2.60	DOMESTIC	BASALT
11	M58	Wanoja (E of Wardha river)	Adjacent to Warora - Madheri road	20°15'15.0867533410349"	78°58'35.427255837119"	195	2.11	9.12	0.84	3.6	5.1	7.1	1.95	DOMESTIC	BASALT
12	M59	Warora	Anandvan Bio-Technology Lab, Adjacent to Nagpur-Chandrapur road	20°14'10.3433305858061"	79°0'59.3288748066641"	212	4.12	11.21	0.3	3.8	6.3	9.0	2.70	DOMESTIC	BASALT
13	M60	Marda	500 m E of the village, in field and north side of road	20°14'9.53638233280714"	78°56'44.7768949901012"	224	3.12	10.2	0.71	2.4	4	7.4	2.40	DOMESTIC	BASALT

Sr. No.	Well No.	Name of village	Well location	Latitude	Longitude	R.L. in m	Well dia (m)	Well depth (m bmp)	Height of measuring point (m agl)	Depth to Water Level (m bgl)				Utility / Owner	Formation Tapped
										DEC-22	JAN - FEB-23	MAY-23	Aug-23		
14	M62	Ashti	East of the village , opp. to Mahadev Upre's house	20°13'1.19700862173318"	78°58'5.07884726025165"	214	4	10.11	0.45	4.3	5.1	8.3	1.90	DOMESTIC	BASALT
15	WN17	Wanoja	60m E of road entering in villageand N of Nallah	20°10'47.7104582490867"	78°55'6.83464405743179"	225	4.6	9.3	0.4	4.2	6.5	7.9	1.95	D/I	
16	WN18	Machhindra	In front of GP office.	20°10'48.4143616868323"	78°53'39.4049451870286"	214	2.71	10.18	0.76	2.1	3.7	8.1	2.60	D/I	
17	WN95	GORAJ	200m W of road to village in field	20°12'1"	78°55'51"	210	4.5	7.8	0.2	2.1	4.9	5.5	3.00	D/I	
18	WN107	SEMBAL	NORTH -WEST FROM JAGANNATH BABA TEMPLE ABOUT 200M	20°10'51.41"	78°59'37.2"	215	4.2	8.7	0.3	3.6	4.2	7.0	3.80	D/I	

NOTE- GP-Gram Panchayat, BMP-Below Measuring Point, agl- Above Ground Level, D-Domestic, I-Irrigation, P-Private, RL- reduced Level, bgl- Below Ground level, NA- Not Accessible

PIEZOMETER WATER LEVEL READING AMALGAMATED YEKONA I & II OC MINE (WCL MAJRI AREA)

User ID	Time	METER
1156	09-05-2013 08:03	14.1
1156	08-05-2013 08:02	14.35
1156	08-05-2013 08:07	14.25
1156	08-05-2013 08:07	14.26
1156	07-05-2013 08:03	14.17
1156	07-05-2013 08:02	14.17
1156	07-05-2013 08:02	14.17
1156	06-05-2013 08:02	14.24
1156	06-05-2013 08:02	14.23
1156	05-05-2013 08:03	14.27
1156	04-05-2013 08:03	14.23
1156	04-05-2013 08:02	14.23
1156	04-05-2013 08:02	14.23
1156	03-05-2013 08:03	14.17
1156	03-05-2013 08:02	14.24
1156	03-05-2013 08:02	14.24
1156	02-05-2013 08:04	14.14
1156	02-05-2013 08:02	14.14
1156	01-05-2013 08:03	14.33
1156	01-05-2013 08:02	14.38
1156	01-05-2013 08:02	14.38



User Id	Month	Average Level
1156	January	13.55
1156	February	14.13
1156	March	14.13
1156	April	14.38
1156	May	14.28
1156	June	14.02
1156	July	14.63

ANACON LABORATORIES PVT. LTD. NAGPUR

ANALYSIS REPORT

Anacon Laboratories

TC 5458

Test Report

Issued To: [illegible]	Sample Received No: [illegible] Issued Date: [illegible] Reference: -	Analysis Start: [illegible] Analysis End: [illegible] Sample Category: [illegible]
Sample Name: [illegible]	Sample Description: [illegible]	Purpose of Analysis: Drinking
Sample Collected By: [illegible]	Sampling Date: [illegible] Sampling Time: [illegible]	Sampling Location: [illegible]

Test Results

S.N.	Test Parameter	Measurement Unit	Test Method	As per IS 10500 : 2012 (Drinking Water Specifications) Including Amendment No. 1		Test Result
				Acceptable Limit	Permissible Limit	
C	Physical Testing Water					
1	pH		[illegible]	[illegible]	[illegible]	[illegible]
2	Colour	Hazen	[illegible]	5	15	1
3	Turbidity (as NTU)	NTU	[illegible]	1	5	[illegible]
4	Conductivity (25)	µS/cm	[illegible]	[illegible]	[illegible]	[illegible]
5	Total Dissolved Solids	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
6	Fluoride (as F)	mg/l	[illegible]	1.0	1.5	[illegible]
7	Magnesium (as Mg)	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
8	Nitrate (as NO3)	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
9	Phenol	-	[illegible]	Absent	Absent	Absent
10	pH	-	[illegible]	[illegible]	[illegible]	[illegible]
11	Sulphate (as SO4)	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
12	Total Alkalinity (as CaCO3)	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
13	Turbidity	NTU	[illegible]	1	5	[illegible]
14	Total Hardness (as CaCO3)	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
D	Chemical Testing Heavy Metals in Water					
1	Arsenic (as As)	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
2	Aluminium (as Al)	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
3	Boron	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
4	Copper (as Cu)	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
5	Cadmium (as Cd)	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
6	Iron (as Fe)	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
7	Lead (as Pb)	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
8	Manganese (as Mn)	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
9	Nickel (as Ni)	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
10	Selenium (as Se)	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
11	Total Chromium (as Cr)	mg/l	[illegible]	[illegible]	[illegible]	[illegible]
12	Zinc (as Zn)	mg/l	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

Verified By: [illegible] Authorised Signatory: [illegible] Checked By: [illegible]

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Anacon Laboratories Pvt. Ltd. Nagpur Lab
[illegible]

Anacon Laboratories

TC 6458

Test Report

[illegible]

Issued To: [illegible]	Sample Received No: [illegible]	Analysis Start: [illegible]	
	Received Date: [illegible]	Analysis End: [illegible]	
	Reference: [illegible]	Sample Category: Water	

Sample Name	Sample Particulars/Details	Purpose of analysis	Quantity Received
Drinking Water	[illegible]	Drinking	[illegible]

Sample Collected By: Mr. [illegible]	Sampling Date: [illegible] / Sampling Time: Not Mentioned	Sampling Location: [illegible]

Test Required: Chemical Testing

TEST RESULTS

S.N.	Test Parameter	Measurement Unit	Test Method	Requirements as per IS 10500 : 2012 (Drinking Water Specifications) Including Amendment No. 1		Test Result
				Acceptable Limit	Permissible Limit *	
I	Chemical Testing 1. Water					
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	Agreeable	Agreeable	Agreeable
10	pH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
II	Chemical Testing 2. Pesticide in Water					
14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTE: [illegible]

Technical Manager | Quality Manager | Operations Manager

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[illegible]
Tel: +91 [illegible] | Email: [illegible]
Website: [illegible]

Anacon Laboratories

TC 5456

Test Report

[illegible]

Date: [illegible]

Page 1 of 1

Issued To: M/s Western Coalfields Limited (WCL) [illegible] Coal Estate, CMJ Block, Nagpur WCL HQ (MS) 440001	Sample Received No: [illegible] Issued Date: [illegible] Reference: -	Analysis Start: [illegible] Analysis End: [illegible] Sample Category: Water

Sample Name Ground Water	Sample Particulars/Details Ground Water (Grab Sample) Million Weight [illegible]	Purpose of analysis [illegible]	Quantity Received [illegible]
Sample Collected By Mr. Mukesh Vishwa	Sampling Date: [illegible] Sampling Time: [illegible]	Sampling Executed Anacon	
Test Required: [illegible]			

TEST RESULTS

S.N.	Test Parameter(s)	Measurement Unit	Test Method	Requirements (as per IS 10500 : 2012 Drinking Water Specifications) including Amendment No. 1		Test Result
				Acceptable Limit	Permissible Limit	
I	Chemical Testing (Water)					
1	Alkalinity	mg/l	IS 3025 (Part 23) : 1986	200	600	[illegible]
2	Odour	Hazen	IS 3025 (Part 5) : 2012	5	15	[illegible]
3	Chloride (as Cl)	mg/l	IS 3025 (Part 32) : 1988	250	1000	[illegible]
4	Calcium (as Ca)	mg/l	IS 3025 (Part 40) : 1991	75	200	[illegible]
5	Fluoride (as F)	mg/l	IS 3025 (Part 60) : 2008	0.8	1	[illegible]
6	Iron (as Fe)	mg/l	IS 3025 (Part 53) : 2003	1.0	1.5	[illegible]
7	Magnesium (as Mg)	mg/l	IS 3025 (Part 46) : 1994	30	100	[illegible]
8	Nitrate (as NO3)	mg/l	APHA 22nd Edition 2012	45	No relaxation	[illegible]
9	Odour	-	IS 3025 (Part 5) : 2018	Agreeable	Agreeable	Agreeable
10	pH	-	IS 3025 (Part 11) : 2022	6.5 to 8.5	No relaxation	[illegible]
11	Sulphate (as SO4)	mg/l	IS 3025 (Part 24) : 2022	200	400	[illegible]
12	Total Dissolved Solids	mg/l	IS 3025 (Part 16) : 1984	500	2000	[illegible]
13	Turbidity	NTU	IS 3025 (Part 10) : 1984	1	5	[illegible]
14	Total Hardness (as CaCO3)	mg/l	IS 3025 (Part 21) : 2009	200	600	[illegible]
II	Chemical Testing A. Heavy Metals in Water					
5	Arsenic (as As)	mg/l	IS 3025 (Part 37) : 2012	0.01	No relaxation	[illegible]
6	Aluminium (as Al)	mg/l	IS 3025 (Part 2) : 2009	0.03	0.2	[illegible]
7	Boron	mg/l	IS 3025 (Part 1) : 2009	0.5	2.4	[illegible]
8	Cadmium (as Cd)	mg/l	IS 3025 (Part 41) : 2003	0.003	0.3	[illegible]
9	Chromium (as Cr)	mg/l	IS 3025 (Part 52) : 2019	0.05	No relaxation	[illegible]
10	Copper (as Cu)	mg/l	IS 3025 (Part 42) : 2019	0.05	No relaxation	[illegible]
11	Lead (as Pb)	mg/l	IS 3025 (Part 47) : 2019	0.01	No relaxation	[illegible]
12	Manganese (as Mn)	mg/l	IS 3025 (Part 59) : 2019	0.1	0.3	[illegible]
13	Nickel (as Ni)	mg/l	IS 3025 (Part 54) : 2019	0.02	No relaxation	[illegible]
14	Selenium (as Se)	mg/l	IS 3025 (Part 56) : 2019	0.01	No relaxation	[illegible]
15	Total Chromium (as Cr)	mg/l	IS 3025 (Part 52) : 2019	0.05	No relaxation	[illegible]
16	Zinc (as Zn)	mg/l	IS 3025 (Part 2) : 2009	5	15	[illegible]

NOTE: [illegible]

REMARKS: [illegible]

Certified By

Deputy Manager
Technical Manager

Deputy Technical Manager

Authorised Signatory

Quality Manager

[illegible]

Anacon Laboratories Pvt. Ltd. Nagpur Lab
[illegible] Road, Fine Star Industrial Complex, MIDC Butibori, Nagpur, Maharashtra, India - 441 122
[illegible]
Website: www.anaconlaboratories.com

Anacon Laboratories

TC 6463

Test Report

Issued To: M/s Wardwell Coal India Limited (WCL) [illegible]	Sample Received No: [illegible]	Analysis Start: [illegible]	
	Received Date: [illegible]	Analysis End: [illegible]	
	Reference: -	Sample Category: Water	

Sample Name: Ground Water	Sample Particulars/Details: Ground Water [illegible]	Purpose of Analysis: Drinking	Quantity Received: [illegible]
Sample Collected By: Mr. [illegible]	Sampling Date: [illegible] / Sampling Time: [illegible]	Sampling Location: [illegible]	
Type Required: General Testing			

TEST RESULTS

S.N.	Test Parameter	Measurement Unit	Test Method	Requirements as per IS 10500 : 2012 (Drinking Water Specifications) Including Amendment No. 1		Test Result
				Acceptable Limit	Permissible Limit	
I	General Testing 1. Water					
1	pH	[illegible]	IS 3025 (Part 11) : 1983	[illegible]	[illegible]	[illegible]
2	Color	Hazen	IS 3025 (Part 4) : 2021	5	15	1
3	Odour (at 27°C)	[illegible]	IS 3025 (Part 5) : 1983	[illegible]	[illegible]	[illegible]
4	Turbidity (at 27°C)	[illegible]	IS 3025 (Part 10) : 1984	1	5	[illegible]
5	Total Solids (Filtrable)	[illegible]	IS 3025 (Part 16) : 2023	[illegible]	-	[illegible]
6	Fluoride (as F)	mg/l	IS 3025 (Part 60) : 2008	1.0	1.5	[illegible]
7	Magnesium (as Mg)	mg/l	IS 3025 (Part 46) : 1994	30	100	[illegible]
8	Nitrate (as NO_3)	mg/l	APHA [illegible] (Method [illegible] : 2017)	45	No relaxation	[illegible]
9	Odour	-	IS 3025 (Part 5) : 2023	Agreeable	Agreeable	Agreeable
10	pH	-	IS 3025 (Part 11) : 2023	6.5 to 8.5	No relaxation	[illegible]
11	Sulphate (as SO_4)	mg/l	IS 3025 (Part 24) : 2023	200	400	[illegible]
12	Total Alkalinity (as CaCO3)	mg/l	IS 3025 (Part 23) : 1986	200	600	[illegible]
13	Turbidity	NTU	IS 3025 (Part 10) : 1984	1	5	[illegible]
14	Total hardness (as CaCO3)	mg/l	IS 3025 (Part 21) : 2009	200	600	[illegible]
II	General Testing 2. Inorganic In Water					
15	Arsenic (as As)	mg/l	IS 3025 (Part 37) : 2023	0.01	No relaxation	[illegible]
16	Aluminium (as Al)	mg/l	IS 3025 (Part 55) : 2019	0.03	0.2	[illegible]
17	Boron	mg/l	IS 3025 (Part 57) : 2019	0.5	1.5	[illegible]
18	Copper (as Cu)	mg/l	IS 3025 (Part 42) : 2019	0.05	1.5	[illegible]
19	Cadmium (as Cd)	mg/l	IS 3025 (Part 41) : 2023	0.003	No relaxation	[illegible]
20	Iron (as Fe)	mg/l	IS 3025 (Part 53) : 2019	0.01	No relaxation	[illegible]
21	Lead (as Pb)	mg/l	IS 3025 (Part 47) : 2019	0.01	No relaxation	[illegible]
22	Manganese (as Mn)	mg/l	IS 3025 (Part 59) : 2019	0.1	0.3	[illegible]
23	Mercury (as Hg)	mg/l	IS 3025 (Part 48) : 2019	0.001	No relaxation	[illegible]
24	Selenium (as Se)	mg/l	IS 3025 (Part 56) : 2009	0.01	No relaxation	[illegible]
25	Total Chromium (as Cr)	mg/l	IS 3025 (Part 52) : 2019	0.05	No relaxation	[illegible]
26	Zinc (as Zn)	mg/l	IS 3025 (Part 86) : 2019	5	15	[illegible]

Note: [illegible]

Verified By

[illegible]
Technical Manager

[illegible]
Dy. Technical Manager

[illegible]
Deputy Manager

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Tel : [illegible] Email : [illegible]
Website : www.anacon-laboratories.com

Anacon Laboratories

TC 8458

Test Report

TLR No: [illegible]
Test Report No: [illegible] - 31

Date: [illegible]

Page 1 of 1

Issued To : M/s Western Coalfields Limited (WCL) [illegible] [illegible]	Sample Received No. [illegible] Issued Date [illegible] Reference -	Analysis Start [illegible] Analysis End [illegible] SOR Category [illegible]

Sample Name Ground Water	Sample Plants Co-Ordinates [illegible]	Purpose of Analysis Monitoring	Quantity Received 1 Ltr
Sample Collected By Mr. [illegible]	Sampling Date [illegible] Sampling Time [illegible]	Sampling Location [illegible]	
Date Reporting/Start of Analysis Testing			

TEST RESULTS

S.N.	Test Parameter	Measurement Unit	Test Method	Requirements as per IS 10500 : 2012 (Drinking Water Specification) Including amendment No. 1		Test Results
				Acceptable Limit	Permissible Limit	
I	Physical Testing of Water					
1	Turbidity	NTU	IS 3025 (Part 10) : 1984	1	5	[illegible]
2	Colour	Hazen	IS 3025 (Part 4) : 2021	5	15	1
3	Chloride (as Cl)	mg/l	IS 3025 (Part 32) : 1988	250	1000	[illegible]
4	Calcium (as Ca)	mg/l	IS 3025 (Part 40) : 1991	75	200	[illegible]
5	Residual Chlorine	mg/l	IS 3025 (Part 26) : 2021	0.2	1	[illegible]
6	Fluoride (as F)	mg/l	IS 3025 (Part 60) : 2008	1.0	1.5	[illegible]
7	Magnesium (as Mg)	mg/l	IS 3025 (Part 46) : 1994	30	100	[illegible]
8	Sulfate (as SO_4)	mg/l	APHA, edition 23rd edition 2017	45	No relaxation	[illegible]
9	Odour	-	IS 3025 (Part 5) : 2018	Agreeable	Agreeable	Agreeable
10	pH	-	IS 3025 (Part 11) : 2022	6.5 to 8.5	No relaxation	7.31
11	Nitrate (as NO_3)	mg/l	IS 3025 (Part 34) : 2022	45	100	[illegible]
12	Total dissolved solids	mg/l	IS 3025 (Part 16) : 1984	500	2000	[illegible]
13	Turbidity	NTU	IS 3025 (Part 10) : 1984	1	5	0.1
14	Total Hardness (as CaCO3)	mg/l	IS 3025 (Part 21) : 2009	200	600	41
II	Chemical Testing of Pesticides in Water					
15	Arsenic (as As)	mg/l	IS 3025 (Part 37) : 1988	0.05	No relaxation	BDL (DL - 0.01)
16	Aluminium (as Al)	mg/l	IS 3025 (Part 2) : 2019	0.03	0.2	BDL (DL - 0.01)
17	Boron	mg/l	IS 3025 (Part 2) : 2019	0.5	2.4	BDL (DL - 0.1)
18	Copper (as Cu)	mg/l	IS 3025 (Part 42) : 2019	0.05	1.5	BDL (DL - 0.01)
19	Cadmium (as Cd)	mg/l	IS 3025 (Part 2) : 2019	0.003	No relaxation	BDL (DL - 0.001)
20	Iron (as Fe)	mg/l	IS 3025 (Part 2) : 2019	0.3	No relaxation	0.16
21	Lead (as Pb)	mg/l	IS 3025 (Part 2) : 2019	0.01	No relaxation	BDL (DL - 0.001)
22	Manganese (as Mn)	mg/l	IS 3025 (Part 2) : 2019	0.1	0.3	0.04
23	Nickel (as Ni)	mg/l	IS 3025 (Part 2) : 2019	0.02	No relaxation	BDL (DL - 0.001)
24	Selenium (as Se)	mg/l	IS 3025 (Part 56) : 2010	0.01	No relaxation	BDL (DL - 0.001)
25	Total Chromium (as Cr)	mg/l	IS 3025 (Part 2) : 2019	0.05	No relaxation	BDL (DL - 0.01)
26	Zinc (as Zn)	mg/l	IS 3025 (Part 2) : 2019	5	15	BDL (DL - 0.1)

NOTE: [illegible]

Verified By

[illegible]
Technical Manager

[illegible]
Deputy Laboratory Manager

[illegible]
Laboratory Manager

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[illegible] Park, [illegible] Industrial Estate, MIDC Bui [illegible], Nagpur, Maharashtra, India - 441 122
[illegible]
Website: www.anaconlaboratories.com

Anacon Laboratories

TC 5158

Test Report

ULR No.- TC5158[illegible]
Test Report No: [illegible]

Issued [illegible]

Page 1 of 1

Issued To: M/s Western Coalfields Limited (WCL) [illegible] Road, Coal Estate, [illegible] [illegible]	Sample Received No: [illegible] Received Date: [illegible] Reference: -	Analysis Start: [illegible] Analysis End: [illegible] Sample Category: Water

Sample Name	Sample Particulars/Details	Purpose of analysis	Quantity Received
Ground Water	Source: Mahul Shaft K.v. MCF (Major Area)	Drinking	1 Ltr

Sample Collected By	Sampling Date	Sampling Location
Mr. Mihirth Mishra	[illegible] Sampling Time: Not Mentioned	[illegible]

Test Required: Chemical, Testing

TEST RESULTS

S.N.	Test Parameter	Measurement Unit	Test Method	Requirements as per IS 10500 : 2012 (Drinking Water Specifications) Including Amendment No. 4		Test Result
				Acceptable Limit	Permissible Limit	
I	Chemical Testing: Water					
1	Alkalinity	mg/l	IS 3025 (Part 23) : 1986	200	[illegible]	[illegible]
2	Colour	Hazen	IS 3025 (Part 4) : 2021	5	15	1
3	Chloride (as Cl)	mg/l	IS 3025 (Part 32) : 1988	250	1000	[illegible]
4	Calcium (as Ca)	mg/l	IS 3025 (Part 40) : 1991	75	200	[illegible]
5	Residual Chlorine	mg/l	IS 3025 (Part 26) : 2021	0.2	1	BDL (DL: 0.1)
6	Fluoride (as F)	mg/l	IS 3025 (Part 60) : 2008	1.0	1.5	[illegible]
7	Magnesium (as Mg)	mg/l	IS 3025 (Part 46) : 1994	30	100	[illegible]
8	Nitrate (as NO3)	mg/l	APHA, Method 4500-NO3 B, 2017	45	No relaxation	[illegible]
9	Odour	-	IS 3025 (Part 5) : 2018	Agreeable	Agreeable	Agreeable
10	pH	-	IS 3025 (Part 11) : 2022	6.5 to 8.5	No relaxation	[illegible]
11	Sulphate (as SO4)	mg/l	IS 3025 (Part 24) : 2023	200	400	[illegible]
12	Total Dissolved Solids (TDS)	mg/l	IS 3025 (Part 16) : 1984	500	2000	[illegible]
13	Turbidity	NTU	IS 3025 (Part 10) : 1984	1	5	0.2
14	Total Hardness (as CaCO3)	mg/l	IS 3025 (Part 21) : 2009	200	600	[illegible]
II	Chemical Testing: 2. Pesticides in Water					
15	Aldrin (as Ald)	mg/l	IS 3025 (Part 37) : 2021	0.03	No relaxation	BDL (DL: 0.01)
16	Alachlor (as Al)	mg/l	IS 3025 (Part 2) : 2019	0.02	0.1	BDL (DL: 0.01)
17	Atrazine	mg/l	IS 3025 (Part 2) : 2019	0.1	2.0	BDL (DL: 0.01)
18	Chlorpyrifos (C)	mg/l	IS 3025 (Part 2) : 2019	0.01	1.2	BDL (DL: 0.001)
19	Endosulfan (Endl)	mg/l	IS 3025 (Part 2) : 2019	0.003	No relaxation	BDL (DL: 0.0001)
20	Isoproturon	mg/l	IS 3025 (Part 2) : 2019	0.9	No relaxation	0.01
21	Lindane (Ln)	mg/l	IS 3025 (Part 2) : 2019	0.01	No relaxation	BDL (DL: 0.0001)
22	Methoxychlor (Mx)	mg/l	IS 3025 (Part 2) : 2019	0.02	0.1	0.00
23	Simazine (as Sz)	mg/l	IS 3025 (Part 2) : 2019	0.01	No relaxation	BDL (DL: 0.001)
24	Butachlor (as Bu)	mg/l	IS 3025 (Part 2) : 2019	0.01	No relaxation	BDL (DL: 0.0001)
25	Total Organochlorine (as Cl)	mg/l	IS 3025 (Part 2) : 2019	0.01	No relaxation	BDL (DL: 0.0001)
26	Phenolic (as Ph)	mg/l	IS 3025 (Part 2) : 2019	0.5	12	BDL (DL: 0.1)

NOTE: * Please see overleaf "Notes" for explanation of abbreviations. * Results are valid only for the sample tested and under conditions of performance only. * This report shall not be reproduced except in full without prior written approval of Anacon Labs. * Results are based on sample received and information provided. * Unless otherwise specified, samples shall be disposed off after 30 days. * Unless specified, [illegible] of the Test. [illegible] * Unless specified, [illegible] for drinking water. * "-" [illegible] * BDL - Below detection limit. * DL - Indicates detection limit of instrument/method used and not the [illegible] limit.

DISCLAIMER: [illegible]

Verified By

Sample Prep. Analyst

Reviewer, Technical Manager

Authorised Signatory

Director, Quality Manager

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[illegible] Park, [illegible] MIDC, Butibori, Nagpur, Maharashtra, India - 441 122
[illegible]
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Anacon Laboratories

IC 8455

Test Report

ULR No.: [illegible]
Test Report No.: [illegible]

Issued To
M/s Western Coalfields Limited (WCL)
[illegible]

Sample Received No.: [illegible]
Issued Date: [illegible]
Reference: -

Analysis Start: [illegible]
Analysis End: [illegible]
Sample Category: Water

Sample Name	Sample Particulars/Details	Purpose of analysis	Quantity Received
Ground Water	Ground Water (Well No. - [illegible])	Drinking	1 Ltr

Sample Collected By	Sampling Date / Sampling Time	Sampling Location
M/s Vidisco Manager	[illegible] / [illegible]	[illegible]

Test Requested: Chemical Testing

TEST RESULTS

S.N.	Test Parameter	Measurement Unit	Test Method	Requirements as per IS 10500 : 2012 (Drinking Water Specifications) Including Amendment No. 4		Test Result
				Acceptable Limit	Permissible Limit #	
I	Chemical Testing 1. Water					
1	Alkalinity	mg/l	IS 3025 (Part 23) : 1986	200	600	[illegible]
2	Colour	Hazen	IS 3025 (Part 4) : 2021	5	15	1
3	Chloride (as Cl)	mg/l	IS 3025 (Part 32) : 1988	250	1000	[illegible]
4	Calcium (as Ca)	mg/l	IS 3025 (Part 40) : 1991	75	200	[illegible]
5	Residual Chlorine	mg/l	IS 3025 (Part 26) : 2021	0.2	1	BDL (DL - 0.1)
6	Iron (as Fe)	mg/l	IS 3025 (Part 53) : 2003	1.0	1.5	[illegible]
7	Magnesium (as Mg)	mg/l	IS 3025 (Part 46) : 1994	30	100	[illegible]
8	Nitrate (as NO3)	mg/l	APHA [illegible] 4500-NO3- B : 2017	45	No relaxation	[illegible]
9	Odour	-	IS 3025 (Part 5) : 2018	Agreeable	Agreeable	Agreeable
10	pH	-	IS 3025 (Part 11) : 2017	6.5 - 8.5	No relaxation	[illegible]
11	Sulphate (as SO4)	mg/l	IS 3025 (Part 24) : 2023	200	400	[illegible]
12	Total dissolved solids	mg/l	IS 3025 (Part 16) : 1984	500	2000	[illegible]
13	Turbidity	NTU	IS 3025 (Part 10) : 1984	1	5	[illegible]
14	Total hardness (as CaCO3)	mg/l	IS 3025 (Part 21) : 2009	200	600	[illegible]
II	Chemical Testing 2. Residue in Water					
15	Arsenic (as As)	mg/l	IS 3025 (Part 37) : 2023	0.01	No relaxation	BDL (DL - [illegible])
16	Aluminium (as Al)	mg/l	IS 3025 (Part 55) : 2019	0.03	0.2	BDL (DL - [illegible])
17	Boron	mg/l	IS 3025 (Part 57) : 2019	0.5	2.4	BDL (DL - [illegible])
18	Copper (as Cu)	mg/l	IS 3025 (Part 42) : 2019	0.05	1.5	BDL (DL - [illegible])
19	Cadmium (as Cd)	mg/l	IS 3025 (Part 41) : 2019	0.003	No relaxation	BDL (DL - [illegible])
20	Iron (as Fe)	mg/l	IS 3025 (Part 53) : 2019	1.0	No relaxation	BDL (DL - [illegible])
21	Lead (as Pb)	mg/l	IS 3025 (Part 47) : 2019	0.01	No relaxation	BDL (DL - [illegible])
22	Mercury (as Hg)	mg/l	IS 3025 (Part 48) : 2019	0.1	0.2	[illegible]
23	Nickel (as Ni)	mg/l	IS 3025 (Part 54) : 2019	0.02	No relaxation	BDL (DL - [illegible])
24	Selenium (as Se)	mg/l	IS 3025 (Part 56) : 2019	0.01	No relaxation	BDL (DL - [illegible])
25	Total Chromium (as Cr)	mg/l	IS 3025 (Part 52) : 2019	0.05	No relaxation	BDL (DL - [illegible])
26	Zinc (as Zn)	mg/l	IS 3025 (Part 67) : 2019	5	15	BDL (DL - [illegible])

NOTE: [illegible]

Verified By

[illegible]
Sr. Technical Manager

Authorised Signatory

[illegible]
Director

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[illegible]

Anacon Laboratories

SC 6456

Test Report

TLR No. [illegible]
Test Report No. [illegible]

Issued To :
M/s Western Coalfields Limited (WCL)
[illegible]

Sample Received No: [illegible]
Issued Date: [illegible]
Reference: -

Analysis Start: [illegible]
Analysis End: [illegible]
Analysis Category: Short

Sample Name	Sample Particulars/Details	Purpose of Analysis	Quantity Received
Ground Water	[illegible]	[illegible]	1 Ltr

Sample Collected By	Sampling Date	Sampling Location
Mr. Rakesh Akhare	[illegible]	[illegible]
	Sampling Time: Not Mentioned	

Test Required: Chemical - Indian

TEST RESULTS

S.N.	Test Parameter	Measurement Unit	Test Method	Requirements as per IS 10500: 2012 (Drinking Water Specifications) Including amendment No.1		Test Result
				Acceptable Limit	Permissible Limit #	
I	Physical Testing 1. Water					
1	pH	-	IS 3025 (Part 11) : 2022	6.5	8.5	7.9
2	Colour	Hazen	IS 3025 (Part 4) : 2021	5	15	1
3	Turbidity (as NTU)	NTU	IS 3025 (Part 10) : 1984	1	10	0.55
4	Conductivity (as µS/cm)	µS/cm	IS 3025 (Part 14) : 2013	-	-	1.63
5	Total Dissolved Solids	mg/L	IS 3025 (Part 16) : 2023	500	2000	1.63
6	Fluoride (as F)	mg/L	IS 3025 (Part 60) : 2008	1.0	1.5	BDL (DL = 0.1)
7	Magnesium (as Mg)	mg/L	IS 3025 (Part 46) : 1994	30	100	0.81
8	Sulphate (as SO4)	mg/L	APHA Latest Edition, 2017	200	No relaxation	31.5
9	Odour	-	IS 3025 (Part 5) : 2018	Agreeable	Agreeable	Agreeable
10	pH	-	IS 3025 (Part 11) : 2022	6.5 to 8.5	No relaxation	7.9
11	Sulphate (as SO4)	mg/L	IS 3025 (Part 24) : 2023	200	400	31.6
12	Total Alkalinity	mg/L	IS 3025 (Part 23) : 1986	200	600	28
13	Turbidity	NTU	IS 3025 (Part 10) : 1984	1	5	0.5
14	Total Hardness (as CaCO3)	mg/L	IS 3025 (Part 21) : 2009	200	600	32
II	Chemical Testing 1. Residential Water					
15	Arsenic (as As)	mg/L	IS 3025 (Part 37) : 2023	0.01	No relaxation	BDL (DL = 0.005)
16	Aluminium (as Al)	mg/L	IS 3025 (Part 31) : 2019	0.03	0.2	BDL (DL = 0.01)
17	Boron	mg/L	IS 3025 (Part 31) : 2019	0.5	2.4	BDL (DL = 0.1)
18	Copper (as Cu)	mg/L	IS 3025 (Part 42) : 2019	0.05	1.5	BDL (DL = 0.01)
19	Cyanide (as CN)	mg/L	IS 3025 (Part 27) : 2019	0.05	No relaxation	BDL (DL = 0.01)
20	Iron (as Fe)	mg/L	IS 3025 (Part 53) : 2019	1.0	No relaxation	BDL (DL = 0.01)
21	Lead (as Pb)	mg/L	IS 3025 (Part 47) : 2019	0.01	No relaxation	BDL (DL = 0.005)
22	Manganese (as Mn)	mg/L	IS 3025 (Part 59) : 2019	0.1	0.3	BDL (DL = 0.01)
23	Mercury (as Hg)	mg/L	IS 3025 (Part 48) : 2019	0.001	No relaxation	BDL (DL = 0.001)
24	Selenium (as Se)	mg/L	IS 3025 (Part 56) : 2019	0.01	No relaxation	BDL (DL = 0.01)
25	Total Chromium (as Cr)	mg/L	IS 3025 (Part 52) : 2019	0.05	No relaxation	BDL (DL = 0.01)
26	Zinc (as Zn)	mg/L	IS 3025 (Part 86) : 2019	5	15	BDL (DL = 0.1)

NOTES: [illegible]

Certified By

Authorised Signatory

Technical Manager

Laboratory Manager

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[illegible]

Anacon Laboratories

NC 6458

Test Report

ULR No.- TC5402[illegible]
Test Report No.: [illegible]

Dated [illegible]

Page 1 of 1

Issued To: M/s Western Coalfields Limited (WCL) Pench Kanhan Coal Estate, [illegible] Nagpur, M.S. [illegible]	Sample Received No.: [illegible] Received Date: [illegible] Reference: -	Analysis Start: [illegible] Analysis End: [illegible] Sample Category: [illegible]	

Sample Name Treated Water	Sample Particulars/Details Treated Water [illegible]	Purpose of Analysis Testing	Quantity Received 1L
Sample Collected By Mr. Manish Malviya	Sampling Date: [illegible] Sampling Time: [illegible]	Sampling Location Mahura	

Tests Requested: Chemical Testing

TEST RESULTS

S.N.	Test Parameter	Measurement Unit	Test Method	Requirements as per IS 10500 : 2012 (Drinking Water Specifications) Including Amendment No. 1		Test Result
				Acceptable Limit	Permissible Limit	
I	Chemical Testing Water					
1	Alkalinity	mg/l	IS 3025 (Part 23) : 1986	200	600	[illegible]
2	Colour	Hazen	IS 3025 (Part 4) : 2021	5	15	[illegible]
3	Chloride (as Cl)	mg/l	IS 3025 (Part 32) : 1988	250	1000	[illegible]
4	Sulphate (as SO_4)	mg/l	IS 3025 (Part 24) : 1986	200	400	[illegible]
5	Residual Chlorine	mg/l	IS 3025 (Part 26) : 1986	0.2	1	[illegible]
6	Fluoride (as F)	mg/l	IS 3025 (Part 60) : 2008	1.0	1.5	[illegible]
7	Magnesium (as Mg)	mg/l	IS 3025 (Part 46) : 1994	30	100	[illegible]
8	Total Hardness (as CaCO3)	mg/l	APHA 23rd Edition 2017	200	No relaxation	[illegible]
9	Odour	-	IS 3025 (Part 5) : 2018	Agreeable	Agreeable	Agreeable
10	pH	-	IS 3025 (Part 11) : 2022	6.5 to 8.5	No relaxation	[illegible]
11	Nitrate (as NO_3)	mg/l	IS 3025 (Part 34) : 1988	200	400	[illegible]
12	Total Organic Carbon	mg/l	IS 3025 (Part 15) : 1984	200	500	[illegible]
13	Turbidity	NTU	IS 3025 (Part 10) : 1984	1	5	[illegible]
14	Total Hardness (as CaCO3)	mg/l	IS 3025 (Part 21) : 2009	200	600	[illegible]
II	Chemical Testing 1. Heavy Metals Water					
15	Arsenic (as As)	mg/l	IS 3025 (Part 37) : 2022	0.01	No relaxation	BDL (DL : [illegible])
16	Aluminium (as Al)	mg/l	IS 3025 (Part 31) : 2019	0.03	0.2	BDL (DL : [illegible])
17	Boron	mg/l	IS 3025 (Part 31) : 2019	0.5	2.4	BDL (DL : [illegible])
18	Copper (as Cu)	mg/l	IS 3025 (Part 31) : 2019	0.05	1.5	BDL (DL : [illegible])
19	Cadmium (as Cd)	mg/l	IS 3025 (Part 31) : 2019	0.003	No relaxation	BDL (DL : [illegible])
20	Iron (as Fe)	mg/l	IS 3025 (Part 31) : 2019	0.3	No relaxation	BDL (DL : [illegible])
21	Lead (as Pb)	mg/l	IS 3025 (Part 31) : 2019	0.01	No relaxation	BDL (DL : [illegible])
22	Manganese (as Mn)	mg/l	IS 3025 (Part 31) : 2019	0.1	0.3	[illegible]
23	Nickel (as Ni)	mg/l	IS 3025 (Part 31) : 2019	0.02	No relaxation	BDL (DL : [illegible])
24	Selenium (as Se)	mg/l	IS 3025 (Part 31) : 2019	0.01	No relaxation	BDL (DL : [illegible])
25	Total Chromium (as Cr)	mg/l	IS 3025 (Part 31) : 2019	0.05	No relaxation	BDL (DL : [illegible])
26	Zinc (as Zn)	mg/l	IS 3025 (Part 31) : 2019	5	15	BDL (DL : [illegible])

[illegible]

Checked By

[illegible]
Technical Manager

[illegible]
Director / Technical Manager

[illegible]
Quality Manager

Thanks for putting in your faith and trust in our services. We at Anacon Laboratories cherish our relationship. We believe it is of high value to us that you have a satisfactory experience in every step of our relationship. In case of any queries that you may have, we will be available to listen, improvise and serve you. Feedback can be mailed on feedback@anacon.in

Anacon Laboratories Pvt. Ltd. Nagpur Lab
[illegible]

Anacon Laboratories

TC-5453

Test Report

T.R. No.: [illegible]
Test Report No.: [illegible]

Date: [illegible]

Page 1 of [illegible]

Issued To: M/s [illegible] Limited (WCL) [illegible] [illegible]	Sample Received No.: [illegible] Received Date: [illegible] Reference: -	Analysis Start: [illegible] Analysis End: [illegible]	
Sample Name Ground Water	Sample Particulars (Type) Ground Water (N.A. No. MSA) (Mg/L Area)	Purpose of Analysis Drinking	Quantity Received 1 Ltr
Sample Collected By Mr. Mihesh Mahajan	Sampling Date: 07.05.2025 Sampling Time: Not Mentioned	Sampling Location Chhapar	
Total Sample and General Marking			

TEST RESULTS

S.N.	Test Parameter	Measurement Unit	Test Method	Requirements as per IS 10500 : 2012 (Drinking Water Specification) including Amendment No. 1		Test Result
				Acceptable Limit	Permissible Limit in	
I	Chemical Testing (Water)					
1	Alkalinity	mg/l	IS 3025 (Part 23) : 1986	200	600	NAA
2	Color	Hazen	IS 3025 (Part 4) : 2021	5	15	[illegible]
3	Chloride (as Cl)	mg/l	IS 3025 (Part 32) : 1988	250	1000	[illegible]
4	Calcium (as Ca)	mg/l	IS 3025 (Part 40) : 1991	75	200	[illegible]
5	Residual Chlorine	mg/l	IS 3025 (Part 26) : 2021	0.2	1	[illegible]
6	Fluoride (as F)	mg/l	IS 3025 (Part 60) : 2008	1.0	1.5	[illegible]
7	Magnesium (as Mg)	mg/l	IS 3025 (Part 46) : 1994	30	100	[illegible]
8	Nitrate (as NO3)	mg/l	APHA (latest edition) 4500	45	No relaxation	[illegible]
9	Odour		IS 3025 (Part 5) : 2018	Agreeable	Agreeable	Agreeable
10	pH		IS 3025 (Part 11) : 2022	6.5 to 8.5	No relaxation	[illegible]
11	Sulphate (as SO4)	mg/l	IS 3025 (Part 24) : 2022	200	400	[illegible]
12	Total dissolved solids	mg/l	IS 3025 (Part 16) : 1984	500	2000	[illegible]
13	Turbidity	NTU	IS 3025 (Part 10) : 1984	1	5	[illegible]
14	Total alkalinity (as CaCO3)	mg/l	IS 3025 (Part 23) : 2009	200	600	[illegible]
II	Chemical Testing A. Metals in Water					
15	Arsenic (as As)	mg/l	IS 3025 (Part 37) : 2023	0.01	No relaxation	[illegible]
16	Aluminium (as Al)	mg/l	IS 3025 (Part 2) : 2019	0.03	0.2	[illegible]
17	Boron	mg/l	IS 3025 (Part 2) : 2019	0.5	2.4	[illegible]
18	Copper (as Cu)	mg/l	IS 3025 (Part 2) : 2019	0.05	1.5	[illegible]
19	Cadmium (as Cd)	mg/l	IS 3025 (Part 2) : 2019	0.003	No relaxation	[illegible]
20	Iron (as Fe)	mg/l	IS 3025 (Part 2) : 2019	0.3	No relaxation	[illegible]
21	Lead (as Pb)	mg/l	IS 3025 (Part 2) : 2019	0.01	No relaxation	[illegible]
22	Manganese (as Mn)	mg/l	IS 3025 (Part 2) : 2019	0.1	0.3	[illegible]
23	Nickel (as Ni)	mg/l	IS 3025 (Part 2) : 2019	0.02	No relaxation	[illegible]
24	Selenium (as Se)	mg/l	IS 3025 (Part 56) : 2009	0.01	No relaxation	[illegible]
25	Total Chromium (as Cr)	mg/l	IS 3025 (Part 2) : 2019	0.05	No relaxation	[illegible]
26	Zinc (as Zn)	mg/l	IS 3025 (Part 2) : 2019	5	15	[illegible]

NOTES: [illegible]

REMARKS: [illegible]

Certified By:

Deepak Singh
Technical Manager

Sachin Rai
Senior Technical Manager

Authorised Signatory

[illegible]
Senior Technical Manager

Thanks for putting in your trust in our work. It was a pleasure. We at Anacon Laboratories always aim to exceed your expectations. We put forth our efforts with a vision that you have a standard experience of every step of our relationship. In order to ensure that your value experience and satisfaction is our top priority, we request you to provide your feedback over email at feedback@anacon.in

Anacon Laboratories Pvt. Ltd. Nagpur Lab
[illegible] Plot Park, Five Star Industrial Area, MIDC Butibori, Nagpur, Maharashtra, India - 441 122
[illegible] Email: [illegible]
Website: www.anaconlaboratories.com

Anacon Laboratories

ISO 9001

Test Report

TLR No: [illegible]
Test Report No: [illegible]

Issued: [illegible]

Issued To: M/s Western Coalfields Limited (WCL) [illegible]	Sample Received No.: [illegible] Issued Date: [illegible] Reference: -	Analysis Start: [illegible] Analysis End: [illegible] Sample Category: Water

Sample Name	Sample Particulars/Details	Purpose of analysis	Quantity Received
Drinking Water	Drinking Water, Well No. [illegible]	Drinking	1 Ltr

Sample Delivered By: Mr. [illegible]	Sampling Date: [illegible] Sampling Time: [illegible]	Sampling Location: Nagpur [illegible]

Test Required: Chemical Testing

TEST RESULTS

S.N.	Test Parameter	Measurement Unit	Test Method	Requirements as per IS 10500: 2012 (Drinking Water Specifications) Including Amendment No. 1		Test Results
				Acceptable Limit	Permissible Limit	
I	Chemical Testing 1. Water					
1	pH [illegible]	-	IS [illegible]	[illegible]	[illegible]	[illegible]
2	Colour	Hazen	IS [illegible]	5	15	1
3	Odour Rating (T)	-	IS [illegible]	[illegible]	[illegible]	[illegible]
4	Chloride (as Cl)	mg/l	IS [illegible]	[illegible]	1000	[illegible]
5	Residual Chlorine	mg/l	IS [illegible]	0.2	[illegible]	[illegible]
6	Fluoride (as F)	mg/l	IS [illegible]	1.0	1.5	[illegible]
7	Magnesium (as Mg)	mg/l	IS [illegible]	30	100	[illegible]
8	Nitrate (as NO_3)	mg/l	APHA [illegible]	45	No relaxation	[illegible]
9	Turbidity	-	IS [illegible]	Acceptable	Acceptable	Acceptable
10	pH	-	IS [illegible]	[illegible]	No relaxation	[illegible]
11	Sulphate (as SO_4)	mg/l	IS [illegible]	200	400	[illegible]
12	Total dissolved solids	mg/l	IS [illegible]	500	2000	[illegible]
13	Iron (as Fe)	mg/l	IS [illegible]	1	1	[illegible]
14	Total hardness (as CaCO3)	mg/l	IS [illegible]	300	600	[illegible]
II	Chemical Testing 2. Pesticide In Water					
15	Aldrin (as [illegible])	mg/l	IS [illegible]	[illegible]	No relaxation	[illegible]
16	Alpha-BHC (as [illegible])	mg/l	IS [illegible]	[illegible]	[illegible]	[illegible]
17	Beta-BHC	mg/l	IS [illegible]	[illegible]	[illegible]	[illegible]
18	Gamma-BHC	mg/l	IS [illegible]	[illegible]	[illegible]	[illegible]
19	Chlordane (as [illegible])	mg/l	IS [illegible]	[illegible]	No relaxation	[illegible]
20	Dieldrin (as [illegible])	mg/l	IS [illegible]	1.0	No relaxation	[illegible]
21	Endrin (as [illegible])	mg/l	IS [illegible]	[illegible]	No relaxation	[illegible]
22	Methoxychlor (as [illegible])	mg/l	IS [illegible]	[illegible]	[illegible]	[illegible]
23	Toxaphene (as [illegible])	mg/l	IS [illegible]	[illegible]	No relaxation	[illegible]
24	Alachlor (as [illegible])	mg/l	IS [illegible]	[illegible]	No relaxation	[illegible]
25	Total Chlorophenols (as [illegible])	mg/l	IS [illegible]	[illegible]	No relaxation	[illegible]
26	Atrazine (as [illegible])	mg/l	IS [illegible]	[illegible]	[illegible]	[illegible]

[illegible]

Verified By:

[illegible]
Technical Manager

[illegible]
Dy. Technical Manager

[illegible]
Deputy Technical Manager

Thank for choosing us. [illegible]

Anacon Laboratories Pvt. Ltd. Nagpur Lab
[illegible]

Anacon Laboratories

ANACON

NC 5458

Test Report

Issued To : M/s [illegible] Certified Seed (P) Ltd [illegible] Road, [illegible] Nagpur, WCL [illegible]	Sample Received No. [illegible] Received Date [illegible] Reference -	Analysis Name [illegible] Analysis End [illegible] Sample Category Water
Sample Name: Ground Water	Sample Description/Details: [illegible]	Purpose of Analysis: Drinking / Domestic Received: [illegible]
Sample Collected By: [illegible]	Sampling Date [illegible] Sampling Time [illegible]	Sampling Location: [illegible]
Test Required: [illegible]		

TEST RESULTS

S.N.	Test Parameter	Measurement Unit	Test Method	As per IS 10500 : 2012 (Reviewed in 2018) Including Amendment No. 1 Acceptable Limit	Permissible Limit *	Test Result
I	Chemical Testing of Water					
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	Colour	Hazen	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]
10	pH	-	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
II	Chemical Testing of Residues in Water					
15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

Certified By

[illegible]

Technical Manager

[illegible]

Deputy Technical Manager

[illegible]

Authorised Signatory

Thanks For [illegible] your form and trust in our services. We at Anacon Laboratories [illegible] your satisfaction is [illegible] We [illegible] a lot of hard work [illegible] that you have a pleasant experience at every step of our relationship. [illegible] to ensure that your next experience will be as [illegible] better. We welcome your [illegible] and [illegible] for your [illegible] in [illegible]

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[illegible]

Anacon Laboratories

IC 5458

Test Report

[illegible]

Issued To: [illegible]	Sample Received No: [illegible]	Analysis Date: [illegible]
	Issued Date: [illegible]	Analysis End: [illegible]
	Reference: [illegible]	Sample Category: [illegible]

Sample Name	Sample Particulars/Details	Purpose of Analysis	Quantity Received
[illegible]	[illegible]	[illegible]	[illegible]

Sample Collected By	Sampling Date / Sampling Time	Sample Condition
[illegible]	[illegible]	[illegible]

Test Recommenced: [illegible]

TEST RESULTS

S.N.	Test Parameter	Measurement Unit	Test Method	Requirements as per IS 10500 : 2012 (Drinking Water Specification) Including Amendment No. 1		Test Result
				Acceptable Limit	Permissible Limit	
I	Chemical Testing [illegible] Water					
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
II	Metal Testing [illegible] Water					
15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTE: [illegible]

Verified By: [illegible] Authorized Signatory: [illegible]

[illegible]

Anacon Laboratories Pvt. Ltd. Nagpur Lab
[illegible] Nagpur, Maharashtra, India - 441 122
[illegible] Email : info@anacon.in
Website : www.anacondiagnostics.com

Anacon Laboratories

TC 5463

Test Report

CIR No. [illegible]
Test Report No. [illegible]

Issued To: [illegible]	Sample Inward No. [illegible]	Sample Origin	[illegible]
	Inward Date	Analysis End	[illegible]
	Reference		

Sample Name: [illegible]	Sample Details: [illegible]	Purpose of analysis: [illegible]	Quantity Received: [illegible]
Sample Collected By: [illegible]	Sampling Date: [illegible] / Sampling Time: [illegible]	Sampling Location: [illegible]	
Test Requested: [illegible]			

TEST RESULTS

S.N.	Test Parameter	Measurement Unit	Test Method	Requirements as per IS 10500 : 2012 Drinking Water Specifications including Amendment No. 1		Test Result
				Acceptable limit	Permissible Limit	
I	Chemical Testing : Water					
1	Alkalinity	mg/l	IS 3025 (Part 23) : 1986	200	600	[illegible]
2	Color	Hazen	IS 3025 (Part 4) : 2021	5	15	[illegible]
3	Chloride (as Cl)	mg/l	IS 3025 (Part 32) : 1988	250	1000	[illegible]
4	Calcium (as Ca)	mg/l	IS 3025 (Part 40) : 1991	75	200	[illegible]
5	Magnesium (as Mg)	mg/l	IS 3025 (Part 46) : 2013	30	100	[illegible]
6	Fluoride (as F)	mg/l	IS 3025 (Part 60) : 2008	1.0	1.5	[illegible]
7	Nitrate (as NO3)	mg/l	IS 3025 (Part 34) : 1988	45	100	[illegible]
8	Total Alkalinity	mg/l	IS 3025 (Part 23) : 2017	200	No relaxation	[illegible]
9	Odour	-	IS 3025 (Part 5) : 2018	Agreeable	Agreeable	Agreeable
10	pH	-	IS 3025 (Part 11) : 2017	6.5 to 8.5	No relaxation	[illegible]
11	Sulphate (as SO4)	mg/l	IS 3025 (Part 24) : 2022	200	400	[illegible]
12	Total Hardness (as CaCO3)	mg/l	IS 3025 (Part 21) : 2009	200	600	[illegible]
13	Turbidity	NTU	IS 3025 (Part 10) : 1984	1	5	[illegible]
14	Total Dissolved Solids	mg/l	IS 3025 (Part 16) : 1984	500	2000	[illegible]
II	Chemical Testing : Drinking Water					
15	Arsenic (as As)	mg/l	IS 3025 (Part 37) : 2017	0.01	No relaxation	[illegible]
16	Aluminium (as Al)	mg/l	IS 3025 (Part 28) : 2019	0.03	0.2	[illegible]
17	Boron	mg/l	IS 3025 (Part 57) : 2005	1	5	[illegible]
18	Copper (as Cu)	mg/l	IS 3025 (Part 42) : 2019	0.05	1.5	[illegible]
19	Iron (as Fe)	mg/l	IS 3025 (Part 53) : 2003	0.3	No relaxation	[illegible]
20	Manganese (as Mn)	mg/l	IS 3025 (Part 59) : 2019	0.1	No relaxation	[illegible]
21	Lead (as Pb)	mg/l	IS 3025 (Part 47) : 2019	0.01	No relaxation	[illegible]
22	Mercury (as Hg)	mg/l	IS 3025 (Part 48) : 2019	0.001	No relaxation	[illegible]
23	Nickel (as Ni)	mg/l	IS 3025 (Part 54) : 2019	0.02	No relaxation	[illegible]
24	Selenium (as Se)	mg/l	IS 3025 (Part 56) : 2019	0.01	No relaxation	[illegible]
25	Total Chromium (as Cr)	mg/l	IS 3025 (Part 52) : 2019	0.05	No relaxation	[illegible]
26	Zinc (as Zn)	mg/l	IS 3025 (Part 86) : 2019	5	15	[illegible]

[illegible]

[illegible]

Technical Manager | Deputy Technical Manager | Technical Manager

DISCLAIMER

[illegible]

Anacon Laboratories Pvt. Ltd. Nagpur Lab
[illegible]

Anacon Laboratories

TC-5456

Test Report

TRF No: [illegible]
Test Report No: [illegible]

Issued 28.[illegible].2023

Page 1 of 1

Issued To: M/s Western Coalfields Limited (WCL) Pench Road, Civil Lines, Coal Estate Nagpur, WCL HQ [illegible]	Sample Received No.: [illegible] Received Date: [illegible] Reference: -	Analysis Start: [illegible] Analysis End: [illegible] Sample Category: Water
Sample Name: Water	Sample Particulars/Details: Water [illegible]	Purpose: Consumption Drinking / Quantity Received: 1 Ltr
Sample Collected By: Mr. [illegible]	Sampling Date: [illegible] Sampling Time: [illegible]	Sampling Location: Wanoja

Test Requested: Chlorides, Colour, Hardness, Calcium, Magnesium, Sulphate, Nitrate, Fluoride, Alkalinity, Total Dissolved Solids, Total Hardness, Arsenic, Chromium, Boron, Copper, Cadmium, Iron, Lead, Manganese, Nickel, Selenium, Zinc

TEST RESULTS

S.N.	Test Parameter	Measurement Unit	Test Method	Requirements as per IS 10500:2012 (Drinking Water Specifications) Including Amendment No. 1		Test Result
				Acceptable Limit	Permissible Limit	
I	Chemical Testing (Water)					
1	Alkalinity	mg/l	IS 3025 (Part 23) : 2023	200	600	200.00
2	Colour	Hazen	IS 3025 (Part 4) : 2021	5	15	[illegible]
3	Chloride (as Cl)	mg/l	IS 3025 (Part 32) : 1988	250	1000	150.00
4	Calcium (as Ca)	mg/l	IS 3025 (Part 40) : 1991	75	200	[illegible]
5	Residual Chlorine	mg/l	IS 3025 (Part 26) : 2022	0.2	-	MDL (0.01)
6	Fluoride (as F)	mg/l	IS 3025 (Part 60) : 2008	1.0	1.5	0.01
7	Magnesium (as Mg)	mg/l	IS 3025 (Part 46) : 1994	30	100	[illegible]
8	Nitrate (as NO_3)	mg/l	APHA (Ultraviolet Spectrophotometric Method)	45	No relaxation	[illegible]
9	Odour		IS 3025 (Part 5) : 2023	Agreeable	Agreeable	Agreeable
10	pH		IS 3025 (Part 11) : 2023	6.5 to 8.5	No relaxation	8.00
11	Sulphate (as SO_4)	mg/l	IS 3025 (Part 24) : 2023	200	400	[illegible]
12	Total Dissolved Solids	mg/l	IS 3025 (Part 16) : 1984	500	2000	[illegible]
13	Turbidity	NTU	IS 3025 (Part 10) : 1984	1	5	3.2
14	Total Hardness (as CaCO3)	mg/l	IS 3025 (Part 21) : 2009	200	600	[illegible]
II	Chemical Testing (Heavy Metals in Water)					
15	Arsenic (as As)	mg/l	IS 3025 (Part 37) : 2023	0.01	No relaxation	MDL (0.[illegible])
16	Cadmium (as Cd)	mg/l	IS 3025 (Part 41) : 2023	0.003	No relaxation	MDL (0.[illegible])
17	Boron	mg/l	IS 3025 (Part 57) : 2023	0.5	2.4	MDL (0.[illegible])
18	Copper (as Cu)	mg/l	IS 3025 (Part 42) : 2019	0.05	1.5	MDL (0.[illegible])
19	Chromium (as Cr)	mg/l	IS 3025 (Part 52) : 2019	0.05	No relaxation	MDL (0.[illegible])
20	Iron (as Fe)	mg/l	IS 3025 (Part 53) : 2019	1.0	No relaxation	0.27
21	Lead (as Pb)	mg/l	IS 3025 (Part 47) : 2019	0.01	No relaxation	MDL (0.[illegible])
22	Manganese (as Mn)	mg/l	IS 3025 (Part 59) : 2019	0.1	0.3	0.03
23	Nickel (as Ni)	mg/l	IS 3025 (Part 54) : 2019	0.02	No relaxation	MDL (0.[illegible])
24	Selenium (as Se)	mg/l	IS 3025 (Part 56) : 2022	0.01	No relaxation	MDL (0.[illegible])
25	Total Chromium (as Cr)	mg/l	IS 3025 (Part 52) : 2019	0.05	No relaxation	MDL (0.[illegible])
26	Zinc (as Zn)	mg/l	IS 3025 (Part 27) : 2023	5	15	MDL (0.[illegible])

NOTE: [illegible]

REMARKS: [illegible]

Verified By

Nagesh Patil
Technical Manager

Nikhil Dale
Deputy Technical Manager

Authorized Signatory

Bhushan Gadgil
Deputy Quality Manager

Thank You for [illegible]

Anacon Laboratories Pvt. Ltd. Nagpur Lab
[illegible]

Anacon Laboratories

TC-6488

Test Report

ULR No. [illegible]
Test Report No. [illegible]

Dated [illegible]

Issued To: M/s [illegible] Certificate Limited (WCS) [illegible] Nagpur, [illegible]	Sample Received No. [illegible] Inward Date [illegible] Reference -	Analysis Start [illegible] Analysis End [illegible] Sample Category [illegible]
Sample Name: Water	Sample Particulars/Details: Water [illegible]	Purpose of Analysis: Testing Quantity Received: 1 Ltr
Sample Collected By: Mr. [illegible]	Sampling Date: [illegible] Sampling Time: [illegible]	Sampling Location: [illegible]

Tests Received: [illegible]

TEST RESULTS

SN	Test Parameter	Measurement Unit	Test Method	Requirements as per IS 10500 : 2012 (Drinking Water Specification) Including Amendment No. 4		Test Result
				Acceptable Limit	Permissible Limit	
I	Physical Tests: Water					
1	Odour	[illegible]	IS 3025 (Part 5) : 1988	Agreeable	-	Agreeable
2	Colour	Hazen	IS 3025 (Part 4) : 2021	5	15	5
3	Chloride (as Cl)	mg/l	IS 3025 (Part 32) : 1988	250	1000	100.00
4	Calcium (as Ca)	mg/l	IS 3025 (Part 40) : 1991	75	200	47.7
5	Residual Chlorine	mg/l	IS 3025 (Part 26) : 2021	0.2	1	ND (DL - 0.1)
6	Fluoride (as F)	mg/l	IS 3025 (Part 60) : 2008	1.0	1.5	0.6
7	Magnesium (as Mg)	mg/l	IS 3025 (Part 46) : 1994	30	100	45.9
8	Nitrate (as NO_3)	mg/l	APHA Method 4500-NO_3 B : 2017	45	No relaxation	7.48
9	Odor	-	IS 3025 (Part 5) : 2018	Agreeable	Agreeable	Agreeable
10	pH	-	IS 3025 (Part 11) : 2023	6.5 to 8.5	No relaxation	7.91
11	Sulphate (as SO_4)	mg/l	IS 3025 (Part 24) : 2022	200	400	48.80
12	Total dissolved solids	mg/l	IS 3025 (Part 16) : 2023	500	2000	450
13	Turbidity	NTU	IS 3025 (Part 10) : 2023	1	5	0.5
14	Total hardness (as $CaCO_3$)	mg/l	IS 3025 (Part 21) : 2009	200	600	102
II	Chemical Tests: Metals in Water					
15	Aluminium (as Al)	mg/l	IS 3025 (Part 55) : 2023	0.03	No relaxation	ND (DL - 0.01)
16	Arsenic (as As)	mg/l	IS 3025 (Part 37) : 2023	0.05	0.1	ND (DL - 0.001)
17	Boron	mg/l	IS 3025 (Part 57) : 2023	0.5	2.4	ND (DL - 0.1)
18	Copper (as Cu)	mg/l	IS 3025 (Part 42) : 2019	0.05	1.5	ND (DL - 0.01)
19	Cadmium (as Cd)	mg/l	IS 3025 (Part 41) : 2019	0.003	No relaxation	ND (DL - 0.001)
20	Chromium	mg/l	IS 3025 (Part 52) : 2019	0.05	No relaxation	0.03
21	Lead (as Pb)	mg/l	IS 3025 (Part 47) : 2019	0.01	No relaxation	ND (DL - 0.01)
22	Manganese (as Mn)	mg/l	IS 3025 (Part 59) : 2019	0.1	0.3	0.06
23	Mercury (as Hg)	mg/l	IS 3025 (Part 48) : 2019	0.001	No relaxation	ND (DL - 0.01)
24	Nickel (as Ni)	mg/l	IS 3025 (Part 54) : 2019	0.02	No relaxation	ND (DL - 0.001)
25	Total Chromium (as Cr)	mg/l	IS 3025 (Part 52) : 2019	0.05	No relaxation	ND (DL - 0.01)
26	Zinc (as Zn)	mg/l	IS 3025 (Part 86) : 2019	5	15	ND (DL - 0.01)

NOTE: [illegible]

REMARKS: [illegible]

Verified By:

Shilpa Pande
Technical Manager

[illegible]
Deputy Technical Manager

Authorized Signatory:

[illegible]
Senior Quality Manager

This is to inform you that we have completed the analysis of your sample. We appreciate the opportunity to serve you and hope our service has met your expectations. We value your feedback and would be grateful if you could share your experience with us. Your feedback helps us improve our services and ensure we continue to meet your needs effectively.

Anacon Laboratories Pvt. Ltd. Nagpur Lab
[illegible]
Tel. [illegible] | Email: [illegible]
Website: www.anacon-laboratories.com

Anacon Laboratories

TC-6465

Test Report

[illegible]

Issued To: M/s [illegible] [illegible] Nagpur, [illegible]	Sample Inward No.: [illegible] Inward Date: [illegible] Reference: -	Analysis Start: [illegible] Analysis End: [illegible] Sample Category: Water
Sample Name: Water	Sampling Location/Details: [illegible]	Packing of Sample: [illegible] / Quantity Received: [illegible]
Sample Collected By: Mr. [illegible]	Sampling Date: [illegible] Sampling Time: [illegible]	Sampling Location: [illegible]

Test Requested: Alkalinity, Calcium, Chloride, Colour, Total Chlorine, Fluoride, Hardness, Nitrate, [illegible] as CaCO3, Total Iron, Total Chromium, Nickel, Selenium, Total Coliform, [illegible]

S.No.	Test Parameter	Measurement Unit	Test Method	Requirements as per IS 10500 : 2012 (Drinking Water Specification) Including Amendment No. 1		Test Result
				Acceptable Limit	Permissible Limit	
1	General Testing of Water					
2	Alkalinity	mg/l	IS 3025 (Part 23) : 1986	200	[illegible]	[illegible]
3	Colour	Hazen	IS 3025 (Part 4) : 2021	5	15	[illegible]
4	[illegible]	mg/l	IS 3025 (Part 32) : 1988	500	1500	[illegible]
5	[illegible]	mg/l	IS 3025 (Part 32) : 1988	75	200	[illegible]
6	Residual Chlorine	mg/l	IS 3025 (Part 26) : 1986	0.2	1	[illegible]
7	Fluoride (as F)	mg/l	IS 3025 (Part 60) : 2008	1.0	1.5	[illegible]
8	Magnesium (as Mg)	mg/l	IS 3025 (Part 46) : 1994	30	100	[illegible]
9	Nitrate (as NO3)	mg/l	IS 3025 (Part 34) (Annexure-A) : 2021	45	No relaxation	[illegible]
10	Odour	-	IS 3025 (Part 5) : 2018	Agreeable	Agreeable	Agreeable
11	pH	-	IS 3025 (Part 11) : 2022	6.5 to 8.5	No relaxation	[illegible]
12	[illegible]	mg/l	IS 3025 (Part 70) : 2021	200	600	[illegible]
13	Total Dissolved Solids	mg/l	IS 3025 (Part 16) : 1984	500	2000	[illegible]
14	Turbidity	NTU	IS 3025 (Part 10) : 1984	1	5	[illegible]
15	Total Hardness (as CaCO3)	mg/l	IS 3025 (Part 21) : 2009	200	600	600
16	Chemical Testing of Residues in Water					
17	Aluminium (as Al)	mg/l	IS 3025 (Part 55) : 2003	0.03	Not detectable	[illegible]
18	Arsenic (as As)	mg/l	IS 3025 (Part 37) : 2019	0.01	0.05	[illegible]
19	Boron	mg/l	IS 3025 (Part 57) : 2009	0.5	2.4	[illegible]
20	Copper (as Cu)	mg/l	IS 3025 (Part 42) : 2019	0.05	1.5	[illegible]
21	Cadmium (as Cd)	mg/l	IS 3025 (Part 41) : 2019	0.003	No relaxation	[illegible]
22	Iron (as Fe)	mg/l	IS 3025 (Part 53) : 2019	0.3	No relaxation	0.18
23	Lead (as Pb)	mg/l	IS 3025 (Part 47) : 2019	0.01	No relaxation	[illegible]
24	Manganese (as Mn)	mg/l	IS 3025 (Part 59) : 2019	0.1	0.3	[illegible]
25	Mercury (as Hg)	mg/l	IS 3025 (Part 48) : 2019	0.001	No relaxation	[illegible]
26	Selenium (as Se)	mg/l	IS 3025 (Part 56) : 2019	0.01	No relaxation	[illegible]
27	Total Chromium (as Cr)	mg/l	IS 3025 (Part 52) : 2019	0.05	No relaxation	[illegible]
28	Zinc (as Zn)	mg/l	IS 3025 (Part 86) : 2019	5	15	[illegible]

NOTE: [illegible]

[illegible]

Verified By

[illegible]
Technical Manager

[illegible]
Deputy Technical Manager

Authorized Signatory

[illegible]
Deputy Quality Manager

—END OF REPORT—

Thank You for putting in your faith and trust in our services. We at Anacon Laboratories cherish our relationship. We put in a lot of hard work to ensure a seamless experience at every step of our relationship. In order to ensure that your valued experience stands a gold-star rating, we request for your feedback post a mail at feedback@anacon.in

Anacon Laboratories Pvt. Ltd. Nagpur Lab
[illegible], 35 Road Park, Five Star Industrial Estate, MIDC Butibori, Nagpur, Maharashtra, India - 441 122
[illegible]
Web Site: www.anaconlaboratories.com

Anacon Laboratories

TC 5051

Test Report

ULR No.: [illegible]
Test Report No.: [illegible]

Date: [illegible]

Page 1 of 1

Issued To: M/s Western Coalfields Limited (WCL) Pench Area, Coal Estate, Gondia Nagpur, Maharashtra, 440001	Sample Received No.: [illegible] Received Date: [illegible] Reference: -	Analysis Start: [illegible] Analysis End: 26.06.2025 Sample Category: Water

Sample Name: Water	Sample Particulars/Details: Water (Well No. [illegible] Near South Area)	Purpose of Analysis: Drinking	Quantity Received: 1 Ltr
Sample Collected By: Mr. M. Rohy Mishra	Sampling Date: [illegible] Sampling Time: [illegible]	Sampling Location: Spot	

Tests Requested: Colourless, Odour, Chloride, Calcium, Hardness, Magnesium, Nitrate, Nitrite, Alkalinity, TDS, Sulphate, Total Hardness, Arsenic, Boron, Cadmium, Iron, Copper, Cyanides, Lead, Manganese, Fluoride, Selenium, Total Chromium, Zinc

TEST RESULTS

S.N.	Test Parameter	Measurement Unit	Test Method	Requirements as per IS 10500:2012 (Drinking Water Specifications) Including Amendment No. 1 Acceptable Limit	Permissible Limit	Test Result
1	Physical Testing of Water					
2	Alkalinity	mg/l	IS 3025 (Part 23): [illegible]	200	600	[illegible]
3	Colour	Hazen	IS 3025 (Part 4): [illegible]	5	15	[illegible]
4	Chloride (as Cl)	mg/l	IS 3025 (Part 32): 1988	250	1000	[illegible]
5	Calcium (as Ca)	mg/l	IS 3025 (Part 40): 1991	75	200	[illegible]
6	Residual Chlorine	mg/l	IS 3025 (Part 26): [illegible]	0.2	1	[illegible]
7	Fluoride (as F)	mg/l	IS 3025 (Part 60): 2008	1.0	1.5	[illegible]
8	Magnesium (as Mg)	mg/l	IS 3025 (Part 46): 1994	30	100	[illegible]
9	Nitrate (as NO3)	mg/l	APHA Standard Methods Ed. [illegible]	45	No relaxation	[illegible]
10	Odour	-	IS 3025 (Part 5): 2018	Agreeable	Agreeable	Agreeable
11	pH	-	IS 3025 (Part 11): 2022	6.5 to 8.5	No relaxation	[illegible]
12	Sulphate (as SO4)	mg/l	IS 3025 (Part 24): 2022	200	400	[illegible]
13	Total Dissolved Solids	mg/l	IS 3025 (Part 16): 1984	500	2000	[illegible]
14	Turbidity	NTU	IS 3025 (Part 10): 1984	1	5	[illegible]
15	Total Hardness (as CaCO3)	mg/l	IS 3025 (Part 21): 2009	200	600	[illegible]
16	Chemical Testing of Heavy Metals in Water					
17	Arsenic (as As)	mg/l	IS 3025 (Part 37): 2022	0.01	No relaxation	[illegible]
18	Aluminium (as Al)	mg/l	IS 3025 (Part 55): 2019	0.03	0.2	[illegible]
19	Boron	mg/l	IS 3025 (Part 57): 2019	0.5	2.4	[illegible]
20	Copper (as Cu)	mg/l	IS 3025 (Part 42): 2019	0.05	1.5	[illegible]
21	Cadmium (as Cd)	mg/l	IS 3025 (Part 41): 2019	0.003	No relaxation	[illegible]
22	Iron (as Fe)	mg/l	IS 3025 (Part 53): 2019	0.3	No relaxation	[illegible]
23	Lead (as Pb)	mg/l	IS 3025 (Part 47): 2019	0.01	No relaxation	[illegible]
24	Manganese (as Mn)	mg/l	IS 3025 (Part 59): 2019	0.1	0.3	[illegible]
25	Nickel (as Ni)	mg/l	IS 3025 (Part 54): 2019	0.02	No relaxation	[illegible]
26	Selenium (as Se)	mg/l	IS 3025 (Part 56): 2019	0.01	No relaxation	[illegible]
27	Total Chromium (as Cr)	mg/l	IS 3025 (Part 52): 2019	0.05	No relaxation	[illegible]
28	Zinc (as Zn)	mg/l	IS 3025 (Part 27): 2019	5	15	[illegible]

NOTE: [illegible]

Verified By

Technical Manager

Technical Manager

Authorized Signatory

Deputy Quality Manager

END OF REPORT

Thanks for putting trust in our lab. [illegible] Anacon Laboratories. [illegible] Please [illegible] in order to improve [illegible] your next experience with us significantly better. [illegible] on feedback@anacon.in

Anacon Laboratories Pvt. Ltd. Nagpur Lab
[illegible] Maharashtra [illegible]
[illegible] Email: [illegible]
[illegible]

ANNEXURE 34

वेस्टर्न कोलफील्ड्स लिमिटेड
Western Coalfields Limited
(A Subsidiary of Coal India Limited)

[illegible]

[illegible]

[illegible]

दिनांक- [illegible] 2021

LIGHTING SURVEY REPORT FOR MINE LIGHTING

Sl No	Location	Standard Illumination in Lux		Measured Illumination in Lux (Value in ℓ)		Remark
		H	V	H	V	
1	Work place of heavy machinery	15	45			
	(Coal Face			8	10	
	(OB Face			20	05	
2	Drilling operation:					
	(i) Area where drilling rig works		25		01	
	(ii) Area where drill holes are	15		00		
3	Places where manual work is done	15	35	-		
4	Places where loading, unloading or transfer, loading dumpers, trucks or trains is carried on (Including OB Dump and Coal Stock Pard)	15	35			
	(i) Hard dumping			-	-	
	(ii) BC carpet			-	-	
	(iii) Coal stock			04	06	
5	Operator cabin of machine or mechanical	50				
	PC Valve new			42		
6	Haul roads for Trucks and Dumper	10				
	(Haul roads for TLC) and Dumper			08		
	(Haul road for B/C patch			-	-	
7	Roadways & footpath from bench to bench	10		-	-	
8	Permanent junction for use of persons employed	10		-	-	

9	Coal Handling Plant					
	a) Place of crushing screening, segregation and loading/ unloading	40		35		
	b) Operation point	50		35		
	c) Other places of operation of electrical apparatus / equipment	20		-	-	
30	Pumping Station	70		30		
	I) Electrical Substation					
	II) Electrical Substation	300	50	-	-	
	ii) Other places of operation of electrical apparatus / equipment	20	20	-	-	
32	First Aid Station	50		20		
33	Rest Shelter	50		25		
34	Workshop	100	50	50	22	
35	Parking Yard	50		14		

W.L (Mining)
Amalgamated Yekona I&II OC Mine

W.L (Mining)
Amalgamated Yekona I&II OC Mine

Mine Engineer
Amalgamated Yekona I&II OC Mine

Safety Officer
Amalgamated Yekona I&II OC Mine

Mine Manager
Amalgamated Yekona I&II OC Mine

ANN 34

पश्चिम कोलफील्ड्स लिमिटेड
Western Coalfields Limited
(मिनिरत्न कंपनी) (A Miniratna Company)
(कोल इंडिया लिमिटेड की अनुषंगी कंपनी)
(A Subsidiary of Coal India Limited)

Office of the Mine Manager, Amalgamated Yard Opt OC Mine
पत्रांक / Ref No. / दिनांक / Date

Subject: [illegible]

संदर्भ: [illegible] दिनांक: 05/09/2023

LIGHTING SURVEY REPORT FOR MINE LIGHTING

Sl No	Location	Standard Illumination in Lux		Measured Illumination in Lux (Values-II)		Remark
1	Work place of heavy machinery:	H	V	H	V	
		15	25			
	(i) Coal Face			5	25	
	(ii) OB Face			10	25	
2	Drilling operations					
	(i) Area where drilling is going on		25		50	
	(ii) Area where drill holes exists	25		10		
3	Places where manual work is done	25	25	-	-	
4	Places where loading, unloading or transfer, loading dumpers, trucks or trains is carried on (including Oil Dump and Coal Stack Yard)	25	15			
	(i) Hard dumping			33	30	
	(ii) SC dumping			-	-	
	(iii) Coal stack			104	6	
5	Operator cabin of roads re or mechanized	50				
	(i) Surface Miner	-		50		
	(ii) FC Valve-235			65		
	(iii) Dozer (DD-112)			80		
6	Haul roads for Trucks and Dumper	10				
	(i) Kutcha road			3.0		
	(ii) Hard roads for Trucks and Dumper			6.2		
	(iii) Haul road for D/C patch			-		
7	Roadways & footpaths from bunch to bunch	10		-	-	
8	Permanent paths for use of persons employed	10		-	-	

9	Coal Handling Plant					
	a) Plant of crushing screening, segregation and loading/ unloading	40		-	-	
	b) Operation plant	50		-	-	
	c) Other places of operational and/ or maintenance / equipment	30		-	-	
10	Pumping Station	40				
	Electrical Substation					
	i) Electrical Substation	100	50	80	45	
	ii) Other places of operation of electrical apparatus / equipment	30	30	-	-	
12	First Aid Station	30		40		
13	Rest Shelter	30		22		
14	Workshop	150	50	45	30	
15	Parking Yard	50		31		

W.C. (Mining)
Amalgamated Yelona I&II OC Mine

W.C. (Mining)
Amalgamated Yelona I&II OC Mine

Mine Engineer (Mine)
Amalgamated Yelona I&II OC Mine

Safety Officer
Amalgamated Yelona I&II OC Mine

18/09/23
Mine Manager
Amalgamated Yelona I&II OC Mine

FOR THE MONTH OF APRIL 2023

DATE: 23/04/2023

TO WATER TUNNEL (TUNNEL GROUND)

Sl. No.	Type of M/C	White Idle (dB)	White Loading (dB)	White Drilling (dB)	White Tipping (dB)
01.	30-864	76.0dB(A)	84.3dB(A)	99.1 dB(A)	96.6dB(A)
02.	40-704	75.3dB(A)	89.9dB(A)	98.8dB(A)	96.6dB(A)
03.	40-1002	75.6dB(A)	91.8dB(A)	97.6dB(A)	98.7dB(A)
04.	40-1001	77.5dB(A)	89.9 dB(A)	98.5dB(A)	99.8dB(A)

EXCAVATOR :-

Sl. No.	M/C. No	White Running (inside)	White Running (outside)
01.	2090-1130(B)	90.1 dB(A)	89.9 dB(A)
02.	40 - 289	90.6dB(A)	90.1dB(A)

FOR LOADER :-

Sl. No.	M/C. No.	White Idle (dB)	White Running (inside cabin)	White Running (outside cabin)
01.	VE-L150(B)	82.1dB(A)	75.3dB(A)	76.9 dB(A)

DRILL MACHINE :-

Sl. No.	M/C No.	White Idle (dB)	White Drilling (inside cabin)	White Drilling (outside cabin)
01.	2019-2000 (D3)	78.2 dB	83 dB	81 dB(A)

DOZER :-

Sl. No.	M/C No.	White Idle (dB)	White Running (inside cabin)	White Running (outside cabin)
01.	20-130	80.1 dB(A)	85.3dB(A)	87.1 dB(A)

GRADER

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

FOR THE MONTH OF MAY - 2022

[illegible] SINGING [illegible]

Sl. No.	Tripper No.	While Idle (dB)	While Loading (dB)	While Running (dB)	While Tripping (dB)
01	[illegible]	53.1	63.1(dB)	74.5(dB)	74.8(dB)
02	[illegible]	53.7	69.9(dB)	76.2(dB)	86.0(dB)
03	[illegible]	63.2	74.2(dB)	73.2(dB)	90.1(dB)
04	[illegible]	47.8	74.6(dB)	73.1(dB)	89.2(dB)
05	[illegible]	55.3	68.1(dB)	72.4(dB)	95.1(dB)

[illegible] :-

Sl. No.	M/C No.	WHILE RUNNING (Inside Cabin)	WHILE RUNNING (Outside)
01.	[illegible]	73.8 dB(A)	86.2 dB(A)
02.	[illegible]	78.1 dB(A)	89.9 dB(A)

[illegible] LOADER :-

Sl. No.	M/C No.	WHEN IDLE (dB)	WHILE Running (Inside Cabin)	While Running (Outside Cabin)
1.	[illegible]	82.4 dB(A)	93.4 dB(A)	96.4 dB(A)

[illegible] DRILL MACHINE :-

Sl. No.	M/C No.	While Idle (dB)	While Drilling (Inside Cabin)	While Drilling (Outside Cabin)
1.	[illegible]	76.4 dB	88.2(dB)	89.2(dB)
2.	[illegible]	76.3(dB)	89.2(dB)	90.9(dB)

[illegible] :-

Sl. No.	M/C No.	While Idle (dB)	While Running (Inside Cabin)	While Running (Outside Cabin)
1.	[illegible]	82.2(dB)	84.6(dB)	85.2(dB)

ANN 34 (23)

Conductor

Sl. No.	MC No.	While Idle (Ah)	While Running Inside Cabin	While Running Outside Cabin (Ah)
1	16 HCL (3)	5.9(Ah) (A)	1.19 (Ah)	80.1 (Ah)

Chief Engineer
S.E. (C)
Dept. of Railways

Sub Divisional Officer
Railway Electrical
Sub-Divisional Officer
Railway Electrical

FOR THE MONTH OF JUNE 2023

ANN 34

Dt. 14.08.2023

IN TIPPER (INSIDE CABIN)

Sl. No.	Type No	While Idling (dB)	While Loading (dB)	While Running (dB)	While Reversing (dB)
01	[illegible]-1199	61.4	66.0	74.5	68.9
02	[illegible]-1198	60.3	65.1	75.0	69.7
03	[illegible]-1197	59.7	64.9	76.1	65.4
04	[illegible]-1196	61.9	65.7	75.2	66.1
05	[illegible]-1191	62.1	66.4	74.8	69.1

Excavator

Sl. No.	M/C No	While Idle (Inside Cab)	While Loading (Inside Cab)	While Running (Inside Cab)
01	Volvo-EC-289	67.[illegible] dB(A)	80.[illegible] dB(A)	75.[illegible] dB(A)
02	Volvo-EC-289	76.5 dB	82.5 dB	93.[illegible] dB(A)
03	Volvo-EC-289	70.5 dB	75.9 dB	80.[illegible] dB(A)

SURFACE MINER

Sl. No.	M/C No.	While Idle dB(A) (Inside)	While Operation dB(A) (Inside)
01	Wirtgen-Bosch SM 48	69.1 dB(A)	78.[illegible] dB(A)

DOZER

Sl. No.	M/C No.	While Idle (Inside Cabin)	While Running (Inside Cabin)
01	[illegible] ([illegible])	92.[illegible] dB(A)	86.2 dB(A)

ANN 34 (39)

Fog Leader

[illegible]	M/C [illegible]	White [illegible]	White [illegible]
[illegible]	Value - [illegible]	[illegible] 53.5 [illegible]	[illegible]

[illegible]

[illegible]

[illegible]

FOR THE MONTH OF JULY 2023

ANN 34

(80)

Dt: 08/07/2023

HEAVY EQUIPMENT (Crane Crane)

Sl. No.	Type No.	Noise Inside	Noise Operating Inside (dB)	Noise Operating Outside (dB)	Noise Operating Outside (dB)
01.	1994	56.1	78.1	66.3	65.2
02.	do-1997	57.0	78.9	68.5	65.2
03.	do-1998	56.9	75.8	68.0	62.6
04.	do-1999	56.7	74.4	66.4	64.2

Excavator :-

Sl. No.	M/C No.	Noise Inside (dB)	Noise Operation Inside (dB)	Noise Operation Outside (dB)
01.	WF-358	55.2	78.3	74.6
02.	EX 862	57.3	74.1	73.0

Dy Loader :-

Sl. No.	M/C No.	Noise Operation Inside (dB)	Noise Operation Outside (dB)
01.	VAVE-24	71.2	71.3

GRADER :-

Sl. No.	M/C No.	Noise Idle (dB)	Noise Running Inside (dB)	Noise Running Outside (dB)
01.	GRADER 07	59.3	73.0	60.1

Colliery Manager
Area/Colliery

For the month of August - 2023

ANN 34

Date: 08-2023

Tipper (Double Gear)

Sl No	Tipper No	Idle time (hrs)	Work time (hrs)	Work Percent (%)	Work efficiency (%)
1	KD-1050	53.3	63.3	70.3	66.3
2	KD-1097	61.1	66.1	82.3	70.2
3	KD-835	60.0	65.9	72.8	69.0
4	KD-1083	61.7	65.5	73.2	69.2

Excavator

Sl No	M/c No	Idle time (hrs)	Work operation (hrs)	Work efficiency (%)
1	EX-330	58.3	77.2	78.3
2	EX-113	56.6	74.3	77.2

Pay Loader

Sl No	M/c No	Idle operation	Work efficiency
1	KD 1503M	75.4	76.3

Grader

Sl No	M/c No	Idle time	Work operation	Work efficiency
1	KR-56	53.2	76.3	77.2

SURFACE MINOR

SL NO	W/C NO	WORK DESCRIPTION	WORK STATUS
1	[illegible]	[illegible]	[illegible]

[illegible]

Umesh ch. [illegible]
25.08.2020

25/08/23

[illegible]
APPLICATION [illegible]
[illegible]

DATE	TIME	LOCATION	NOISE LEVEL (dB)	ILLUMINATION LEVEL (Lux)
[illegible]	3.09p.m	Charmishahi Chowk	49.1	1
[illegible]	3.16p.m	Yekana Village Gate	46.3	1
[illegible]	3.33p.m	Mavda Village Road near camp	48.2	0
28.10.2011	8.10p.m	Charmishahi Chowk	49.7	1
[illegible]	8.21p.m	Yekana Village Gate	45.3	1
[illegible]	8.54p.m	Mavda village road near camp	40.0	0
16.11.2012	8.10p.m	Charmishahi Chowk	48.2	1
16.11.2012	8.43p.m	Yekana village Gate	46.1	1
16.11.2012	9.10p.m	Mavda village road near camp	40.1	0
21.12.2012	8.20p.m	Charmishahi Chowk	49.4	1
21.12.2012	8.45p.m	Yekana Village Gate	45.2	1
21.12.2012	8.55p.m	Mavda Village road near camp	40.1	0

Third party Assessment of EC compliance of Amalgamated Yekona-I & II OC Mine Project

Sponsor

WESTERN COALFIELDS LIMITED
MAJRI AREA

CSIR-National Environmental Engineering Research Institute, Nagpur-440020

EC COMPLIANCE REPORT

Project : *Amalgamated Yekona-I& II OC Mine Project*

Clearance letter No. : J-11015/381/2015-IA.II(M) **Date : 01.01.2021**

SR.NO.	**Condition**	**Compliance Status**	**NEERI Remark**
4(i)	The Environment Clearances issued vide letter no. vide letter J-11015/175/2006-IA. II(M) Dated 17 October 2006 and J-11015/182/2006-IA. II(M) Dated 17 October. 2006 shall be applicable along with conditions.	Noted and same is being complied	No remark
(ii)	The proponent shall obtain Consent to Establish/ Operate from the State Pollution Control Boards for the proposed capacity of 2.75MTPA prior to commencement.	1st CTO granted vide letter no. Format1.0/CAC/UAN No. MPCB-CONSENT-0000105075/CO-2110000179 dated 05.10.21 valid upto 31.03.2023 for 2.75 MTY capacity	Verified from document
(iii)	Third party monitoring (by NEERI/CIMFR/IIT/NITs) for air quality shall be carried out at identified locations. Both ambient and the process area, to arrive at impact of the proposed expansion at regular interval of 3 years.	Noted. Third party monitoring (by NEERI/CIMFR/IIT/NITs) for air quality will be done within the 3 yrs of grant of EC i.e. before 01.01.2024 and same will be repeated thereafter every 3 years	No remark
(iv)	Top soil should be stored separately at marked area and necessary vegetation shall be maintained to avoid any entrainment of dust.	Top soil is being stored at designated Top Soil dump of Yekona I quarry with an area of 9.90 Ha & height of 45 mtrs. Top Soil dump of Yekona II quarry with an area of 14.3 Ha & height of 30 mtrs Grass seeding is being done to avoid fugitive dust from dump	Verified during site visit
(v)	PP shall construct embankment leaving 100 mtrs away from HFL of Wardha river and the same shall be taken prior approval from DGMS	Noted. However, Embankment is constructed for Yekona I quarry (Length: 2.40 kms, Height: 10 mtrs (max.), Width at top: 30 mtrs and width at bottom: 50 mtrs) & for Yekona II quarry (Length: 7.20 kms, Height: 10 mtrs (avg.), Width at top: 30 mtrs and width at bottom: 50 mtrs)	Verified during site visit

(vi)	Transportation of coal from coal handling plan shall be through mechanized covered trucks for 3 years. No transportation by trucks after 3 years and proposed railway siding/pipe conveyor system.	Mechanically closed trucks are not provided by any truck maker for coal in India. However, tarpaulin covering is being ensured for all the coal transportation trucks.	Verified during site visit
(vii)	All the villages coming under the zone of influence as in hydrology study shall be provided with suitable water supply along with sanitation facility	Water supply arrangements will be made for all the villages coming under zone of influence, if there is any water scarcity reported in any of the village	Verified
(viii)	Commitment made during public consultation process shall be adhere to. As proposed, Rs.45.35 Crore is earmarked for CER activities shall be considered as part of Environment Management Plan, which shall be accomplished within period of 5 years.	Noted. The work of providing tubewell at Charurkhati village is awarded as per the commitment made during public hearing	No remark
(ix)	Water quality and bioassay test of Wardha River shall be monitored quarterly and submitted to State Pollution Control Board. No water shall be discharged in river.	Water quality and bioassay test of Wardha River is being monitored quarterly. (copy of reports of the month July 2021, Oct 2021 & Jan 2022 enclosed) Report of same is being submitted to MPCB, MOEF Regional offices along with six monthly EC Compliance report.	Test report verified during site visit
(x)	Quarterly monitoring of quality of water from bore hole used for drinking purpose shall be conducted and report thereof shall be submitted to SPCB.	Drinking water monitoring is being done on quarterly basis through CMPDIL. (copy of reports of the sampling of July 2021 & Jan 2022 enclosed) Report of same is being submitted to MPCB, MOEF Regional offices along with six monthly EC Compliance report.	Water quality test report verified
(xi)	Progressive backfilling of mine and progressive reclamation of OB dump shall be done	Noted and same is being done as per mining plan	No remark

<table>
<tr><td>(xii)</td><td>To control the production of dust at source, the crusher and in-pit belt conveyors shall be provided with mist type sprinklers.</td><td>Surface Miner is provided to avoid fugitive emission due to crushing at Yekona II quarry

Also, fixed sprinklers are provided at coal stockyards.

Supply Order of 5 nos. Mist Cannon of 100 mtrs throw is issued and out of which, 1 no. mist cannon is installed at Coal stockyard of mine</td><td>Verified during site visit</td></tr>
<tr><td>(xiii)</td><td>Mitigating measures shall be undertaken to control dust and other fugitive emissions all along the roads by providing sufficient fixed type water sprinklers. Adequate corrective measures shall be undertaken to control dust emissions, which would include mechanized sweeping, water sprinkling/mist spraying on haul roads and loading sites, long range misting/fogging arrangement, wind barrier wall and vertical greenery system, green belt, dust suppression arrangement at loading and unloading points, etc.</td><td>15 nos. fixed sprinklers are provided at coal stockyard of Yekona I OC and 15 nos. fixed sprinklers are provided at coal stockyard of Yekona II OC

15 nos. fixed sprinklers installed at Weigh Bridge.

5 nos. mist cannon of 100 mtrs throw with 320 deg rotation (Supply Order issued) out of which, 1 no. is installed at Coal Stockyard

10,000 nos. trees over an area of 4 Ha is planted as wind barrier and green belt between mine and Yekona village & 15,000 nos. over an area of 6 Ha on Top Soil Dump during 2021-22.

<table><tr><td>FY</td><td>Nos.</td><td>Area (Ha)</td></tr><tr><td>2021-22</td><td>25,000 Nos.</td><td>10 Ha</td></tr><tr><td></td><td></td><td></td></tr></table></td><td>Verified during site visit</td></tr>
<tr><td>(xiv)</td><td>Continuous monitoring of occupational safety and other health hazards, and the corrective actions need to be ensured.</td><td>Regular PME of departmental as well as contractual worker is being done for Occupational and other health hazards.

PME during Year 2021 of 206 Deptt. Worker and IME during Year 2021 of 56 Contractual worker of Yekona I OC Mine and 320 Contractual worker of Yekona II OC Mine</td><td>Verified</td></tr>
<tr><td>(xv)</td><td>The total industrial water demand (peak) in operation phase shall be met by utilizing treated mine discharge water. If require,</td><td>Water demand for fire-fighting, dust suppression etc is met through mine discharge only.</td><td>ETP is constructed and use as an when required</td></tr>
</table>

	necessary arrangement shall be made to reuse treated water from STP&ETP to nearby TPP or coal washery /or future coal washery by entering suitable agreement. No wastewater (treated or untreated) shall be discharged into the river or any other water body.	ETP effluent is being recycled for washing of HEMM & STP effluent is being used for gardening purpose. Same is in acclimatization stage	due lack of wastewater. The vehicles used in the mining process are outsourced. Treated water is being recycled and used for washing of HEMM. 5KLD MBBR based STP installed to treat the canteen sewage. Presently, STP under microbial cultural acclimatization stage with generated sewage as organic load.
(xvi)	PP shall take permission of state public works Department before the proposed diversion of Road. Road between Naidev village to Warora shall be constructed by project proponent in co-ordination with PWD atleast 7 mts width and tree plantation shall be done along with road (both sides).	Noted. PWD Permission will be sought before the diversion of road and both side tree plantation condition will also be complied.	No remark
(xvii)	STP for proposed colony shall be constructed within one year of implementation of colony	Noted. Modular STP of 5 KLD Capacity is provided for mine premises & same is in acclimatization stage However, there is no colony for this mine, STP for colony will be provided whenever the colony will be constructed	5KLD MBBR based STP installed to treat the canteen sewage. Presently, STP under microbial cultural acclimatization stage with

			generated sewage as organic load.
(xviii)	Toe wall of atleast 15 mts to 20 mts height should be constructed along the OB dump to protect Yekona village.	Toe wall of adequate height wherever necessary will be constructed along OB dump	Verified during site visit
(xix)	5 Fog canon shall be installed to reduce the impact of air pollution for nearby yekona village.	5 nos. Mist cannon of 100 mtrs throw with 320 deg rotation is in procurement (Supply Order issued) out of this, 1 no. is installed at Coal stockyard	Verified during site visit
(xx)	Water storage ponds shall be constructed of appropriate depth in nearby villages (Pandurni village, Wanoja village, Naydev village and Mohbala village) in collaboration with Gram Panchayats	Noted. Water storage pond will be constructed if any nearby village demand for the same.	No remark
(xxi)	Peripheral tree plantation of local species in nearby village (pandurni village, Wanoja village, Naydev village and Mohbala village) in collaboration with Gram Panchayats	10,000 nos. trees of native species over an area of 4 Ha as green belt/ wind barrier between mine and nearby Yekona village is planted in FY 2021-22	Verified during site visit
(xxii)	Fund allocated in Approved Wildlife conservation plan for schedule I species shall be deposited within six months of issue of EC letter.	Fund of Rs 35 Lakhs allocated for GIB Conservation was deposited to DFO, Chandrapur vide Cheque no. 013366 dated 06.08.2020.	Verified from document
(xxiii)	Green belt along the boundary should be developed on priority basis preferably within first 3 years	10,000 nos. trees of native species over an area of 4 Ha as green belt/ wind barrier between mine and nearby Yekona village is being planted in FY 2021-22. Further green belt around the mine will be strengthened in coming years.	Verified during site visit
(xxiv)	The recommendation of scientific Study for method of Working, Ultimate Pit Slope, Dump Slope & Monitoring of slope stability conducted by Indian Institute of	Noted and same is being complied	No remark

<table>
<tr><td></td><td>Technology, Kharagpur shall be complied</td><td></td><td></td></tr>
<tr><td>(xxv)</td><td>3-teir Tree plantation with wired fencing shall be project proponent for clearly demarcating forest land adjacent forest land.</td><td>Noted and same will be implemented</td><td>No remark</td></tr>
<tr><td>(xxvi)</td><td>Persons of nearby villages shall be given training on livelihood and skill development to make them employable.</td><td>Skill Development training is being organised regularly (such as Tailoring, Beauty Parlour, Computer education, Security Guard etc.) for persons living in nearby villages</td><td>Verified</td></tr>
<tr><td>(xxvii)</td><td>Mining shall be carried out only by surface miners for the project (as proposed) and silo loading till railway siding through in-pit conveyor should be installed to avoid road transportation in 3 years.</td><td>Mining is being done partially by Surface Miners wherever topography, gradient is favourable.

Remaining coal excavation is being done through Shovel-dumper combination.</td><td>Verified</td></tr>
<tr><td>(xxviii)</td><td>Efforts shall be made for utilizing alternate sources water, abandoned mines or else whatsoever and thus minimizing the dependability on a single source.</td><td>Mine water is being utilised for all the activities such as fire-fighting, dust suppression etc</td><td>Verified during site visit</td></tr>
<tr><td>(xxix)</td><td>Active OB Dump should not be kept barren/open and should be covered by Temporary grass to avoid air born of particles.</td><td>Noted

Grass seeding is done over the benches, embankment, Top Soil dump & OB Dump</td><td>Verified during site visit</td></tr>
<tr><td>(xxx)</td><td>Project proponent to plant 150,000 nos. of native trees with broad leaves along the transportation route in three years to prevent the effect of air pollution. After completion of tree plantation. Number of trees shall be duly endorsed from District Forest Officer.</td><td>10,000 nos. trees of native species over an area of 4 Ha as green belt/ wind barrier between mine and Yekona Village are planted as on date on plain land. 15,000 nos. over an area of 6 Ha is planted on Top Soil dump in FY 2021-22
<table><tr><td>FY</td><td>Nos.</td><td>Area (Ha)</td></tr><tr><td>2021-22</td><td>25,000 Nos.</td><td>10 Ha</td></tr><tr><td></td><td></td><td></td></tr></table>Tree Plantation work is being</td><td>Verified during site visit</td></tr>
</table>

		undertaken by Madhya Pradesh Rajya Van Vikas Nigam Ltd.	
(xxxi)	Project Proponent shall obtain blasting permission from DGMS for conducting mining operation near villages and also explore development of rock breakers of suitable capacity in the project to avoid blasting very near to villages. There shall be no damages caused to habitation/structures due to blasting activity.	Blasting permission is obtained from DGMS	Verified
(xxxii)	The project proponent shall complies with all the statutory requirements and judgment of Hon'ble Supreme Court dated the 2nd August 2017 in Writ petition (Civil) No.114 of 2014 in the matter of Common Cause versus Union of India and Ors. State Government shall ensure that the entire compensation levied. If any, for illegal mining paid by the project proponent through their respective Department in strict compliance of judgment of Hon'ble Supreme Court dated the 2nd August 2017 in writ petition (Civil) No. 114 of 2014 in the matter of common Cause versus Union of India and Ors.	Noted	No remark
(xxxiii)	Project Proponent shall obtain the necessary prior permission from the Central Ground Water Authority (CGWA) in case of intersecting the Ground water table.	CGWA NOC Obtained vide NOC no. CGWA/NOC/MIN/ORIG/2019/6689 dtd 19.11.2019 valid upto 18.11.2021. Renewal application is submitted on 17.11.2021	Renewal application
(xxxiv)	Proponent shall appoint an Occupational Health Specialist for Regular and Periodical medical examination of the workers engaged in the Project and maintain records accordingly; also, Occupational health check-ups for workers having some ailments like BP,	Complied Regular and Periodical medical examination (IME and PME) of the workers (Departmental as well as contractual workers) has been undertaken at Majri Area Hospital of WCL. Area Hospital is headed by Chief Medical Officer.	Verified from record

	diabetes, habitual smoking, etc. shall be undertaken once in six months and necessary remedial/ preventive measures taken accordingly. The Recommendations of National Institute for ensuring good occupational environment for mine workers shall be implemented; The prevention measure for burns, malaria and provision of anti-snake venom including all other paramedical safeguards may be ensured before initiating the mining activities	There is 1 No. PME incharge and 1 No. PME co-incharge with appropriate medical qualifications. There are five assisting Doctors. In addition, there is 1 No. PME Clerk and 2 Nos assisting category workers.	
(xxxv)	Project Proponent shall follow the mitigation measures provided in office memorandum No.Z-11013/57/2014-IA.II (M), dated 29october, 2014, titled "Impact of mining activities on Habitations-Issues related to the mining Projects wherein Habitations and villages are the part of mine lease areas or Habitations and villages are surrounded by the mine lease area".	Noted and is being complied	No remark
(xxxvi)	The illumination and sound at night at project sites disturb the villages in respect of both human and animal population. Consequent sleeping disorders and stress may affect the health in the villages located close to mining operations. Habitations have a right for darkness and minimal noise levels at night. PPs must ensure that the biological clock of the villages is not disturbed; by orienting the floodlights/ masks away from the villagers and keeping the noise levels well within the prescribed limits for day light/ night hours.	Noted It is ensured that the biological clock of the villages is not disturbed; by orienting the floodlights/ masks away from the villagers and keeping the noise levels well within the prescribed limits for day light/night hours	
(xxxvii)	The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered fauna, spotted in	Fund of Rs 35 Lakhs allocated for GIB Conservation was deposited to DFO, Chandrapur vide Cheque no. 013366 dated 06.08.2020.	Verified from document

	the study area. Action plan for conservation of flora and fauna shall be implemented in consultation with the State Forest and Wildlife Department. A copy of action plan shall be submitted to the Ministry of Environment, Forest and Climate Change and its Regional Office.	Awareness rally in nearby villages in collaboration with forest deptt is also organised on 11.02.2021	
(xxxviii)	Hon'ble Supreme Court in an writ petition (s) Civil No. 114/2014,Common Cause vs Union on India & Ors vide its judgement dated 8th January, 2020 has directed the union of India to impose a condition in the mining lease and a similar condition in the environmental clearance and the mining plan to the effect that the mining lease holders shall, after ceasing mining operations, undertake re-grassing the mining area and any other area which may have been disturb due to their mining activities and restore the land to a condition which is fit for growth of fodder, flora, fauna etc. Compliance of this condition after the mining activity is over at the cost of the mining lease holders/Project Proponent". The implementation report of the above said condition shall be sent to the Regional Office of the MoEFCC.	Noted. Grass seeding of embankment, benches is already been done. Also, grass seeding of top soil dump and OB dump will be done once dump become inactive.	Verified during site visit

Specific condition with respect area being in CPAs

(i)	CTE/CTO for the project shall be obtained from the SPCB as required under the Air(Prevention and control of pollution) Act,1981 and the water (Prevention of control of Pollution) Act,1974, and the SPCB shall follow the mechanism/protocol issued by the Ministry vide letter no.Q-16017/38/2018-CPA dated 24october,2019 while issuing the	1st CTO granted vide letter no. Format1.0/CAC/UAN No. MPCB-CONSENT-0000105075/CO-2110000179 dated 05.10.21 valid upto 31.03.2023 for 2.75 MTY capacity CTE approved vide 23rd CAC Meeting dtd 17.03.2021 /CTE letter issued vide letter no. format 1.0/CAC/UAN no.	Verified

	CTE/CTO for the project, for improvement of environment of environmental quality in the area.	0000104421 /CE – 2105001339 dated 31.05.2021 for capacity 2.75 MTY.	
(ii)	The green belt of at least 5-10 m width shall be developed in more than 40% of the total project area, mainly along the periphery of mine boundary, in downward wind direction, and along road sides etc. Selection of plant species shall be as per the CPCB guidelines in consultation with the State Forest Department.	10,000 nos. trees of native species over an area of 4 Ha as green belt/ wind barrier between mine and Yekona Village are planted as on date on plain land. The width of green belt is more than 50 mtrs	Verified during site visit
(iii)	In addition, the project proponent shall develop greenbelt outside the plant premises such as avenue plantation, plantation in vacant areas, social forestry etc.	Noted Bamboo Plantation as Avenue/ Road side plantation is done in 2021 monsoon Plants distribution to nearby villages (such as Yekona, Marda, Charurkhati etc) as steps towards collaboration with nearby villages and increasing green cover in nearby village area	Bamboo plantation as the road side plantation verified
(iv)	Monitoring of compliance of EC condition may be submitted with third party audit every year.	Noted and Work for same is awarded to NEERI Nagpur vide award letter no. WCL/HQ/ENV/16-J/73-81 dated 26.10.2021	This report is for the same
(v)	Fund allocation for Corporate Environment Responsibility (CER) which is atleast 2 times as per OM of 1st May,2018 may now be considered as 2 time of fund allocated on commitment made during public consultation process for incorporating in EIA-EMP for deliberation of EAC and item-wise details along with time bound action plan shall be prepared and submitted to the Ministry's Regional Office.	Noted and same will be spent over the coming years	No remark

(vi)	Effective fugitive emission control measures should be imposed in the process, transportation, packing etc.	Complied. 15 nos. fixed sprinklers are provided at Coal stockyard (Yekona I OC) and at Coal stockyard (Yekona II OC) to control fugitive emission 15 nos. fixed sprinklers at Weigh Bridge 2 nos. 15 KL Mobile water tankers are deployed on Coal transportation road and haul road 5 nos. Mist cannon of 100 mtrs throw with 360 deg rotation are in procurement stage (Supply order issued) out of which 1 is installed & operational at Coal stockyard Grass seeding over embankment, benches is done 10,000 nos. trees of native species over an area of 4 Ha as green belt/ wind barrier between Yekona II OC mine OB Dump and Yekona Village are planted. Green belt between mine OB dumps and mine boundary will further strengthened/ developed	Verified during site visit
(vii)	Transportation of materials by rail/ conveyor belt , wherever feasible.	Noted and will be complied Study conducted by GMR for installation of Pipe Conveyor between Yekona Mine and GMR power Plant. Proposal of Railway Siding is also under consideration	No remark
(viii)	A detailed water harvesting plan may be submitted by the project proponent	Roof Top Rain Water Harvesting is installed over office building such as Sub Area Manager Office, Manager Office etc.	Verified during site visit

		Pond deepening for nearby villages to increase water recharge and water holding capacity of ponds is being done before monsoon as per the requirement of villagers	
(ix)	In case, domestic waste water generation is more than 10 KLD, the industry may install STP.	Modular STP for mine premises of 5 KLD Capacity is provided. Same is in acclimatization stage	5KLD MBBR based STP installed to treat the canteen sewage. Presently, STP under microbial cultural acclimatization stage with generated sewage as organic load.
(x)	Monitoring of compliance of EC conditions may be submitted with third party audit every year	Noted and Work for same is awarded to NEERI Nagpur vide award letter no. WCL/HQ/ENV/16-J/73-81 dated 26.10.2021	This report is for the same

4.1 The grant of environmental clearance is further subject to compliance of the Standard EC conditions as under:

(A) Statutory Compliance

4(i)	The project proponent shall obtain forest clearance under the provisions of forest (Conservation) Act,1986, in case of the diversion of forest land for non-forest purpose involved in the project.	Not Applicable	No remark
(ii)	The project proponent shall obtain clearance from the National Board Wildlife, if applicable.	Not Applicable	No remark
(iii)	The project proponent shall prepare a site-specific conservation plan/ wildlife management plan and approved by the chief wildlife warden. The recommendation of the approved site-specific	Conservation plan for Schedule-I species i.e. Great Indian Bustard (GIB) has been prepared and approved by PCCF (Wildlife), Nagpur.	Verified from document

	conservation plan/wildlife management plan shall be implemented in consultation with the state forest department. The implementation report shall be furnished along with the six monthly compliance report (in case of the presence of schedule-1 species in the study area).	Fund of Rs 35 lakhs allocated was also deposited to DFO, Chandrapur and same is being spent to implement the activities as per the conservation plan	
(iv)	The project proponent shall obtain consent to establish/operate under the provisions of Air (Prevention &Control of Pollution) Act,1981 and the water (Prevention& Control of Pollution) Act,1974 from the concerned State pollution Control Board/Committee.	1st CTO granted vide letter no. Format1.0/CAC/UAN No. MPCB-CONSENT-0000105075/CO-2110000179 dated 05.10.21 valid upto 31.03.2023 for 2.75 MTY capacity CTE approved vide 23rd CAC Meeting dtd 17.03.2021 /CTE letter issued vide letter no. format 1.0/CAC/UAN no. 0000104421 /CE – 2105001339 dated 31.05.2021 for capacity 2.75 MTY.	Verified from document
(v)	The project proponent shall obtain the necessary permission from the Central Ground Water Authority.	CGWA NOC Obtained vide NOC no. CGWA/NOC/MIN/ORIG/2019 /6689 dtd 19.11.2019 valid upto 18.11.2021. Renewal application submitted on 17.11.2021	Verified
(vi)	Solid/hazardous waste generated in the mines needs to addressed as per solid waste management rules,2016/hazardous & other waste management rules,2016.	Noted and same is being complied	No remark

(B) Air Quality Monitoring And Preservation

(i)	Continuous ambient air quality monitoring stations as prescribed in the statue be established in the core zone as well as in the buffer zone for monitoring of pollutants, namely PM10, PM2.5, SO2, and NOx. Location of the stations shall be decided based on the meteorological data,	1 no. CAAQMS along with MET station is installed and commissioned in March 2022 in mine core zone and location of same is finalised in consultation with MPCB.	Verified

	topographical features and environmentally and ecologically sensitive targets in consultation with the state pollution control board. Online ambient air quality monitoring stations may also be installed in addition to the regular monitoring stations as per the requirement and/ or in consultation with the SPCB. Monitoring of heavy metals such as hg. As, Ni, Cd ,Cr ,etc to be carried out at least once in six months.	Apart from this 4 nos. AAQ monitoring stations are also set up for AAQ monitoring on fortnightly basis. Heavy Metal monitoring is being monitored on half yearly basis through CMPDIL (NABL accredited lab). Report of May & Nov 2021 heavy metal monitoring enclosed	
(ii)	The Ambient Air Quality monitoring in the core zone shall be carried out to ensure the Coal Industry Standards notified vide GSR 742 E dated 25th September, 2000 and as amended from time to time by the Central Pollution Control Board. Data on ambient air quality and heavy metals such as Hg, As, Ni, Cd, Cr and other monitoring data shall be regularly reported to the Ministry/ Regional Office and to the CPCB/SPCB.	Monitoring of Ambient Air Quality is being carried out as per GSR 742 (E) dated 25.09.2000. Data on ambient air quality is being monitored on fortnightly basis and heavy metals such as Hg, As, Ni, Cd, Cr is being monitored on half yearly basis and same is being reported to the Ministry/ Regional Office and to the MPCB along with six monthly EC Compliance report (May & Nov 2021 heavy metal monitoring enclosed) The ambient air quality monitoring stations are established in consultation with officials of Maharashtra Pollution Control Board, Chandrapur. Monitoring reports for the period from April 2021 to September 2021 is enclosed. It can be seen that all the parameters are within the prescribed standards. Monitoring of Heavy metals has also been carried out by CMPDIL in the month of May & Nov 2021	Verified the report
		(PM10) Values of µg/m^3	

Date	PIT Office	Ashti Village	Dandgaon Village
APR 21 (1st FN)	139	70	65
APR 21 (2nd FN)	120	60	77
MAY 21 (1st FN)	145	68	72
MAY 21 (2nd FN)	130	73	80
JUNE 21 (1st FN)	155	77	50
JUNE 21 (2nd FN)	140	70	70
JULY 21 (1st FN)	112	80	51
JULY 21 (2nd FN)	126	87	66
AUG 21 (1st FN)	147	70	76
AUG 21 (2nd FN)	141	78	73
SEPT 21 (1st FN)	136	56	70
SEPT 21 (2nd FN)	122	53	83
Std	**250**	**100**	**100**

(PM2.5) Values of µg/m^3

Date	PIT Office	Ashti Village	Dandgaon Village
APR 21 (1st FN)	42	24	24
APR 21 (2nd FN)	36	20	27
MAY 21 (1st FN)	38	22	23
MAY 21 (2nd FN)	32	24	26
JUNE 21 (1st FN)	41	23	20
JUNE 21 (2nd FN)	36	20	26
JULY 21 (1st FN)	35	23	22
JULY 21 (2nd FN)	40	28	28
AUG 21 (1st FN)	41	20	26
AUG 21 (2nd FN)	34	24	22
SEPT 21 (1st FN)	37	18	22
SEPT 21 (2nd FN)	30	17	26
Std	60	60	60

(iii)	Transportation of coal, to the extent permitted by road, shall be carried out by covered trucks/conveyors. Effective control measures such as regular water/ mist sprinkling/ rain gun etc shall be carried out in critical areas prone to air pollution (with higher values of PM10/PM2.5) such as haul road, loading/ unloading and	Noted and will be complied Study conducted by GMR for installation of Pipe Conveyor between Yekona Mine and GMR power Plant. Proposal of Railway Siding is also under consideration	No remark

	transfer points. Fugitive dust emissions from all sources shall be controlled regularly. It shall be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central/ State Pollution Control Board.	15 nos. fixed sprinklers are provided at Coal stockyard (Yekona I OC) and at Coal stockyard (Yekona II OC) to control fugitive emission 15 nos. fixed sprinklers at Weigh Bridge 2 nos. 15 KL Mobile water tankers are deployed on Coal transportation road and haul road 5 nos. Mist cannon of 100 mtrs throw with 360 deg rotation are in procurement stage (Supply order issued) out of which 1 no. is installed at coal stockyard Mobile crusher is provided with Mist spray arrangement	Verified during site visit
(iv)	The transportation of coal shall be carried out as per the provisions and route envisaged in the approved Mining Plan or environment monitoring plan. Transportation of the coal through the existing road passing through any village shall be avoided. In case, it is proposed to construct the by-pass road, it should be constructed so that the impact of sound, dust and accidents could be appropriately mitigated.	Noted and is being complied	No remark
(v)	Vehicular emissions shall be kept under control and regularly monitored. All the vehicles engaged in mining and allied activities shall operate only after obtaining 'PUC' certificate from the authorized pollution testing centres.	All the light vehicles namely jeep & trucks etc. having valid PUC certificate for vehicular emission through RTO approved agency are used.	Verified
(vi)	Coal stock pile/ crusher/ feeder and breaker material transfer points shall invariable be provided with dust suppression system. Belt-conveyor shall be fully covered to avoid air borne dust. Side cladding all along the conveyor gantry should be made to avoid air borne dust. Drills shall be wet	15 nos. fixed sprinklers are provided at Coal stockyard (Yekona I OC) and at Coal stockyard (Yekona II OC) to control fugitive emission 15 nos. fixed sprinklers at Weigh Bridge	Verified during site visit

	operated or fitted with dust extractors.	2 nos. 15 KL Mobile water tankers are deployed on Coal transportation road and haul road 5 nos. Mist cannon of 100 mtrs throw with 360 deg rotation are in procurement stage (Supply order issued) out of which 1 no. installed at Coal stockyard Mobile crusher is provided with Mist spray arrangement Drills are wet operated	
(vii)	Coal handling plant shall be operated with effective control, measures w.r. t. various environmental parameters. Environmental friendly sustainable technology should be implemented for mitigating such parameters.	There is no CHP is provided in this mine. Partial Coal extraction is through Surface Miner technology which helps in eliminating blasting and crushing of Coal. Remaining coal extraction which is being done through Shovel-dumper combination , Mobile crusher is installed which have mist spray arrangement to minimise fugitive dust emission.	Verified during site visit

(C) Water Quality Monitoring And Preservation

(i)	The effluent discharge (mine waste water, workshop effluent) shall be monitored in terms of the parameters notified under the water Act, 1974 Coal Industry Standards vide GSR 742 € dated 25th September, 2000 and as amended from time to time by the Central Pollution Control Board.	Mine Water discharge, Workshop ETP effluent is being monitored vide GSR 742 E dated 25th September, 2000.

MINE WATER DISCHARGE (Yekona I)

Date	pH	COD	TSS	O&G
APR 21 (1st FN)	7.07	18	32	BDL
APR 21 (2nd FN)	7.60	26	36	BDL
MAY 21 (1st FN)	7.42	26	44	BDL
MAY 21 (2nd FN)	7.66	20	48	BDL
JUNE 21 (1st FN)	8.30	26	40	BDL
JUNE 21 (2nd F)	8.20	22	36	BDL

JULY 21 (1st FN)	8.10	36	26	BDL
JULY 21 (2nd FN)	7.93	44	28	BDL
AUG 21 (1st FN)	7.38	48	34	BDL
AUG 21 (2nd FN)	7.29	36	22	BDL
SEPT 21 (1st FN)	7.64	32	30	BDL
SEPT 21 (2nd FN)	7.88	40	38	BDL

MINE WATER DISCHARGE (Yekona II)

Date	pH	COD	TSS	O&G
APR 21 (1st FN)	7.72	24	44	BDL
APR 21 (2nd FN)	7.83	22	36	BDL
MAY 21 (1st FN)	7.33	22	32	BDL
MAY 21 (2nd FN)	7.28	26	36	BDL
JUNE 21 (1st FN)	7.32	32	36	BDL
JUNE 21 (2nd F)	7.66	30	32	BDL
JULY 21 (1st FN)	8.15	40	30	BDL
JULY 21 (2nd FN)	8.26	32	22	BDL
AUG 21 (1st FN)	8.10	40	30	BDL
AUG 21 (2nd FN)	8.22	28	20	BDL
SEPT 21 (1st FN)	7.86	40	26	BDL
SEPT 21 (2nd FN)	8.07	36	20	BDL

(ii)	The monitoring data shall be uploaded on the company's website and displayed at the project site at a suitable location. The circular No.J-20012/1/2006-IA.11 (M) dated 27th May, 2009 issued by Ministry of Environment, Forest and Climate Change shall also be referred in this regard for its compliance.	Noted and is being complied	No remark
(iii)	Regular monitoring of ground water level and quality shall be carried out in and around the mine lease area by establishing a network of existing wells constructing new piezometers during the mining operations. The monitoring of ground water levels shall be carried out four times a year i.e. pre-monsoon, monsoon, post-monsoon and winter. The ground water quality shall be monitored once a year, and the data thus collected shall be sent regularly to MOEFCC/ RO.	Regular monitoring of ground water level and quality is being carried out in and around the mine lease. The monitoring is carried out four times in a year pre-monsoon (April-May), monsoon (August), post-monsoon (November) and winter (January) and the data thus collected is being sent regularly to Ministry of Environment, Forest and Climate Change and its Regional Office, Central Ground Water Authority and Regional Director, Central	

		Ground Water Board Report of the monitoring (December 2019 to July 2021) has been submitted to CGWB & MoEF vide e.mail dated 18.11.2021	
(iv)	Monitoring of water quality upstream and downstream of water bodies shall be carried out once in six months and record of monitoring data shall be maintained and submitted to the Ministry of Environment, Forest and Climate Change/ Regional Office.	Monitoring of water quality upstream and downstream of water bodies is being carried out half yearly and report of same is also submitted to MPCB & MoEF on regular basis. Copy of latest report (Jan 2022) enclosed	Report required
(v)	Ground water, excluding mine water, shall not be used for mining operations. Rainwater harvesting shall be implemented for conservation and augmentation of ground water resources.	Complied Ground water excluding mine water is not being used for mining operations. Roof Top Rain Water Harvesting is installed over office building such as Sub Area Manager Office, Manager Office etc. Pond deepening for nearby villages to increase water recharge and water holding capacity of ponds. It helps in augmenting ground water resources.	Verified during site visit
(vi)	Catch and/ or garland drains and siltation ponds in adequate numbers and appropriate size shall be constructed around the mine working, coal helps & OB dumps to prevent run off of water and flow of sediments directly into the river and water bodies, further, dump material shall be properly consolidated/ compacted and accumulation of water over dumps shall be avoided by providing adequate channels for flow of sit into the drains. The drains/ ponds so constructed shall by regularly de-silted particularly before onset of monsoon and maintained properly. Sump capacity should provide adequate retention period to allow proper settling of silt material. The water so collected in the	Garland drains of dimension (Length: 4150 mtr, Avg. width: 2.0 mtr, Avg. Depth: 2.00 mtr) is provided around the mine. Catch drain of dimension (Length: 3300 mtr, Avg. width: 2.0 mtr, Avg. Depth: 2.00 mtr) provided around OB dumps. Desilting of catch drains and garland drains is done every year before onset of monsoon departmentally. The catch drains provided all around the OB Dump acts as an arrestor against any flow of	Verified during site visit

	sump shall be utilised for dust suppression and green belt development and other industrial use. Dimension of the retaining wall constructed, if any, at the toe of the OB dumps within the mine to check run-off and siltation should be based on the rainfall data. The plantation of native species to be made between toe of the dump and adjacent field/ habitation/ water bodies.	silt and sediments into the nearby fields/ nalla. As such specifically, at present there is no requirement of retaining wall at the toe of the dump. Moreover, grass seeding has been placed over the slopes which further protects the flow of silts and sediments.	
(vii)	Adequate groundwater recharge measures shall be taken up for augmentation of ground water. The project authorities shall meet water requirements of nearby village(s) after due treatment conforming to the specific requirements(standards).	Roof Top Rain Water Harvesting is installed over office building such as Sub Area Manager Office, Manager Office etc. If any water requirement issue at nearby village come to the notice, project authority will take all necessary measures to fulfil the requirement	Verified during site visit
(viii)	Industrial waste water generated from CHP, workshop and other waste water, shall be properly collected and treated so as to conform to the standards prescribed under the standards prescribed under water Act, 1974 and Environment (Protection) Act,1986 and the rules made there under, and as amended from time to time. Adequate ETP/STP needs to be provided.	ETP of 100 KLD capacity with Oil Skimmer is constructed for treating the effluent generated from washing of HEMM STP of suitable capacity will be constructed along with the construction of new quarters for the workers of Amalg. Yekona OC mine. 1 no. Modular STP of 5 KLD Capacity is provided for mine premises (Canteen) and same is in acclimatization stage	ETP is constructed and use as an when required due lack of wastewater. The vehicles used in the mining process are outsourced. Treated water is being recycled and used for washing of HEMM. No remark 5KLD MBBR based STP installed to treat the canteen sewage. Presently, STP under microbial cultural acclimatization stage with generated

			sewage as organic load.
(ix)	The water pumped out from the mine, after siltation, shall be utilised for industrial purpose viz. watering the mine area, roads, green belt development etc. The drains shall be regularly desilted particularly after monsoon and maintained properly.	Pumped out mine water is used for fire fighting, dust suppression etc. After treatment, it is being released in local nalla from where villagers are further utilise it for their farming needs.	Verified
(x)	The surface drainage plan including surface water conservation plan for the area of influence affected by the said mining operations, considering the presence of rive/ rivulet/pond/lake etc, shall be prepared and implemented by the project proponent. The surface drainage plan and/or any diversion of natural water courses shall be as per the approved Mining Plan/EIA/EMP report and with due approval of the concerned State/GoI Authority. The construction of embankment to prevent any danger against inrush of surface water into the mine should be as per the approved Mining Plan and as per the permission of DGMS or any other authority as prescribed by the law.	Noted and same will be prepared and implemented	No remark
(xi)	The project proponent shall take all precautionary measures to ensure riverine/riparian ecosystem in and around the coal mine up to a distance od 5 km. A rivarine/riparian ecosystem conservation and management plan should be prepared and implemented in consultation with the irrigation/water resources department in the state government.	Noted. Rivarine/ riparian ecosystem conservation and management plan is prepared (Copy of same is enclosed) and implemented in consultation with the irrigation/water resources department in the state government.	Report verified

(D) Noise And Vibration Monitoring And Prevention

(i)	Adequate measures shall be taken for control of noise levels as per Noise Pollution Rules, 2016 in the work environment. Workers engaged in blasting and drilling operations,	Adequate measures namely proper maintenance of HEMM and controlled blasting is being done so as to control noise levels below 85 dB(A). The workers engaged in noisy	Verified

	operation of HEMM, etc shall be provided with personal protective equipments (PPE) like ear plugs/muffs in conformity with the prescribed norms and guidelines in this regard, Adequate awareness programme for users to be conducted. Progress in usage of such accessories to be monitored.	environment are provided with ear plugs/muffs. Noise Monitoring stations are established for monitoring the noise level data and regularly monitored.	

Noise levels in dB (A)

Date	STN 1				
	Day		Night		
APR 21 (1st FN)	53.60		53.50		
APR 21 (2nd FN)	53.70		53.60		
MAY 21 (1st FN)	62.30		61.60		
MAY 21 (2nd FN)	61.10		60.20		
JUNE 21 (1st FN)	62.10		61.50		
JUNE 21 (2nd F)	61.10		60.80		
JULY 21 (1st FN)	49.60		46.70		
JULY 21 (2nd FN)	48.40		45.60		
AUG 21 (1st FN)	52.40		50.90		
AUG 21 (2nd FN)	55.60		54.20		
SEPT 21 (1st FN)	56.50		55.40		
SEPT 21 (2nd FN)	57.50		56.30		
STD	**75.00**		**70.00**		

(ii)	Controlled blasting techniques shall be practised in order to mitigate ground vibrations, fly rocks, noise and air blast etc., as per the guidelines prescribed by the DGMS.	Controlled blasting is being done as per DGMS guidelines with cord relay and shock tubes.	Verified
(iii)	The noise level survey shall be carried out as per the prescribed guidelines to access noise exposure of the workman at vulnerable points in the mine premises, and report in this regard shall be submitted to the ministry/ RO on six-monthly basis.	Noise level survey shall be carried out as per the DGMS guidelines to access noise exposure of the workman at vulnerable points in the mine premises	Verified

(E) Mining Plan

(i)	Mining shall be carried out under strict adherence to provisions of the Mines Act 1952 and subordinate legislations made there-under as applicable.	Noted and is being complied	No remark
(ii)	Mining shall be carried out as per the approved mining plan(including Mine Closure Plan) abiding by mining laws related to coal mining and the relevant circulars issued by Directorate General Mines Safety (DGMS).	Noted and is being complied	No remark

(iii)	No mining shall be carried out in forest land without obtaining Forestry Clearance as per Forest (Conservation) Act,1980.	Noted and complied There is no forest land involved in this project	No remark
(iv)	Efforts should be made to reduce energy and consumption by conservation, efficiency improvements and use of renewable energy.	Noted. Steps for installation of Renewable energy in mine premises is being taken	No remark

(F) Land Reclamation

(i)	Digital survey if entire lease hold area/ core zone using Satellite Remote Sensing survey shall be carried out at least once in three years for monitoring land use pattern and report in 1;50,000 scale or as notified by Ministry of Environment, Forest and Climate Change (MOEFCC) from time to time shall be submitted to MOEFCC/Regional Office (RO).	Land use pattern of the mine is studied every 3 year through Satellite imagery. Monitoring of same has been done by CMPDIL in 2021. Report of same is uploaded on WCL Website (http://www.westerncoal.in/?q=node/270)	Verified from website
(ii)	The final mine void depth should preferably be as per the approved Mine Closure Plan, and in case it exceeds 40 m, adequate engineering interventions shall be provided for sustenance of aquatic life therein. The remaining area shall be backfilled and covered with thick and alive top soil. Post-mining land be rendered usable for agricultural/ forestry purposes and shall be diverted. Further action will be treated as specified in the guidelines for preparation of Mine Closure Plan issued by the Ministry of coal dated 27th August,2009 and subsequent amendments.	Noted Adequate care will be taken to sustain aquatic life as the void depth will be more than 40 mtr as per mine closure plan once the mine is closed. Backfilled area will be reclaimed by plantation or other useful purposes. Mine closure plan/ guidelines will be followed.	No remark
(iii)	The entire excavated area, backfilling, external OB dumping (including top soil) and afforestation plan shall be in conformity with the "during	Total 21,17,550 nos of saplings will be planted in 847.02 ha till mine closure.	No remark This is future process during

	mining"/"post mining" land-use pattern, which is an integral part of the approved Mining Plan and the EIA/ EMP submitted to this Ministry. Progressive compliance status vis-à-vis the post mining land use pattern shall be submitted to the MOEFCC/RO.	ACTUAL PLANTATION AS ON DATE 2021-22 = 10,000 Nos. over an area of 4 Ha (PLAIN) & 15,000 Nos. over an area of 6 Ha (TOP SOIL DUMP)	mine closure.
(iv)	Fly ash shall be used for external dump of overburden, backfilling or stowing of mine as per provisions contained in clause (i) and (ii) of subparagraph (8) of fly ash notification issued vide SO 2804 (E) dated 3rd November,2009 as amended from time to time. Efforts shall be made to utilize gypsum generated from Flue Gas Desulfurization (FGD),if any, along with fly ash for external dump of overburden, backfilling of mines. Compliance report shall be submitted to Regional Office of MoEFCC, CPCB and SPCB.	Noted As per the notification, fly ash backfilling is to be done in abandoned coal mines. Fly ash for backfilling will be utilised as per notification at the end of mine life when the mine gets abandoned.	No remark
(v)	Further, it may be ensured that as per the time schedule specified in mine closure plan it should remain live till the point of utilization. The topsoil shall temporarily be stored at earmarked site (s) only and shall not be kept unutilized. The topsoil shall be used for land reclamation and plantation purposes. Active OB dumps shall be stabilised with native grass species to prevent erosion and surface run off. The other overburden dumps shall be vegetated with native flora species. The excavated area shall be backfilled and afforested in line with the approved Mine Closure Plan. Monitoring and management of rehabilitated areas shall continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the ministry of Environment, Forest and Climate Change/ Regional Office.	5.533 Mm^3 Top soil has been excavated till 30.09.2021 and is being stored in the earmarked site (Yekona I quarry: Top Soil Dump area: 9.90 Ha, height: 45 mtrs, bench: 5) & (Yekona II quarry: Top Soil Dump area: 14.30 Ha, height: 30 mtrs, bench: 3)and will be utilized as per the plantation programme. 6.177 Mm^3 OB (excl. top soil) has been excavated till 30.09.2021 and is being stacked at the earmarked dump site only (Yekona I quarry: Hard OB Dump area: 11.53 Ha, height: 30 mtrs, bench: 2) & (Yekona II quarry: Hard OB Dump area: 14.60 Ha, height: 35 mtrs, bench: 3). Regarding Monitoring and management of rehabilitated areas, it is submitted that, the same in respect of external OB dump is yet to start as the dump is active. But after vegetation / plantation, the monitoring and management will be continued	Presently, OB dump is active. Verified during site visit

		till it becomes self sustaining. Compliance against this condition is a part of Six monthly EC Compliance report which is submitted to RO, MoEF&CC regularly and will continue to be submitted.	
(vi)	The project proponent shall make necessary alternative arrangements, if grazing land is involved on core zone, in consultation with the State government to provide alternate areas for livestock grazing, if any. In this context, the project proponent shall implemented the directions of Hon'ble Supreme Court with regard to acquiring grazing land.	Not Applicable, as no separate land is acquired for grazing land.	No remark

(G) Green Belt

(i)	The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered/endemic flora/fauna, if any, spotted/reported in the study area. The Action plan in this regard, if any, shall be prepared and implemented in consultation with the State Forest and Wildlife Department.	Conservation plan for Schedule-I species i.e. Great Indian Bustard (GIB) has been prepared and approved by PCCF (Wildlife), Nagpur. Fund of Rs 35 lakhs allocated was also deposited to DFO, Chandrapur and same is being spent to implement the activities as per the conservation plan	Verified from documents
(ii)	Greenbelt consisting of 3-tier plantation of width not less than 7.5 m shall be developed all along the mine lease area as soon as possible. The green belt comprising a mix of native species (endemic species should be given priority) shall be developed all along the major approach/ coal transportation roads.	Noted and is being complied Green belt of more than 50 mtrs by planting 10,000 trees over an area of 4 Ha between mine and yekona village is developed during 21-22	No remark

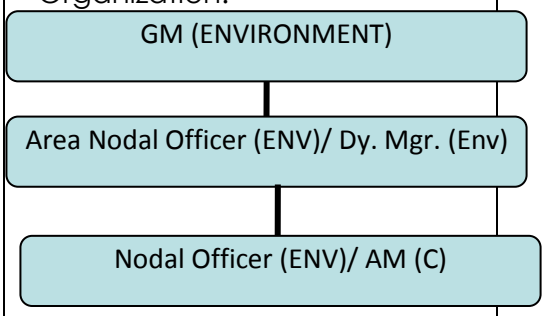
(H) Public Hearing and Human Health Issues

(i)	Adequate illumination shall be ensured in all mine locations (as per DGMS standards) and monitored weekly. The report on the same shall be submitted to this ministry & it's RO on six-monthly	Noted and same is being complied	No remark

	basis.		
(ii)	The project proponent shall undertake occupational health survey for initial and periodical medical examination of the personnel engaged in the project and maintain records accordingly as per the provisions of the Mines Rules, 1995 and DGMS circulars. Besides regular periodic health check-up,20% of the personnel identified from workforce engaged in active mining operations shall be subjected to health check-up for occupational diseases and hearing impairment time to time.	Complied Regular and Periodical medical examination (IME and PME) of the workers (Departmental as well as contractual workers) has been undertaken at Majri Area Hospital of WCL. Area Hospiital is headed by Chief Medical Officer. Health check-up to detect for occupational diseases and hearing impairment is also being done	Verified from records
(iii)	Personnel (including outsourced employees) working in core zone shall wear protective respiratory devices and shall also be provided with adequate training and information on safety and health aspects.	Personnel (including outsourced employees) working in mine is provided with protective respiratory devices and adequate training and information on safety and health aspects is also provided at GVTC Majri on inducting in mining activity as well as on regular basis till they work in mines of WCL MAJRI AREA.	Verified
(iv)	Implementation of the action plan on the issues raised during the public hearing shall be ensured. The project proponent shall undertake all the tasks/measures as per the action plan submitted with budgetary provisions during the public hearing. Land oustees shall be compensated as per the norms laid down in the R&R policy of the company/State Government/Central Government, as applicable.	Noted and is being complied	No remark
(v)	The project proponent shall follow the mitigation measures provided in this Ministry's OM No.Z-11013/5712014-IA.II (M) dated 29th October, 2014 titled 'Impact of mining activities on habitations-issues related to the mining projects wherein habitations and villages are the part of mine lease	Noted and is being complied	No remark

	areas or habitations and villages are surrounded by the mine lease area.		

(I) Corporate Environment Responsibility

(i)	The project proponent shall comply with the provisions contained in this Ministry's OM vide F.No.22-65/2017-IA.III dated 1st May 2018, as applicable, regarding Corporate Environment Responsibility.	Noted and is being complied	No remark
(ii)	The company shall have a well laid down environmental policy duly approve by the Board of Directors. The environmental policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infringements/ deviation/ violation of the environmental/ forest/ wildlife norms/ conditions. The company shall have defined system of reporting infringements/ deviation/ violation of the environmental/ forest/ wildlife norms/ conditions and/ or shareholders/stake holders.	Coal India Limited has its well laid down environmental policy duly approve by the CIL Board. The Environment Policy prescribes for standard operating process/ procedures to bring into focus any infringements/deviation/violation of the environmental or forest norms/conditions. The company has a well laid down system of reporting of non-compliances/ violations of environmental norms to the Board of Directors of the company and/or shareholders or stakeholders at large.	Existing in WCL
(iii)	A separate Environmental Cell both at the project and company head quarter level, with qualified personnel shall be set up under the control of senior Executive, who will directly to the head of the organization.	Environment Cell exists at HQ, Area, & project level. GM (Environment) directly reports to the head of the Organization.  	Existing in WCL
(iv)	Action plan for implementing EMP and environmental conditions	Noted and is being complied	No remark

	along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the Six Monthly Report Compliance Report.		
(v)	Self environmental audit shall be conducted annually. Every three tears third party environmental audit shall be carried out.	Environmental Audit Cell has been formulated to ensure implementation of all the EC Conditions vide letter no. WCL/HQ/ENV/20-B & 25-I/71-81 dated 18.02.2017.	Verified

(J) Miscellaneous

(i)	The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising it at least in two local newspapers of the District or State, of which one shall be in the vernacular language within seven days and in addition this shall also be displayed in the project proponent's website permanently.	Complied. Advertisement given in following 2 Newspapers :- 1) Chandrapur Samachar (Marathi) dated 06.01.2021 2) Mahavidharbha (Hindi) dated 06.01.2021	Verified
(ii)	The copies of the environmental clearance shall be submitted by the project proponent to the heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the Government who in turn has to display the same for 30 days from the date of receipt.	Copies of the environmental clearance is submitted to the heads of local bodies, and Municipal Bodies and relevant offices of the Government between 02.01.21 to 05.01.21 and submission to Panchayat offices on 19.02.2021 due to panchayat election in January 2021	Verified
(iii)	The project proponent shall upload the status of compliance of the stipulated environment	Compliance of the stipulated environment clearance conditions, including result of monitored data	Verified

	clearance conditions, including result of monitored data on their website and update the same on half-yearly basis.	are uploaded on WCL website regularly (http://www.westerncoal.in/?q=node/270).	
(iv)	The project proponent shall monitor the criteria, pollutants level namely; PM10, SO2, NOx (ambient levels) or critical sectoral parameters, indicated for the projects and display the same at a convenient location for disclosure to the public and put on the website of the company.	Noted and is being complied	No remark
(v)	The project proponent shall submit six-monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the ministry of environment, Forest and Climate Change at environment clearance portal.	Six-monthly EC Compliance reports are uploaded on MoEF Website/ portal regularly	Verified
(vi)	The project proponent shall follow the mitigation measures provided in this Ministry's OM No. Z-11013/5712014-IA. II (M) dated 29th Ocober,2014, titled 'Impact of mining activities on habitations-issues related to the mining projects wherein habitations and villages are the part of mine lease areas or habitations and villages are surrounded by the mine lease area'.	Noted and is being complied	No remark
(vii)	The project proponent shall submit the environmental statement for each financial year in Form-v to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company.	Environment Statement (Yekona I OC mine and Yekona II OC Mine separately) for 2020-21 has been submitted to MPCB (UAN No. 34450 in respect of Yekona I OC & UAN no. 34451 in respect of Yekona II OC Mine) on dated 27.08.2021 as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently. Same is also been uploaded on the Company's website along with the status of compliance of EC	Verified

		conditions	
(viii)	The project authorities shall inform to the Regional Office of the MOEFCC regarding commencement of mining operations.	Information regarding commencement of mining operations of Amalg. Yekona I & II OC Mine is given to the Regional Office of the MOEF&CC vide e.mail dated 27.11.2021 (copy enclosed)	Verified
(ix)	The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government.	Noted and is being complied	No remark
(x)	The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report, commitment made during Public Hearing and also that during their presentation to the Expert Appraisal Committee.	Noted and is being complied	No remark
(xi)	No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forests and Climate Change.	Noted	No remark
(xii)	Concealing factual data or submission of false/ fabricated data may result in revocation of this environmental clearance and attract action under the provisions of Environment (Protection) Act,1986.	Noted	No remark
(xiii)	The ministry may revoke or suspend the clearance, if implementation of any of the above condition is not satisfactory.	Noted	No remark
(xiv)	The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.	Noted	No remark
(xv)	The regional office of this ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full	Noted	No remark

	cooperation to the officer (s) of the Regional Office by furnishing the requisite data/ information/ monitoring reports.		
(xvi)	The above conditions shall 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, Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016 and the public liability insurance Act, 1991 along with their amendments and rules and any other orders passed by the Hon'ble supreme court of india/ High courts and any other court of law relating to the subject matter.	Noted	No remark
5.	The proponent shall abide by all the commitment and recommendations made in the EIA/ EMP report and also that during presentation to the EAC. All the commitments made on the issues raised during public hearing shall also be implemented in letter and spirit.	Noted	No remark
6.	The proponent shall obtain all necessary clearances/ approvals that may be required before the start of the project. The Ministry or any other competent authority may stipulate any further condition for environmental protection. The Ministry or any other competent authority may stipulate any further condition for environmental protection.	Noted and complied	No remark
7.	Any appeal against this environmental clearance shall lie with the National Green Tribunal. If preferred, within a period of 30 days as prescribed under section 16 of the National Green Tribunal Act,2010.	Noted	No remark
8.	The coal company/ project proponent shall be liable to pay the compensation against the illegal mining, if any, and as raised by the respective State Governments at	Noted	No remark

	any point of time. In terms of the orders dated 2nd August, 2017 of Hon'ble Supreme Court in WP(Civil) No.114/2014 in the matter of 'Common Cause Vs Union of india & others.		
9.	The concerned State Government shall ensure no mining operations to commence till the entire compensation for illegal mining, if any, is paid by the project proponent through their respective Department of mining & Geology, in strict compliance of the judgment of Hon'ble Supreme Court.	Noted	No remark
10.	This environmental compliance shall not be operational till such time the project proponent complies with the above said judgment of Hon'ble Supreme Court, as applicable, and other statutory requirements.	Noted	No remark

ANNEXURE 37

Maharashtra Pollution Control Board

महाराष्ट्र प्रदूषण नियंत्रण मंडळ

Form 4

See rules 6(5),13(8),16(6) and 20(2) of Hazardous and other wastes 2016

FORM FOR FILING ANNUAL RETURNS

[To be submitted to state pollution control board/pollution control committee by 30th June of every year for the preceeding period April to march]

Unique Application Number:	***Submitted On:***	***Industry Type :***
MPCB-HW_ANNUAL_RETURN-0000039939	29-06-2023	Generator

Submitted for Year:

April 2022 to March 2023

1. Name of the generator/operator of facility	***Address of the unit/facility***
AMALGAMATED YEKONA I & II OC MINE	PO: Panzurni, Tahsil: Warora, District: Chandrapur

1b. Authorization Number	***Date of issue***	***Date of validity of consent***
format1.0/CAC/UAN No. MPCB-CONSENT-0000105075/CO-2110000179	Oct 5, 2021	Mar 31, 2023

2. Name of the authorised person	***Full address of authorised person***
GAUTAM ROY	Office of Sub Area Manager, PO: Panzurni, Tahsil: Warora, District: Chandrapur

Telephone	***Fax***	***Email***
07175285086	07175285088	yekonaoc@gmail.com

3.Production during the year (product wise), wherever applicable

Product Type *	***Product Name ****	***Consented Quantity***	***Actual Quantity***	***UOM***
Mining	Coal	2.7500	2.749	MT/A

PART A: To be filled by hazardous waste generators

1. Total Quantity of waste generated category wise

Type of hazardous waste	***Wate Name***	***Consented Quantity***	***Quantity***	***UOM***
5.1 Used or spent oil	Used Oil	40.000	37	KL/Anum
5.2 Wastes or residues containing oil	Oil Contaminated waste (oil filter, hose pipe)	2.400	2	MTA
2.2 Sludge containing oil	ETP Sludge	24.000	2.72	MTA

2. Quantity dispatched category wise.

Type of Waste	***Quantity of waste***	***UOM***	***Dispatched to***	***Facility Name***
5.1 Used or spent oil	37	KL/Anum	Recycler or Actual user	Authorised recycler
5.2 Wastes or residues containing oil	2	MTA	Disposal Facility	CHWTSDF butibori
2.2 Sludge containing oil	0.72	MTA	Disposal Facility	CHWTSDF Butibori

3. Quantity Utilised in-house,If any

Type of Waste	***Name of Waste***	***Quantity of Waste***	***UOM***
	NA	0	KL/Anum

4. Quantity in storage at the end of the year

Type of Waste	Name of Waste	Quantity of Waste	UOM
2.2 Sludge containing oil	etp sludge	2	MTA

5. Quantity disposed in landfills as such and after treatment

Type	Quantity	UOM
Direct landfilling	NA	KL/Anum
Landfill after treatment	NA	KL/Anum

6. Quantity incinerated (if applicable)	UOM
NA	KL/Anum

PART B: To be filled bt Treatment,storage, and disposal facility operators

1.Total Quantity received	UOM	State Name
NA	KL/Anum	Maharashtra

2. Quantity in stock at the beginning of the year	UOM
NA	KL/Anum

3. Quantity treated	UOM
NA	KL/Anum

4. Quantity disposed in landfills as such and after treatment

Type	Quantity	UOM
Direct landfilling	NA	KL/Anum
Landfill after treatment	NA	KL/Anum

5. Quantity incinerated (if applicable)	UOM
NA	KL/Anum

6. Quantiry processed other than specified above	UOM
NA	KL/Anum

7. Quantity in storage at the end of the year.	UOM
NA	KL/Anum

PART C: To be filled by recyclers or co-processors or other users

1. Quantity of waste received during the year

Waste Name/Category	Country Name	State Name	Quantity of waste received from domestic sources	Quantity of waste imported(If any)	Units
NA	NULL	Other	NA	NA	KL/Anum

2. Quantity in stock at the beginning of the year

Waste Name/Category	Quantity	UOM
NA	NA	KL/Anum

3. Quantity of waste recycled or co-procesed or used

Name of Waste	Type of Waste	Quantity	UOM
NA	NA	NA	KL/Anum

4. Quantity of products dispatched (wherever applicable)

Name of product	Quantity	UOM
NA	NA	KL/Anum

5. Total quantity of waste generated

Waste name/category	quantity	UOM

NA	NA	KL/Anum

6. Total quantity of waste disposed

Waste name/category	***quantity***	***UOM***
NA	NA	KL/Anum

7. Total quantity of waste re-exported (If Applicable)

Waste name/category	***quantity***	***UOM***
NA	NA	KL/Anum

8. Quantity in storage at the end of the year

Waste name/category	***quantity***	***UOM***
NA	NA	KL/Anum

9. Quantity disposed in landfills as such and after treatment

Type	***Quantity***	***UOM***
Direct landfilling	NA	KL/Anum
Landfill after treatment	NA	KL/Anum

10. Quantity incinerated (if applicable)	***UOM***
NA	KL/Anum

Personal Details

Place	***Date***	***Designation***
Yekona	2023-06-29	Sub Area Manager

CONTINUOUS AMBIENT AIR QUALITY

MONITORING STATION

ANALYSER RACKS

ANNEXURE 40

ENVIRONMENTAL MONITORING REPORT
W.r.t. HEAVY METALS IN AMBIENT AIR

MAJRI AREA

WESTERN COALFIELDS LTD.

APRIL 2023 TO JUNE 2023

[redacted]

Environment Laboratory

CMPDI

[redacted]

[illegible]

Environmental Laboratory [illegible] NAGPUR	Test Report Analysis air quality monitoring data for heavy metals

TEST REPORTED	[illegible]	DATE OF ISSUE	[illegible]
NAME OF [illegible]	[illegible]	[illegible]	[illegible]
TEST REQ. BY	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		
[illegible]	[illegible]		

S.No.	Name of Location	Location Code	Date of Sampling
	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]

S. No.	Parameters	Method of analysis	Detection limit	Observed data				
				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	Arsenic (µg/m³)	[illegible]	[illegible] µg/m³	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	Lead (µg/m³)	[illegible]	[illegible] µg/m³	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible] (µg/m³)	[illegible]	[illegible] µg/m³	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	Total Chromium (µg/m³)	[illegible]	[illegible] µg/m³	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible] (µg/m³)	[illegible]	[illegible] µg/m³	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible] (µg/m³)	[illegible]	[illegible] µg/m³	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Environment Laboratory CMPDI RI-IV NAGPUR	Test Report Ambient Air quality monitoring data for heavy metals

TEST REPORT NO.	[illegible]		DATE OF TEST
SAMPLE COLLECTED BY	[illegible]		SAMPLE DESCRIPTION
TEST REQUIRED	[illegible]		
[illegible]	[illegible]		[illegible]
NAME OF PROJECT	[illegible]		[illegible]
No. of Pages			

Sl No	Name of location	Sampling Unit	Date of sampling
[illegible]	[illegible]	[illegible]	[illegible]

Sl. No.	Parameter	Method of analysis	Detection limit	Observed value: [illegible]
1	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

1 [illegible]
2 [illegible]
3 [illegible]

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ENVIRONMENTAL MONITORING REPORT

YEKONA I & II OC

MAJRI AREA

WESTERN COALFIELDS LTD.

JOB NO. 4094423068

APRIL 2023

Environment Laboratory
NABL Accredited vide Cert. No. TC-7102
CMPDI
REGIONAL INSTITUTE-IV, KASTURBA NAGAR,
JARIPATKA, NAGPUR, PIN – 440 014

AN ISO 9001:2015 COMPANY

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

TEST REPORT NO.	RIN/TR/APRIL-23/52	DATE OF ISSUE	30-05-23
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR		
TEST REQUIRED	SPM: IS 5182 Part-4:1999(RA 2019), PM-10: IS-5182 Part 23:2006(RA 2017), PM2.5: USEPA Quality Assurance guidance document volume-II (part-II)-2.12:2016, NO2: IS 5182 Part-06:2006(2017), SO2:IS 5182 Part-2:2001(RA 2017)		
SAMPLE DESCRIPTION	AIR SAMPLE	SAMPLING PLAN :	LQR 47
SAMPLING METHOD : LSOP 4	PERIOD OF PERFORMANCE OF LAB ACTIVITIES:		13-04-23 TO 15-05-23

PIT OFFICE		MYOA1					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	5	2	6	10	
08-04-23	09-04-23	260	174	72	16	10	Clear Sky / LightBreeze
23-04-23	24-04-23	256	160	70	14	BDL	Clear Sky / LightBreeze
STANDARDS FOR COAL MINE, GSR 742(E), dt. 25TH September 2000		**600**	**300**	**60**	**120**	**120**	

PENZURNI VILLAGE		MYOA2					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	5	2	6	10	
08-04-23	09-04-23	120	72	36	14	BDL	Clear Sky / LightBreeze
23-04-23	24-04-23	122	68	42	16	BDL	Clear Sky / LightBreeze
NAAQS, 2009		**-**	**100**	**60**	**80**	**80**	

ASHTI VILLAGE		MYOA3					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	5	2	6	10	
08-04-23	09-04-23	122	69	30	12	BDL	Clear Sky / LightBreeze
23-04-23	24-04-23	130	62	36	14	BDL	Clear Sky / LightBreeze
NAAQS, 2009		**-**	**100**	**60**	**80**	**80**	

DANDGAON VILLAGE		MYOA4					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	5	2	6	10	
14-04-23	15-04-23	136	75	30	12	BDL	Clear Sky / LightBreeze
29-04-23	30-04-23	145	84	38	13	BDL	Clear Sky / LightBreeze
NAAQS, 2009		**-**	**100**	**60**	**80**	**80**	

HIWRA MAJRA VILLAGE		MYOA5					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	5	2	6	10	
14-04-23	15-04-23	130	74	32	12	BDL	Clear Sky / LightBreeze
29-04-23	30-04-23	123	66	29	11	BDL	Clear Sky / LightBreeze
NAAQS, 2009		**-**	**100**	**60**	**80**	**80**	

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

FUGITIVE DUST MONITORING

TEST REQUIRED	SPM: IS 5182 Part-4:1999(RA 2019), PM-10: IS-5182 Part 23:2006(RA 2017) & PM2.5: USEPA Quality Assurance guidance		
SAMPLE DESCRIPTION	Air sample(Fugitive)		
SAMPLING METHOD : LSOP 4	PERIOD OF PERFORMANCE OF LAB ACTIVITIES:		13-04-23 TO 15-05-23

COAL STOCK YARD		MYOF1		
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)		ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	
FROM	TO	5	5	
23-04-23	24-04-23	530	489	Clear Sky / Moderatebreeze

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

SAMPLE DESCRIPTION	Water sample	
Test Required	pH: IS 3025 -Part 11:1983(RA 2017),TSS: IS 3025-Part 17:1984(RA 2017),COD: APHA (23rd Edition) 5220 C :2017,O &G: IS 3025-Part 39:1991(RA 2019) & BOD: IS 3025 (Part 44): 1993 (RA 2019)	
SAMPLING METHOD	LSOP 5	PERIOD OF PERFORMANCE OF LAB ACTIVITIES : 13-04-23 TO 15-05-23

MINE WATER DISCHARGE:	YEKONA I OC : MYOW1			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
08-04-23	7.67	28	48	BDL
23-04-23	7.4	30	52	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

MINE WATER DISCHARGE:	YEKONA II OC : MYOW2			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
08-04-23	7.21	32	56	BDL
23-04-23	7.5	18	28	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

ETP	: MYOW3			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
08-04-23	7.5	32	44	BDL
23-04-23	7.56	36	48	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

STP(DOMESTIC EFFLUENT)TREATED:	: MYOW4	
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS	
	TSS (in mg/l)	BOD(in mg/l)
DETECTION LIMIT	10	2
08-04-23	28	13
23-04-23	36	16
GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENT POLLUTANTS GSR 801E EPA 1993	100	30

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

NOISE LEVEL MONITORING DATA

SAMPLE DESCRIPTION	NOISE SAMPLE
Test Required	CPCB PROCTOCOL FOR AMBIENT NOISE MEASUREMENT, JUNE-2015
SAMPLING METHOD	LSOP 6

PIT OFFICE		MYON1	
MONTH	DATE OF SAMPLE COLLECTION	NOISE LEVEL IN dB(A)	
		DAY TIME	NIGHT TIME
	DETECTION LIMIT	20	20
APRIL'23	12-04-23	59.9	58.3
APRIL'23	28-04-23	59.8	58.1
NOISE POLLUTION (REGULATION AND CONTROL) RULES		75	70

Ashwin B Wasnik
Reviewed by

Deepanshu Sahu
Authoriesed by

1. This report cannot be reproduced in part or full without written of the management.
2. Laboratory activities are performed at the Laboratory permanent facility that is ground floor, Environment Lab, CMPDI RI-IV, Nagpur.
3. This report refers to the values related to the items tested.

********** End of report **********

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ENVIRONMENTAL MONITORING REPORT

YEKONA I & II OC

MAJRI AREA

WESTERN COALFIELDS LTD.

JOB NO. 4094423068

MAY 2023

Environment Laboratory
CMPDI
REGIONAL INSTITUTE-IV, KASTURBA NAGAR,
JARIPATKA, NAGPUR, PIN – 440 014

AN ISO 9001:2015 COMPANY

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

TEST REPORT NO.	RIN/TR/MAY-23/52		DATE OF ISSUE	
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR			
TEST REQUIRED	SPM: IS 5182 Part-4:1999(RA 2019), PM-10: IS-5182 Part 23:2006(RA 2017), PM2.5: USEPA Quality Assurance guidance document volume-II (part-II)-2.12:2016, NO2: IS 5182 Part-06:2006(2017), SO2:IS 5182 Part-2:2001(RA 2017)			
SAMPLE DESCRIPTION	AIR SAMPLE		SAMPLING PLAN :	LQR 47
SAMPLING METHOD : LSOP 4	PERIOD OF PERFORMANCE OF LAB ACTIVITIES:			16-05-23 TO 15-06-23

PIT OFFICE		MYOA1					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	**PM_{10}**	**$PM_{2.5}$**	**NO_2**	**SO_2**	
FROM	TO	5	5	2	6	10	
09-05-2023	10-05-2023	270	186	64	18	14	Clear Sky / LightBreeze
23-05-2023	24-05-2023	264	179	58	16	11	Clear Sky / LightBreeze
STANDARDS FOR COAL MINE, GSR 742(E), dt. 25TH September 2000		**600**	**300**	**60**	**120**	**120**	

PENZURNI VILLAGE		MYOA2					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	**PM_{10}**	**$PM_{2.5}$**	**NO_2**	**SO_2**	
FROM	TO	5	5	2	6	10	
09-05-2023	10-05-2023	132	65	28	11	BDL	Clear Sky / LightBreeze
23-05-2023	24-05-2023	109	76	30	10	BDL	Clear Sky / LightBreeze
NAAQS, 2009		-	**100**	**60**	**80**	**80**	

ASHTI VILLAGE		MYOA3					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	**PM_{10}**	**$PM_{2.5}$**	**NO_2**	**SO_2**	
FROM	TO	5	5	2	6	10	
09-05-2023	10-05-2023	136	76	34	12	BDL	Clear Sky / LightBreeze
23-05-2023	24-05-2023	127	88	29	10	BDL	Clear Sky / LightBreeze
NAAQS, 2009		-	**100**	**60**	**80**	**80**	

DANDGAON VILLAGE		MYOA4					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	**PM_{10}**	**$PM_{2.5}$**	**NO_2**	**SO_2**	
FROM	TO	5	5	2	6	10	
09-05-2023	10-05-2023	122	69	36	14	BDL	Clear Sky / LightBreeze
23-05-2023	24-05-2023	124	81	38	12	BDL	Clear Sky / LightBreeze
NAAQS, 2009		-	**100**	**60**	**80**	**80**	

HIWRA MAJRA VILLAGE		MYOA5					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	**PM_{10}**	**$PM_{2.5}$**	**NO_2**	**SO_2**	
FROM	TO	5	5	2	6	10	
09-05-2023	10-05-2023	141	84	29	12	BDL	Clear Sky / LightBreeze
23-05-2023	24-05-2023	130	89	36	11	BDL	Clear Sky / LightBreeze
NAAQS, 2009		-	**100**	**60**	**80**	**80**	

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

SAMPLE DESCRIPTION	Water sample	
Test Required	pH: IS 3025 -Part 11:1983(RA 2017),TSS: IS 3025-Part 17:1984(RA 2017),COD: APHA (23rd Edition) 5220 C :2017,O &G: IS 3025-Part 39:1991(RA 2019) & BOD: IS 3025 (Part 44): 1993 (RA 2019)	
SAMPLING METHOD	LSOP 5	PERIOD OF PERFORMANCE OF LAB ACTIVITIES : 16-05-23 TO 15-06-23

MINE WATER DISCHARGE:	YEKONA I OC : MYOW1			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
09-05-2023	7.98	48	60	BDL
23-05-2023	8.22	38	40	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

MINE WATER DISCHARGE:	YEKONA II OC : MYOW2			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
09-05-2023	7.85	40	52	BDL
23-05-2023	8.32	32	36	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

ETP	: MYOW3			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
09-05-2023	7.56	36	48	BDL
23-05-2023	7.78	30	40	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

STP(DOMESTIC EFFLUENT)TREATED:	: MYOW4	
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS	
	TSS (in mg/l)	BOD(in mg/l)
DETECTION LIMIT	10	2
09-05-2023	32	16
23-05-2023	44	14
GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENT POLLUTANTS GSR 801E EPA 1993	100	30

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

NOISE LEVEL MONITORING DATA

SAMPLE DESCRIPTION	NOISE SAMPLE
Test Required	CPCB PROCTOCOL FOR AMBIENT NOISE MEASUREMENT, JUNE-2015
SAMPLING METHOD	LSOP 6

PIT OFFICE		MYON1	
MONTH	DATE OF SAMPLE COLLECTION	NOISE LEVEL IN dB(A)	
		DAY TIME	NIGHT TIME
	DETECTION LIMIT	20	20
MAY'23	12-05-2023	57.6	56.9
MAY'23	28-05-2023	58.6	57.4
NOISE POLLUTION (REGULATION AND CONTROL) RULES		75	70

Ashwin B Wasnik
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Deepanshu Sahu
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ENVIRONMENTAL MONITORING REPORT

YEKONA I & II OC

MAJRI AREA

WESTERN COALFIELDS LTD.

JOB NO. 4094423068

JUNE - 2023

Environment Laboratory
NABL Accredited vide Cert. No. TC-7102
CMPDI
REGIONAL INSTITUTE-IV, KASTURBA NAGAR,
JARIPATKA, NAGPUR, PIN – 440 014

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

TEST REPORT NO.	RIN/TR/JUNE-23/52	DATE OF ISSUE	31-07-23
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR		
TEST REQUIRED	SPM: IS 5182 Part-4:1999(RA 2019), PM-10: IS-5182 Part 23:2006(RA 2017), PM2.5: USEPA Quality Assurance guidance document volume-II (part-II)-2.12:2016, NO2: IS 5182 Part-06:2006(2017), SO2:IS 5182 Part-2:2001(RA 2017)		
SAMPLE DESCRIPTION	AIR SAMPLE	SAMPLING PLAN :	LQR 47
SAMPLING METHOD : LSOP 4	PERIOD OF PERFORMANCE OF LAB ACTIVITIES:		16-06-23 TO 15-07-23

PIT OFFICE		MYOA1					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	5	2	6	10	
01-06-23	02-06-23	286	179	59	18	14	Clear Calm
17-06-23	18-06-23	265	165	52	16	11	Clear Calm
STANDARDS FOR COAL MINE, GSR 742(E), dt. 25TH September 2000		**600**	**300**	**60**	**120**	**120**	

PENZURNI VILLAGE		MYOA2					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	5	2	6	10	
01-06-23	02-06-23	115	65	32	14	BDL	Clear Calm
02-06-23	03-06-23	129	74	38	12	BDL	Clear Calm
07-06-23	08-06-23	124	69	32	10	BDL	Clear Calm
08-06-23	09-06-23	138	82	42	15	11	Clear Calm
16-06-23	17-06-23	115	65	30	14	BDL	Clear Sky Light Breez
17-06-23	18-06-23	124	69	32	12	BDL	Clear Sky Light Breez
22-06-23	23-06-23	136	70	36	11	BDL	Cloudy Sky Light Breez
23-06-23	24-06-23	139	78	40	15	BDL	Rainy sky Light Breez
29-06-23	30-06-23	140	81	39	14	BDL	Clear Sky Light Breez
30-06-23	01-07-23	126	75	30	13	BDL	Clear Sky Light Breez
NAAQS, 2009		**-**	**100**	**60**	**80**	**80**	

ASHTI VILLAGE		MYOA3					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	5	2	6	10	
01-06-23	02-06-23	115	60	28	12	BDL	Clear Calm
02-06-23	03-06-23	120	69	26	10	BDL	Clear Calm
07-06-23	08-06-23	135	75	29	11	BDL	Clear Calm
08-06-23	09-06-23	123	79	30	13	BDL	Clear Calm
16-06-23	17-06-23	124	64	30	11	BDL	Clear Sky Light Breez
17-06-23	18-06-23	135	69	31	12	BDL	Clear Sky Light Breez
22-06-23	23-06-23	142	70	34	14	BDL	Cloudy Sky Light Breez
23-06-23	24-06-23	136	65	32	12	BDL	Rainy sky Light Breez
29-06-23	30-06-23	120	69	32	11	BDL	Clear Sky Light Breez
30-06-23	01-07-23	136	78	40	12	BDL	Clear Sky Light Breez
NAAQS, 2009		**-**	**100**	**60**	**80**	**80**	

DANDGAON VILLAGE		MYOA4					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	5	2	6	10	
01-06-23	02-06-23	116	65	25	10	BDL	Clear Calm
02-06-23	03-06-23	125	56	34	9	BDL	Clear Calm
07-06-23	08-06-23	120	73	38	12	BDL	Clear Calm
08-06-23	09-06-23	112	58	32	10	BDL	Clear Calm
16-06-23	17-06-23	113	56	26	10	BDL	Clear Sky Light Breez
17-06-23	18-06-23	132	65	29	11	BDL	Clear Sky Light Breez
22-06-23	23-06-23	132	69	34	12	BDL	Cloudy Sky Light Breez
23-06-23	24-06-23	149	87	32	14	BDL	Rainy sky Light Breez
29-06-23	30-06-23	130	75	31	14	BDL	Clear Sky Light Breez
30-06-23	01-07-23	110	63	28	13	BDL	Clear Sky Light Breez
NAAQS, 2009		**-**	**100**	**60**	**80**	**80**	

HIWRA MAJRA VILLAGE		MYOA5					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	**PM_{10}**	**$PM_{2.5}$**	**NO_2**	**SO_2**	
FROM	TO	5	5	2	6	10	
01-06-23	02-06-23	117	63	40	10	BDL	Clear Calm
02-06-23	03-06-23	110	59	35	14	BDL	Clear Calm
07-06-23	08-06-23	118	69	39	12	BDL	Clear Calm
08-06-23	09-06-23	136	74	37	10	BDL	Clear Calm
16-06-23	17-06-23	115	56	32	12	BDL	Clear Sky Light Breez
17-06-23	18-06-23	136	79	30	10	BDL	Clear Sky Light Breez
22-06-23	23-06-23	124	65	31	11	BDL	Cloudy Sky Light Breez
23-06-23	24-06-23	129	60	34	13	BDL	Rainy sky Light Breez
29-06-23	30-06-23	114	59	29	11	BDL	Clear Sky Light Breez
30-06-23	01-07-23	120	69	32	12	BDL	Clear Sky Light Breez
NAAQS, 2009		**-**	**100**	**60**	**80**	**80**	

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

SAMPLE DESCRIPTION	Water sample	
Test Required	pH: IS 3025 -Part 11:1983(RA 2017),TSS: IS 3025-Part 17:1984(RA 2017),COD: APHA (23rd Edition) 5220 C :2017,O &G: IS 3025-Part 39:1991(RA 2019) & BOD: IS 3025 (Part 44): 1993 (RA 2019)	
SAMPLING METHOD	LSOP 5	PERIOD OF PERFORMANCE OF LAB ACTIVITIES : 16-06-23 TO 15-07-23

MINE WATER DISCHARGE:	YEKONA I OC : MYOW1			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
01-06-23	7.56	48	64	BDL
17-06-23	7.98	42	48	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

MINE WATER DISCHARGE:	YEKONA II OC : MYOW2			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
01-06-23	7.98	48	60	BDL
17-06-23	8.22	38	40	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

ETP	: MYOW3			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
01-06-23	7.65	40	56	BDL
17-06-23	7.45	32	44	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

STP(DOMESTIC EFFLUENT)TREATED:	: MYOW4	
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS	
	TSS (in mg/l)	BOD(in mg/l)
DETECTION LIMIT	10	2
01-06-23	36	14
17-06-23	40	16
GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENT POLLUTANTS GSR 801E EPA 1993	100	30

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

NOISE LEVEL MONITORING DATA

SAMPLE DESCRIPTION	NOISE SAMPLE
Test Required	CPCB PROCTOCOL FOR AMBIENT NOISE MEASUREMENT, JUNE-2015
SAMPLING METHOD	LSOP 6

PIT OFFICE		MYON1	
MONTH	DATE OF SAMPLE COLLECTION	NOISE LEVEL IN dB(A)	
		DAY TIME	NIGHT TIME
	DETECTION LIMIT	20	20
JUNE'23	10-06-23	59.0	58.2
JUNE'23	26-06-23	62.3	61.6
NOISE POLLUTION (REGULATION AND CONTROL) RULES		75	70

Ashwin B Wasnik
Reviewed by

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ENVIRONMENTAL MONITORING REPORT

YEKONA I & II OC

MAJRI AREA

WESTERN COALFIELDS LTD.

JOB NO. 4094423068

JULY - 2023

Environment Laboratory
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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

TEST REPORT NO.	RIN/TR/JULY-23/52		DATE OF ISSUE	31-08-2023
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR			
TEST REQUIRED	SPM: IS 5182 Part-4:1999(RA 2019), PM-10: IS-5182 Part 23:2006(RA 2017), PM2.5: USEPA Quality Assurance guidance document volume-II (part-II)-2.12:2016, NO2: IS 5182 Part-06:2006(2017), SO2:IS 5182 Part-2:2001(RA 2017)			
SAMPLE DESCRIPTION	AIR SAMPLE		SAMPLING PLAN :	LQR 47
SAMPLING METHOD : LSOP 4	PERIOD OF PERFORMANCE OF LAB ACTIVITIES:			16-07-23 TO 14-08-23

PIT OFFICE MYOA1							
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	**PM_{10}**	**$PM_{2.5}$**	**NO_2**	**SO_2**	
FROM	TO	5	5	2	6	10	
04-07-2023	05-07-2023	280	173	57	18	14	CLEAR / CALM
19-07-2023	20-07-2023	262	166	50	15	10	RAINY / CALM
STANDARDS FOR COAL MINE, GSR 742(E), dt. 25TH September 2000		**600**	**300**	**60**	**120**	**120**	

PENZURNI VILLAGE MYOA2						
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	**$PM_{2.5}$**	**NO_2**	**SO_2**	
FROM	TO	5	2	6	10	
03-07-2023	04-07-2023	64	30	13	BDL	CLEAR / CALM
04-07-2023	05-07-2023	71	32	11	BDL	CLEAR / CALM
10-07-2023	11-07-2023	60	27	10	BDL	RAINY / CALM
11-07-2023	12-07-2023	72	40	14	11	RAINY / CALM
18-07-2023	19-07-2023	59	31	13	BDL	RAINY / CALM
19-07-2023	20-07-2023	63	27	12	BDL	RAINY / CALM
25-07-2023	26-07-2023	65	33	11	BDL	RAINY / CALM
26-07-2023	27-07-2023	76	35	14	10	CLOUDY / CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

ASHTI VILLAGE MYOA3						
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	**$PM_{2.5}$**	**NO_2**	**SO_2**	
FROM	TO	5	2	6	10	
03-07-2023	04-07-2023	60	30	12	BDL	CLEAR / CALM
04-07-2023	05-07-2023	72	28	10	BDL	CLEAR / CALM
10-07-2023	11-07-2023	70	29	13	BDL	RAINY / CALM
11-07-2023	12-07-2023	73	33	14	10	RAINY / CALM
18-07-2023	19-07-2023	58	30	11	BDL	RAINY / CALM
19-07-2023	20-07-2023	60	31	14	BDL	RAINY / CALM
25-07-2023	26-07-2023	57	28	12	BDL	RAINY / CALM
26-07-2023	27-07-2023	62	32	11	BDL	CLOUDY / CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

DANDGAON VILLAGE MYOA4						
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	**$PM_{2.5}$**	**NO_2**	**SO_2**	
FROM	TO	5	2	6	10	
03-07-2023	04-07-2023	65	28	12	BDL	CLEAR / CALM
04-07-2023	05-07-2023	55	30	8	BDL	CLEAR / CALM
10-07-2023	11-07-2023	64	32	10	BDL	RAINY / CALM
11-07-2023	12-07-2023	56	30	12	BDL	RAINY / CALM
18-07-2023	19-07-2023	61	28	11	BDL	RAINY / CALM
19-07-2023	20-07-2023	80	31	14	10	RAINY / CALM
25-07-2023	26-07-2023	68	27	10	BDL	RAINY / CALM
26-07-2023	27-07-2023	60	30	12	BDL	CLOUDY / CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

HIWRA MAJRA VILLAGE		MYOA5				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	**$PM_{2.5}$**	**NO_2**	**SO_2**	
FROM	TO	5	2	6	10	
03-07-2023	04-07-2023	60	40	12	BDL	CLEAR / CALM
04-07-2023	05-07-2023	68	32	10	BDL	CLEAR / CALM
10-07-2023	11-07-2023	70	31	14	10	RAINY / CALM
11-07-2023	12-07-2023	68	32	12	BDL	RAINY / CALM
18-07-2023	19-07-2023	58	30	13	BDL	RAINY / CALM
19-07-2023	20-07-2023	65	32	12	BDL	RAINY / CALM
25-07-2023	26-07-2023	60	34	11	BDL	RAINY / CALM
26-07-2023	27-07-2023	64	30	14	BDL	CLOUDY / CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

FUGITIVE DUST MONITORING

TEST REQUIRED	SPM: IS 5182 Part-4:1999(RA 2019), PM-10: IS-5182 Part 23:2006(RA 2017) & PM2.5: USEPA Quality Assurance guidance		
SAMPLE DESCRIPTION	Air sample(Fugitive)		
SAMPLING METHOD : LSOP 4	PERIOD OF PERFORMANCE OF LAB ACTIVITIES:		16-07-23 TO 14-08-23

STOCK YARD		MYOF1		
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)		ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	
FROM	TO	5	5	
11-07-2023	12-07-2023	408	228	RAINY / CALM

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

SAMPLE DESCRIPTION	Water sample	
Test Required	pH: IS 3025 -Part 11:1983(RA 2017),TSS: IS 3025-Part 17:1984(RA 2017),COD: APHA (23rd Edition) 5220 C :2017,O &G: IS 3025-Part 39:1991(RA 2019) & BOD: IS 3025 (Part 44): 1993 (RA 2019)	
SAMPLING METHOD	LSOP 5	PERIOD OF PERFORMANCE OF LAB ACTIVITIES : 16-07-23 TO 14-08-23

MINE WATER DISCHARGE:	YEKONA I OC : MYOW1			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
05-07-2023	7.00	40	60	BDL
19-07-2023	7.30	46	56	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

MINE WATER DISCHARGE:	YEKONA II OC : MYOW2			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
05-07-2023	6.86	40	64	BDL
19-07-2023	6.40	36	44	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

ETP	: MYOW3			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
05-07-2023	6.81	34	44	BDL
19-07-2023	7.0	38	52	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

STP(DOMESTIC EFFLUENT)TREATED:	: MYOW4	
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS	
	TSS (in mg/l)	BOD(in mg/l)
DETECTION LIMIT	10	2
05-07-2023	30	12
19-07-2023	44	15
GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENT POLLUTANTS GSR 801E EPA 1993	100	30

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

NOISE LEVEL MONITORING DATA

SAMPLE DESCRIPTION	NOISE SAMPLE
Test Required	CPCB PROCTOCOL FOR AMBIENT NOISE MEASUREMENT, JULY-2015
SAMPLING METHOD	LSOP 6

PIT OFFICE		MYON1	
MONTH	DATE OF SAMPLE COLLECTION	NOISE LEVEL IN dB(A)	
		DAY TIME	NIGHT TIME
	DETECTION LIMIT	20	20
JULY'23	12-07-2023	58.6	57.4
JULY'23	20-07-2023	56.4	53.9
NOISE POLLUTION (REGULATION AND CONTROL) RULES		75	70

Amol Kamble
Reviewed by

Deepanshu Sahu
Authoriesed by

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ENVIRONMENTAL MONITORING REPORT

YEKONA I & II OC

MAJRI AREA

WESTERN COALFIELDS LTD.

JOB NO. 4094423068

AUGUST - 2023

Environment Laboratory
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REGIONAL INSTITUTE-IV, KASTURBA NAGAR,
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AN ISO 9001:2015 COMPANY

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report

TEST REPORT NO.	RIN/TR/AUG-23/52	DATE OF ISSUE	30-09-2023
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR		
TEST REQUIRED	SPM: IS 5182 Part-4:1999(RA 2019), PM-10: IS-5182 Part 23:2006(RA 2017), PM2.5: USEPA Quality Assurance guidance document volume-II (part-II)-2.12:2016, NO2: IS 5182 Part-06:2006(2017), SO2:IS 5182 Part-2:2001(RA 2017)		
SAMPLE DESCRIPTION	AIR SAMPLE	SAMPLING PLAN :	LQR 47
SAMPLING METHOD : LSOP 4	PERIOD OF PERFORMANCE OF LAB ACTIVITIES:		15-08-23 TO 15-09-23

PIT OFFICE		MYOA1					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	5	2	6	10	
03-08-2023	04-08-2023	268	162	50	14	12	CLEAR / CALM
16-08-2023	17-08-2023	255	154	56	16	10	RAINY / CALM
STANDARDS FOR COAL MINE, GSR 742(E), dt. 25TH September 2000		**600**	**300**	**60**	**120**	**120**	

PENZURNI VILLAGE		MYOA2				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	2	6	10	
01-08-2023	02-08-2023	58	28	10	BDL	CLOUDY / CALM
02-08-2023	03-08-2023	60	24	12	BDL	RAINY / CALM
08-08-2023	09-08-2023	66	29	11	BDL	CLOUDY / CALM
09-08-2023	10-08-2023	70	36	12	10	CLOUDY / CALM
14-08-2023	15-08-2023	60	38	14	10	CLEAR / CALM
16-08-2023	17-08-2023	62	30	12	BDL	CLEAR / CALM
21-08-2023	22-08-2023	68	28	13	10	CLEAR / CALM
22-08-2023	23-08-2023	70	36	14	BDL	CLOUDY / CALM
27-08-2023	28-08-2023	72	40	16	12	CLEAR / CALM
28-08-2023	29-08-2023	70	37	13	BDL	CLEAR / CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

ASHTI VILLAGE		MYOA3				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	2	6	10	
01-08-2023	02-08-2023	50	26	10	BDL	CLOUDY / CALM
02-08-2023	03-08-2023	62	25	11	BDL	RAINY / CALM
08-08-2023	09-08-2023	68	34	14	BDL	CLOUDY / CALM
09-08-2023	10-08-2023	64	30	12	10	CLOUDY / CALM
14-08-2023	15-08-2023	68	30	16	12	CLEAR / CALM
16-08-2023	17-08-2023	60	32	14	BDL	CLEAR / CALM
21-08-2023	22-08-2023	68	28	12	BDL	CLEAR / CALM
22-08-2023	23-08-2023	60	23	12	10	CLOUDY / CALM
27-08-2023	28-08-2023	76	42	13	BDL	CLEAR / CALM
28-08-2023	29-08-2023	72	34	14	10	CLEAR / CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

DANDGAON VILLAGE		MYOA4				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	2	6	10	
01-08-2023	02-08-2023	62	32	10	BDL	CLOUDY / CALM
02-08-2023	03-08-2023	54	38	9	BDL	RAINY / CALM
08-08-2023	09-08-2023	60	32	10	BDL	CLOUDY / CALM
09-08-2023	10-08-2023	52	28	12	BDL	CLOUDY / CALM
14-08-2023	15-08-2023	70	37	13	10	CLEAR / CALM
16-08-2023	17-08-2023	67	30	14	BDL	CLEAR / CALM
21-08-2023	22-08-2023	78	42	16	12	CLEAR / CALM
22-08-2023	23-08-2023	70	32	12	BDL	CLOUDY / CALM
27-08-2023	28-08-2023	58	34	14	BDL	CLEAR / CALM
28-08-2023	29-08-2023	72	40	14	10	CLEAR / CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

HIWRA MAJRA VILLAGE		MYOA5				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	**$PM_{2.5}$**	**NO_2**	**SO_2**	
FROM	TO	5	2	6	10	
01-08-2023	02-08-2023	57	38	11	BDL	CLOUDY / CALM
02-08-2023	03-08-2023	60	32	10	BDL	RAINY / CALM
08-08-2023	09-08-2023	68	30	12	10	CLOUDY / CALM
09-08-2023	10-08-2023	70	32	13	BDL	CLOUDY / CALM
14-08-2023	15-08-2023	64	40	14	10	CLEAR / CALM
16-08-2023	17-08-2023	60	42	15	10	CLEAR / CALM
21-08-2023	22-08-2023	68	39	12	BDL	CLEAR / CALM
22-08-2023	23-08-2023	56	28	11	BDL	CLOUDY / CALM
27-08-2023	28-08-2023	63	40	12	BDL	CLEAR / CALM
28-08-2023	29-08-2023	67	36	10	BDL	CLEAR / CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

SAMPLE DESCRIPTION	Water sample	
Test Required	pH: IS 3025 -Part 11:1983(RA 2017),TSS: IS 3025-Part 17:1984(RA 2017),COD: APHA (23rd Edition) 5220 C :2017,O &G: IS 3025-Part 39:1991(RA 2019) & BOD: IS 3025 (Part 44): 1993 (RA 2019)	
SAMPLING METHOD	LSOP 5	PERIOD OF PERFORMANCE OF LAB ACTIVITIES : 15-08-23 TO 15-09-23

MINE WATER DISCHARGE:	YEKONA I OC : MYOW1			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
02-08-2023	6.83	30	44	BDL
29-08-2023	7.06	34	36	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

MINE WATER DISCHARGE:	YEKONA II OC : MYOW2			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
02-08-2023	6.90	48	52	BDL
29-08-2023	6.88	40	60	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

ETP	: MYOW3			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
02-08-2023	8.08	28	56	BDL
29-08-2023	7.5	46	68	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

STP(DOMESTIC EFFLUENT)TREATED:	: MYOW4	
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS	
	TSS (in mg/l)	BOD(in mg/l)
DETECTION LIMIT	10	2
02-08-2023	38	10.8
29-08-2023	30	11.4
GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENT POLLUTANTS GSR 801E EPA 1993	100	30

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

NOISE LEVEL MONITORING DATA

SAMPLE DESCRIPTION	NOISE SAMPLE
Test Required	CPCB PROCTOCOL FOR AMBIENT NOISE MEASUREMENT, AUG-2015
SAMPLING METHOD	LSOP 6

PIT OFFICE		MYON1	
MONTH	DATE OF SAMPLE COLLECTION	NOISE LEVEL IN dB(A)	
		DAY TIME	NIGHT TIME
	DETECTION LIMIT	20	20
AUG'23	08-08-2023	56.6	54.1
AUG'23	23-08-2023	54.7	53.5
NOISE POLLUTION (REGULATION AND CONTROL) RULES		75	70

Ashwin B Wasnik
Reviewed by

Deepanshu Sahu
Authoriesed by

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2. Laboratory activities are performed at the Laboratory permanent facility that is ground floor, Environment Lab, CMPDI RI-IV, Nagpur.
3. This report refers to the values related to the items tested.

********** End of report **********

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ENVIRONMENTAL MONITORING REPORT

YEKONA I & II OC

MAJRI AREA

WESTERN COALFIELDS LTD.

JOB NO. 4094423068

SEPTEMBER- 2023

Environment Laboratory
NABL Accredited vide Cert. No. TC-7102
CMPDI
REGIONAL INSTITUTE-IV, KASTURBA NAGAR,
JARIPATKA, NAGPUR, PIN – 440 014

AN ISO 9001:2015 COMPANY

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

TEST REPORT NO.	RIN/TR/SEPT-23/52	DATE OF ISSUE	27-10-23
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR		
TEST REQUIRED	SPM: IS 5182 Part-4:1999(RA 2019), PM-10: IS-5182 Part 23:2006(RA 2017), PM2.5: USEPA Quality Assurance guidance document volume-II (part-II)-2.12:2016, NO2: IS 5182 Part-06:2006(2017), SO2:IS 5182 Part-2:2001(RA 2017)		
SAMPLE DESCRIPTION	AIR SAMPLE	SAMPLING PLAN :	LQR 47
SAMPLING METHOD : LSOP 4	PERIOD OF PERFORMANCE OF LAB ACTIVITIES:		15-09-23 TO 15-10-23

PIT OFFICE		MYOA1					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	5	2	6	10	
13-09-23	14-09-23	270	166	60	16	14	CLOUDY/CALM
27-09-23	28-09-23	263	155	50	18	15	CLOUDY/CALM
STANDARDS FOR COAL MINE, GSR 742(E), dt. 25TH September 2000		**600**	**300**	**60**	**120**	**120**	

PENZURNI VILLAGE		MYOA2				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	2	6	10	
05-09-23	06-09-23	53	32	10	BDL	CLOUDY / CALM
06-09-23	07-09-23	63	35	13	10	CLOUDY / CALM
12-09-23	13-09-23	56	33	14	12	CLOUDY / CALM
13-09-23	14-09-23	68	40	11	BDL	CLOUDY / CALM
19-09-23	20-09-23	56	38	12	BDL	CLOUDY / RAINY
20-09-23	21-09-23	60	30	14	10	CLOUDY/RAINY
26-09-23	27-09-23	66	40	10	BDL	CLOUDY/LIGHT BREEZE
27-09-23	28-09-23	70	46	15	13	CLOUDY / CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

ASHTI VILLAGE		MYOA3				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	2	6	10	
05-09-23	06-09-23	57	30	11	BDL	CLOUDY / CALM
06-09-23	07-09-23	50	28	12	10	CLOUDY / CALM
12-09-23	13-09-23	60	35	15	11	CLOUDY / CALM
13-09-23	14-09-23	70	39	14	BDL	CLOUDY / CALM
19-09-23	20-09-23	52	26	12	BDL	CLOUDY / RAINY
20-09-23	21-09-23	70	30	10	BDL	CLOUDY/RAINY
26-09-23	27-09-23	60	33	12	10	CLOUDY/LIGHT BREEZE
27-09-23	28-09-23	68	48	10	BDL	CLOUDY / CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

DANDGAON VILLAGE		MYOA4				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	$PM_{2.5}$	NO_2	SO_2	
FROM	TO	5	2	6	10	
05-09-23	06-09-23	55	37	10	BDL	CLOUDY / CALM
06-09-23	07-09-23	50	30	10	10	CLOUDY / CALM
12-09-23	13-09-23	54	37	12	BDL	CLOUDY / CALM
13-09-23	14-09-23	60	33	14	10	CLOUDY / CALM
19-09-23	20-09-23	63	40	9	BDL	CLOUDY / RAINY
20-09-23	21-09-23	70	40	16	14	CLOUDY/RAINY
26-09-23	27-09-23	50	30	12	BDL	CLOUDY/LIGHT BREEZE
27-09-23	28-09-23	60	34	10	BDL	CLOUDY / CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

HIWRA MAJRA VILLAGE		MYOA5				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	**$PM_{2.5}$**	**NO_2**	**SO_2**	
FROM	TO	5	2	6	10	
05-09-23	06-09-23	64	42	14	BDL	CLOUDY / CALM
06-09-23	07-09-23	53	29	12	10	CLOUDY / CALM
12-09-23	13-09-23	57	38	13	BDL	CLOUDY / CALM
13-09-23	14-09-23	63	44	15	10	CLOUDY / CALM
19-09-23	20-09-23	56	35	14	10	CLOUDY / RAINY
20-09-23	21-09-23	64	40	12	BDL	CLOUDY/RAINY
26-09-23	27-09-23	56	30	14	BDL	CLOUDY/LIGHT BREEZE
27-09-23	28-09-23	50	44	12	BDL	CLOUDY / CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

SAMPLE DESCRIPTION	Water sample	
Test Required	pH: IS 3025 -Part 11:1983(RA 2017),TSS: IS 3025-Part 17:1984(RA 2017),COD: APHA (23rd Edition) 5220 C :2017,O &G: IS 3025-Part 39:1991(RA 2019) & BOD: IS 3025 (Part 44): 1993 (RA 2019)	
SAMPLING METHOD	LSOP 5	PERIOD OF PERFORMANCE OF LAB ACTIVITIES : 15-09-23 TO 15-10-23

MINE WATER DISCHARGE:	YEKONA I OC : MYOW1			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
13-09-23	6.84	38	32	BDL
27-09-23	8.14	48	40	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

MINE WATER DISCHARGE:	YEKONA II OC : MYOW2			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
13-09-23	7.32	40	24	BDL
27-09-23	8.26	36	56	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

ETP	: MYOW3			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
13-09-23	6.86	24	60	BDL
27-09-23	6.78	38	52	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

STP(DOMESTIC EFFLUENT)TREATED:	: MYOW4	
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS	
	TSS (in mg/l)	BOD(in mg/l)
DETECTION LIMIT	10	2
13-09-23	30	12.6
27-09-23	42	15.6
GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENT POLLUTANTS GSR 801E EPA 1993	100	30

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	

NOISE LEVEL MONITORING DATA

SAMPLE DESCRIPTION	NOISE SAMPLE
Test Required	CPCB PROCTOCOL FOR AMBIENT NOISE MEASUREMENT, AUG-2015
SAMPLING METHOD	LSOP 6

PIT OFFICE		MYON1	
MONTH	DATE OF SAMPLE COLLECTION	NOISE LEVEL IN dB(A)	
		DAY TIME	NIGHT TIME
	DETECTION LIMIT	20	20
SEPT'23	08-09-23	59.6	58.5
SEPT'23	24-09-23	59.0	58.7
NOISE POLLUTION (REGULATION AND CONTROL) RULES		75	70

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Riverine / Riparian Ecosystem Conservation and Management Plan

EC Secured vide no. J-11015/ 381/ 2015-IA-II (M) dated 01.01.2021

Existing Production Capacity of 2.75 MTPA in an area of 1679.39 ha

In compliance of Environment Clearance (EC) Condition Pertaining to

AMALGAMATED YEKONA I & II OCP

Tehsil- Warora, District- Chandrapur
Maharashtra (Majri Area, WCL)

JULY- 2021

PREPARED BY

WESTERN COALFIELDS LIMITED

Chapter 1

INTRODUCTION

1.1 Identification of Project and Project Proponent

Amalgamated Yekona I & II OC (Phase-I) project is a Opencast Coal mine of Western Coalfields Limited (WCL) Majri Area, located in Warora Tehsil, Chandrapur District, Maharashtra State. This is an operating coal mine with a production capacity of 2.75 Million Tonne Per Annum (MTPA) in total area of 1679.39 Ha. Project Proponent WESTERN COALFIELDS LIMITED is a subsidiary company of COAL INDIA LIMITED (CIL), which is under administrative control of MINISTRY OF COAL, GOVERNMENT OF INDIA.

1.2 Introduction

Amalgamted Yekona I & II OC mine is basically the amalgamation of Yekona I OC Mine and Yekona II OC mine. Environmental Clearance for Amalgamated Yekona I & II OC mine (Phase I) has been secured for production capacity of 2.75 MTPA in an area of 1679.39 ha vide MoEF & CC letter no. J-11015/381/2015-IA-II (M) dated 01.01.2021.

The Project Report (including Mining Plan) of Amalgamated Yekona I & II OC (Phase I & II) was duly approved by CIL Board for normative capacity of 2.75 MTPA and peak capacity of 3.44 MTPA within area of 1701.32 ha in its 319th meeting held on 12.08.2015 as

communicated by Company Secretary, CIL vide its letter no. CIL:XI(D):04112:2015:10875 dated 26.08.2015.

The Mining Plan (built in mine-closure plan) of Amalgamated Yekona I & II OC Mine Phase-I of Majri Area was duly approved by WCL Board for Phase-I in its 315th meeting held on 27th & 28th September, 2019 vide its letter no. WCL/BD/SECTT/BM-315/2019/958 dated 12.10.2019.

Total geological reserves in the mine lease area is 78.62 MT with 67.65 Mt mineable reserves. Extractable reserves are 57.85 Mt. Percent of extraction is 73.58 % with a maximum depth of 150.0 m.

1.3 Location & Communication

The area under consideration for Phase-I project lies between Latitudes N 20° 13' 39" to 20° 16' 14" N Longitudes E 78° 55'25" E to 78° 58' 24" E. It is covered by Survey of India Topo Sheet No. 55L/15 & 55L/16.

The Delhi Chennai Grand Trunk railway line passes about 5 kms east of the project. The nearest railway station is Warora, situated at 5 kms distance, S.E of the project. The Nagpur-Chandrapur road is about 5 kms to the East of the project. The coal mine can be approached by a fair-weather road from Warora to Nagri via Wanoja. This road passes through the eastern part of the leasehold area and joins Nagpur-Chandrapur road at Warora. Nearest airport is at Nagpur about 110 kms from the project site.

Fig. 1 : Location Plan of Amalgamated Yekona I & II OC Mine

1.4 Topography and Drainage

The entire area of the block is covered by agriculture land with black cotton soil and exhibits a gently undulating topography with general slope towards north. The altitude of the area ranges from 187 m to 203.72 m from Mean Sea Level.

The drainage in the area is controlled by the Wardha River which is flowing southerly and also demarcates the western limit of the block. H.F.L. of Wardha River in the block area is about 198 m. A seasonal nallah passing through the proposed land area of external overburden dump is envisaged to be diverted along the mine boundary. A canal passes through mine area is also proposed to be diverted along the mine boundary.

1.5 Mine Boundary

The geological block boundaries of block are as follows:

Yekona I Block :

North - Subcrop of Composite Seam.

South - Arbitrary line passing through BH CMWY-77, 76, 57, 56 & MWN-9

East - Fault F8-F8

West- Fault F1-F1

Yekona II Block :

North - Subcrop of Composite Seam.

South - Arbitrary line passing through BH CMWY-77, 76, 57, 56 & MWN-9

East - Fault F8-F8

West- Fault F1-F1

1.6 Geological Structure

Average Gradient is 1 in 4.8- 1 in 14. Stripping Ratio is 1: 7.82 m^3/t. Grade of Coal is G8 (4920Kcal/kg).

Details of Seam - One composite seam with multiple sub sections

Thickness of Seams to be worked on are as follows:

Sequence of Coal Seams in Yekona-I Block

Coal Seam/Section	Thickness range (m)	
	Min.	Max.
Upper Coal Band	0.33	0.98
Top Section	1.53	8.34
Bottom Section	1.6	5.72
Lower Band-I	0.31	0.75
Lower Band-II	1.1	1.33

Sequence of Coal Seams in Yekona-II Block

Coal Seam/Section	Thickness range (m)	
	Min.	Max.
r Coal Band	0.25	2.29
Section	3.75	8.45
m Section	2.12	5.38
r Coal Band	0.41	1.31
bined Section	8.83	12.47

1.7 Mining technology

Method of Mining will be Opencast with Shovel – Dumper Combination & Surface Miner.

Geo-Mining parameters of Amalgamated Yekona-I & II OC mine

Sl. No.	PARTICULARS	YEKONA-I	YEKONA-II	Amalagamated Yekona I & II OC
1	Av. Thickness of seam (m)	9.24	9.94	
2	Gradient of seam	1 in 7 to 1in 14	1 in 4.8 to 1 in 8	
3	Depth (m): a) Min. b) Max.	 30 160	 25 150	
4	Av. Strike length (m) a) At surface b) At floor	 1700 1400	 3800 3200	
5	Average Dip-Rise width(km) a)On floor b)On Surface	 1.2 to 2.0 1.5 – 2.4	 0.60 0.87	
6	Area of the Quarry (Ha) a)On floor b)On Surface	 214.70 354.50	 238.64 339.74	 453.34 694.24
7	Total mineable reserves (Mt)	25.04	32.81	57.85
8	GCV (kCal/kg) (without dilution at each contact point)	4714 (G-9)	5053 (G-8)	4920 (G-8)
9	Total volume of OB (Mm^3)	225.71	226.78	452.49
10	Average stripping ratio (m^3/t)	9.01	6.91	7.82
11	Annual mine target (MTPA)	1.00 to 1.25	1.25 to 1.50	2.75
12	Life of the mine	25	24	25

1.8 Land requirement

The land requirement for Phase-I project is as follows:

S.N.	LAND USE	Within ML Area (ha)	Outside ML Area (ha)	Total
1	Agricultural land	1570.31	50.49	620.80
2	Forest land	--	--	--
3	Waste land/Govt. land	58.59	-	58.59
4	Grazing land	--	--	--
5	Surface water bodies	--	--	--
6	Settlements	--	--	--
7	Others (specify)	--	--	--
	Total	**1628.90**	**50.49**	**679.39**

1.9 Genesis of the Study

Environmental Clearance for Amalgamated Yekona I & II OC mine (Phase I) has been secured for production capacity of 2.75 MTPA in an area of 1679.39 ha vide MoEF & CC letter no. J-11015/381/2015-IA-II (M) dated 01.01.2021.

As per EC Condition no. 4.1c(xi) at pg 11 of aforesaid EC letter," Project proponent shall take all precautionary measures to ensure riverine/ reparian ecosystem in and around mine upto a distance of 5 km. A riverine/ reparian ecosystem conservation and management plan should be prepared and implemented in consultation with irrigation/ water resource department in the state government "

In compliance of the aforesaid EC condition, Western Coalfields Limited has prepared riverine/ reparian ecosystem conservation and management plan and also suggested all precautionary measures to ensure riverine/ reparian ecosystem in and around mine.

Subsequently, steps will be taken so as to implement the aforesaid measures / plan in consultation with Irrigation/ Water resource department in the state government.

The Detail analysis report/ plan/ suggestions are being placed in subsequent pages.

Chapter 2

HYDROGEOLOGICAL SETUP

2.0 HYDROGEOLOGY

The amalgamated Yekona I & II OC mine (Phase-I) is situated in Wardha Valley coalfields of WCL. The ground water assessment carried out in the Wardha Valley coalfield is provided in this chapter.

2.1 LOCATION AND ACCESSIBILITY

The mine falls in the interior under the developed region of Chandrapur district. The Chandrapur and Nagpur townships are located at a distance of 110 Km and 52 Km from the mine respectively (Plate I).

The Amalgamated Yekona I & II OC Mine is bounded by Latitudes N 20^0 13′ 42″ to 21^0 15′ 45″ and Longitudes E 78^0 55′ 00″ to 78^0 58′ 30″ and has is covered by the Survey of India Toposheet no. 56L/15 & 56L/16.

2.2 TOPOGRAPHY , DRAINAGE & CLIMATE

The entire area of the geological block is covered by agricultural land with black cotton soil and exhibits a gently undulating topography with general slope towards north. The altitude of the area ranges from 187 m to 203.72 m above Mean Sea Level.

The drainage pattern in the area is controlled by southerly flowing Wardha River which also demarcates the western limit of the block. One seasonal nala flowing towards west passes north of the block and meets Wardha River. H.F.L. of Wardha River in the block area is about 198 m. A seasonal nala passing through the proposed land area of external Overburden Dump is envisaged to be diverted along the mine boundary.

The area is characterised by subtropical climate. The highest temperature recorded is about 48°C during summer and during winter season the temperature goes down to about 10°C. Monsoon is normally active during the period from mid June to mid September. The average annual rainfall recorded in the area is 1130 mm.

2.3 GEOLOGY OF THE AREA

2.3.1 REGIONAL GEOLOGY

Wardha Valley Coalfield is located in the southeastern part of Maharashtra State between Latitude N-$19^0$30′ & 20^0 27′ and Longitude E-78^0 50′ & $79^0$49′. The aerial extent of this coalfield has been estimated as 4000 sq.km. The NNW-SSE axis (which corresponds to the strike of the coal bearing sedimentaries) is around 100 km long with a maximum width of about 80 km. The like hood of extension of this coalfield in the north-northwestwards beneath the Deccan Trap cannot be discounted.

The coalfield has elliptically aligned coal prospects within Barakar Formation around the core of Talchirs, which occupies the central part of the coalfield. The eastern limits of this anticlinal structure is constituted by Konda/Bhandak blocks towards north and Wirur/Subai/Chincholi blocks towards south. The western limb is constituted by Majri/Kawadi/Kolarpimpri blocks toward north and Ghugus/Nakoda/mugoli/Kolgaon-Sawangi towards south. These limbs have been further affected by numerous NNW-SSE trending faults. Depending upon the alignment of these faults vis-à-vis the strike of coal bearing sedimentaries, numerous isolates coal-prospects have been deciphered in western limit of Wardha Valley Coalfield.

The Archaeans are exposed in the low-lying area in the eastern part of coalfield. The Pre-cambrian sediments, Sullavai sandstone and Pakhal Limestones encircle the Gondwana sediments in the south west and north-east while the flows of Deccan Trap conceal the underlying Gondwana sediments in the northwest.

The Talchir formation conspicuously occupies the central part with a maximum width of 21 km and length of 24 km.The coal bearing Barakar Formation conformably overlies the Talchirs. Few exposures of it in the form of narrow linear strips occur in the western part of the coalfields is given in the Table 1.

Table 1: Regional Geological Succession of Wardha Valley Coalfield

Age	Formation	Lithology
Recent to Sub-recent	Detrital mantle	Black cotton soil, sandysoil, kankar etc.
Upper Cretaceous to Eocene	Deccan Trap	Basalts
----------Cretaceous	--UNCOFORMITY----- Lametas	---------- Cherty limestone, Silicified sandstone.
---------- Upper Permian to Lower Triassic	--UNCONFORMITY--- Kamthis	---------- Red, brown, medium to coarse grained sandstone, variegated clay and shale band.
……..	UNCONFORMITY Barakar	…….
Lower Permian	Talchir	Predominantly grey to white medium to coarse grained sandstone with minor shales, carbonaceous shale and one thick coal seam (15 to 25m)
	--UNCONFORMITY--	

Lower Permian-upper Carboniferrous. ---------- Precambrian ---------- Archaean	Sullavai Pakhal --UNCONFORMITY-- Metamorphics	Greenish to grey coloured sandstone, siltstones and shales. ---------- White to light brown quartzitic sandstone, conglomerates. Grey, bluish or pinkish limestone and Cherts ---------- Gneisses or schists

2.3.2 GEOLOGY OF THE BLOCK

Table 2A: Geological succession, Yekona-I Block

Age	Formation	Thickness Range (m)		Lithology
		Minimum	Maximum	
Recent to Sub-Recent	Soil	6.00 (CMWY-59,60)	31.00 (MWM-07)	Black cotton soil/sandy soil
…….Unconformity…….				
Upper Permian to Lower Triassic	Kamthi	8.56 (CMWY-83)	94.20 (MWM-9)	Yellow to brown fine to coarse grained sandstone, shale and clay.
…….Unconformity……				
Lower Permian	Barakar	11.75(+) (CMWY-10)	167(+) (CMWM-56)	Grey to white fine to coarse-grained sandstones, Shale, Carb. shale, Shaly coal and coal.
Upper Carboniferous to Lower Permian	Talchir	1.70(+) (MWW-10)	5.42(+) (MWM-57)	Grey and greenish shale and sandstone.

Table 2B: Geological succession, Yekona-II Block

Age	Formation	Thickness Range (m)		Lithology
		Minimum	Maximum	
Recent to Sub-Recent	Soil	3.00 (MWM-27)	21.00 (MWM-26)	Black cotton soil/sandy soil
…….Unconformity…….				

Age	Formation	Thickness Range (m)		Lithology
		Minimum	Maximum	
Upper Permian to Lower Triassic	Kamthi	3.00 (MWM-38)	54.00 (CMWY-50)	Yellow to brown fine to coarse grained sandstone, shale and clay.
…….Unconformity…….				
Middle Permian	Motur	6.00 (MWM-58)	192.96 (MWM-15)	Fine to medium variegated sandstones, clay and shale.
Lower Permian	Barakar	10.97 (CMWY-111)	158.25 (MWM-21)	Grey to white fine to coarse grained sandstones, Shale, Carb. Shale, Shaly coal and coal.

2.4 HYDROGEOLOGICAL SET- UP

2.4.1 Aquifer Details

Generally sandstone horizons serve as aquifers and shale/clay acts as aquicludes in Gondwanas whereas weathered / secondary porous zones act as aquifers in Basalts & The various hydrogeological units developed in the study area are in the following table.

TABLE 3: Type of aquifers in Amalg. Yekona I&II OC mine area

Sl. No.	Type of Aquifer	Depth range (m)	Core zone	Buffer zone
1.	Unconfined	0 - 25	Soil zone/ weathered Basalt	Alluvium/Weathered Basalts
2.	Semiconfined/ confined	Beyond 25	Kamthi and Barakars	Inter trappeans, vesicular and fractured / jointed Basalts and also sandstone of Gondwanas.

2.4.2 GENERAL AQUIFER PARAMETERS

No detailed hydrogeological investigations were carried out at Amalgamated Yekona- I & II OC mine area. However, the aquifer parameters evaluated by CMPDI at the nearby area (CMPDI, Exploration Camp, Anandwan, Warora) have been considered and attributed for the study area. The projected hydraulic parameters of the aquifers are as follows:

Table 5: Aquifer parameters of Amalg. Yekona I&II OC mine

Aquifer parameters	Barakar Formation
Hydraulic conductivity (m/d)	2.20
Storage Co-efficient	1.57 x 10-4 to 1.1 x 10-3
Specific yield	0.05

2.5 HYDROGEOLOGICAL CONSEQUENCES OF MINING

Mining is associated with groundwater problems, particularly when it is below water table. The impact of mining on groundwater is dependent mainly on mine and aquifer parameters, groundwater recharge-discharge process etc. As such, during this exercise, basically the water level is to be depressed/depleted below the working seam depth in which case large scale mine water pumping cannot be avoided. Consequently the mine dewatering would drain out some area around the mine with decline in groundwater levels. However, these mine-induced effects are temporary. Further, the mine pumped out water would not contaminate the other resources of water. The mine water quality monitoring is being done at the stipulated intervals as preventive measures.

Groundwater inflow and mine influence area have been estimated and the groundwater monitoring has been undertaken as corrective measure to avoid adverse effects. The mine discharge after passing through sedimentation pond / tank is being discharged onto land/natural drains at suitable locations so that the groundwater gets additional recharge by the return flow. The artificial recharge by water conservation structures in mine influence area proper may not be a viable solution because of the reason that recharged water would drain to the mine at a faster rate due to the steep hydraulic gradients resulted in during mining activity. As mentioned earlier the mine impact may be for temporary period during mine life and the area would regain the normalcy/benefits in many ways by appropriate reclamation measures during post-mining period. However, the water shortage in the mine influence area would be supplemented from the treated mine water discharge for both domestic & irrigation use of affected villages if any.

2.6 EFFECT OF OPENCAST MINING ON WATER LEVELS

At there there are only three mines namely Amalgamated Yekona I & II OC (Phase-I), New Majri UG to OC & New Majri II (A) OC are operative mines.

Mining is a dynamic process, the hydraulic gradients also keep on falling continuously in the vicinity of the mine i.e. mine influence area. Both un-confined and semi-confined aquifers

have been affected due to opencast mining in down-dip region in particular. The trend of declines indicates that hydrological continuity exists between Kamthi and Barakar formations.

The groundwater levels in the unconfined aquifers are affected to negligible/insignificant extent in shallow aquifer in the up-dip side of the mine. However, the deep aquifer in lower Barakar is not affected since it lies below the working coal seam. Noticeable effect on groundwater level for most of the coal mine in Wardha valley coalfield has been observed in the down-dip side within a distance of 500-700 m and becomes milder/ negligible thereafter.

2.7 GROUNDWATER LEVELS

To collect the representative groundwater levels in the study area, CMPDI, RI-IV had established a monitoring network with 18 hydrograph stations spread over the buffer zone (10 km radius mine boundary). Ground water monitoring data for Pre-monsoon and Post-monsoon periods for last 4 years (2015-2018) is given below as follows:

Groundwater monitoring data of dugwells in buffer zone of Amalg. Yekona-I and II OC Mine

Well No.	Name of village	Well location	Lat	Long	R.L.	Well dia (m)	Well depth (m bmp)	Height of measuring point (m agl)	DEPTH TO WATER (METER-BELOW GROUND LEVEL)								Utility / Owner	Formation Tapped
									May'15	Nov'15	May'16	Nov'16	May'17	Nov'17	May'18	Nov'18		
M43	Ashi	S of the village & adjacent to road, near Mr. Powdae's house	20.86	78.92	275	2.95	8.25	1.20	5.32	1.15	6.60	1.70	5.90	2.00	4.90	1.85	D / GP	Basalt
M44	Ashi	Adjacent to road, about 1 km south of the village in field	20.31	78.92	212	4.26	6.15	GL	4.55	2.10	5.75	2.10	6.35	3.40	Dry	3.05	I / Private	--do--
M45	Nandra	Centre of the village, near Uddarao Kulte's house	20.56	78.94	240	1.90	12.10	0.75	.....	8.40	11.35	7.25	9.15	7.25	9.65	8.15	D / GP	Alluvium & S.St.
M46	Panjurni	200m E of village in the field	20.28	78.93	209	1.35	12.50	1.00	9.65	7.70	9.90	6.85	9.45	6.90	11.20	8.65	--do--	Basalt
M48	Dongargaon	NE of village, near Ram Mandir	20.33	78.97	213	3.00	9.15	0.75	7.90	6.10	Dry	5.25	Dry	6.65	Dry	6.45	--do--	Vindhyans
M49	Belgaon	About 100m E of village in the field	20.33	78.98	218	3.25	9.50	0.70	3.55	2.00	4.20	1.80	4.95	3.20	4.10	2.45	--do--	Alluvium & S.St.
M51	Kondhala	Near School, S of village	20.32	78.99	214.00	3.00	8.22	1.00		Dry	Dry	5.70	Dry	6.80	Dry	5.85	--do--	Alluvium & S.St.
M52	Dahigaon	SE of village, adjacent to Dongargaon road & nalla	20.31	78.96	207	2.70	7.80	1.60	4.62	3.96	5.60	3.50	6.35	3.95	5.10	3.70	--do--	Vindhyans
M53	Majra (Raitwari)	S of village in the field , about 120 m E of Nagpur road	20.30	79.02	224	2.40	15.00	1.00	10.30		12.75	NA	12.00	NA	12.70	10.40	--do--	Gondwana S.St.
M55	Mohbala	Adjacent to Warora - Dongergaon road, SE of the village	20.27	79.00	220	3.55	9.85	0.60	6.20	3.60	7.00	NA	6.55	4.25	7.75	4.65	--do--	Alluvium & S.St.

Well No.	Name of village	Well location	Lat	Long	R.L.	Well dia (m)	Well depth (m bmp)	Height of measuring point (m agl)	DEPTH TO WATER (METER-BELOW GROUND LEVEL)								Utility / Owner	Formation Tapped
									May'15	Nov'15	May'16	Nov'16	May'17	Nov'17	May'18	Nov'18		
M56	Charur	Center of the village , near the School	20.28	78.95	199	3.00	13.70	0.66	12..35	5.64	11.89	5.24	10.54	7.24	10.64	5.64	--do--	Basalt
M58	Wanoja (Eof Wardha river)	Adjacent to Warora - Madheri road	20.25	78.98	204	3.00	12.30	1.15	9.90		Dry	3.45	10.95	4.65	Dry	8.10	--do--	Alluvium & S.St.
M59	Warora	Anandvan Bio-Technology Lab, Adjacent to Nagpur-Chandrapur road	20.24	79.02	212	8.00	13.15	0.80	11.75	5.00	11.70	2.20	9.70	2.65	Dry	4.40	D / Anandvan Ashram	Basalt
M60	Marda	500 m E of the village, in field and north side of road	20.24	78.95	202	2.45	8.80	1.00	5.65	3.33	6.20	3.10	Dry	3.55	Dry	dry	I / Dilip Pimpadkar	--do--
M62	Ashti	East of the village , opp. to Mahadev Upre's house	20.22	78.97	203	3.10	12.45	0.65	9.70	8.05	Dry	8.45	Dry	Dry	Dry	dry	D / GP	Alluvium & S.St.
WN-17	Wanoja	60m E of road entering in villageand N of Nallah	20.18	78.92	202	3.20	6.80	0.60	Dry	4.75	Dry	5.00	Dry	Dry	Dry.	Dry	D / GP	Basalt
WN-95	Goraj	200m W of road to village in field	20.20	78.93	195	4.40	6.95	0.60	.....	4.50	Dry	2.50	Dry	Dry	Dry	Dry	D / GP	Basalt
WN-96	Hiwra	Outside the village in W, infront of School	20.22	78.91	210	3.75	9.00	0.60	7.60	3.20	Dry	1.80	8.20	5.80	8.5 (water from other source)	4.35 (water fed in)	D / GP	--do--

PO- Pump On, NA- Not Accessible, m bgl- meter below ground level, m agl- meter above ground level, GL- ground level, D- domestic, GP- Gram Panchayat,

The range of water levels (2018), measured from the core and buffer zone of Amalgamated Yekona-I and II OC Mine are given below:

Range of water level (2018) in core and buffer zone of study area

Pre monsoon (May-Jun' 2018)	Core Zone	7.75 m to 10.64 m
	Buffer zone	4.10 m to 12.70 m
Post monsoon (Oct-Nov' 2018)	Core Zone	4.65 m to 8.10m
	Buffer zone	1.85 m to 10.40 m

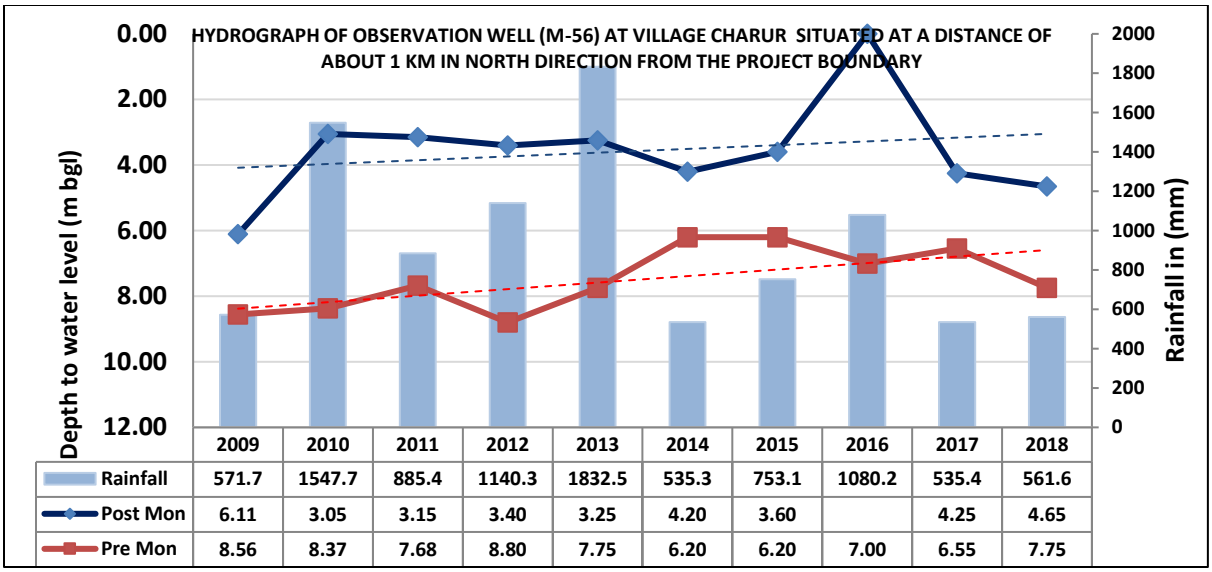
Water Level Fluctuation of the Study Area

Core zone				**Buffer zone**			
Period	Min	Max	Average	Period	Min	Max	Average
2012	1.85	6.94	4.53	**2012**	2.45	6.35	3.82
2013	3.25	4.85	4.20	**2013**	2.15	6.10	3.92
2014	1.85	2.00	1.99	**2014**	0.40	3.50	1.62
2015	2.32	2.60	2.46	**2015**	0.66	6.75	2.82
2016	3.10	6.65	4.88	**2016**	2.10	9.50	4.24
2017	2.30	6.30	3.97	**2017**	1.75	7.05	3.11
2018	3.10	5.00	4.05	**2018**	1.40	3.05	2.03
Note-water level in m below ground level							

2.8 WATER LEVEL TREND

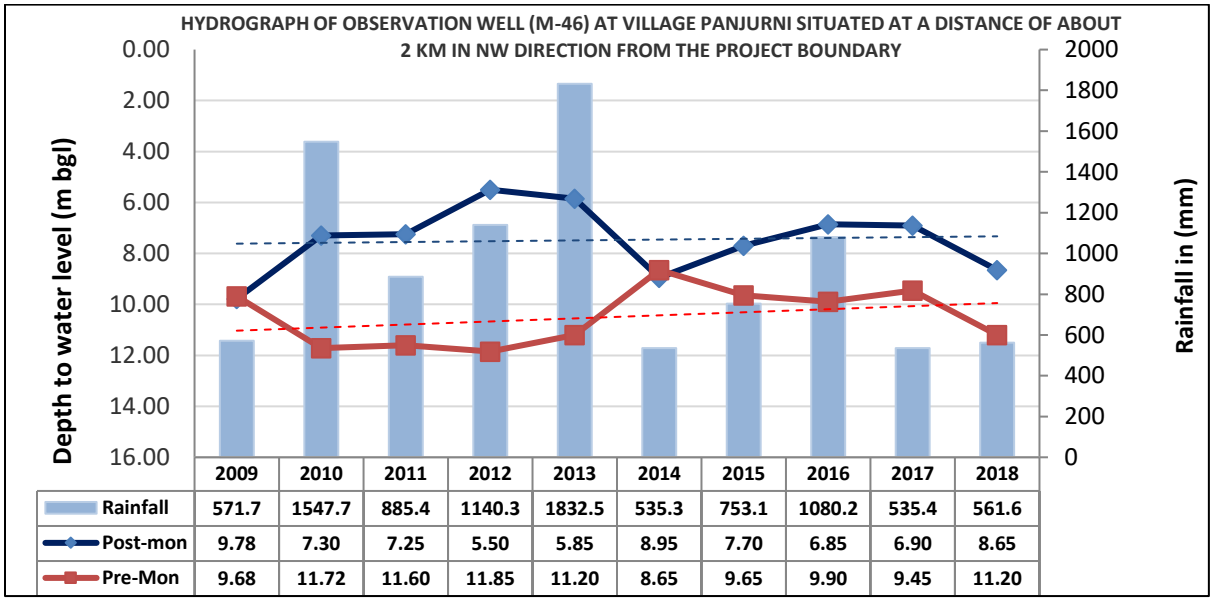
Hydrographs of two permanent observation wells fixed by CMPDI, RI-IV has been prepared based on pre-monsoon (May) and post-monsoon (Nov) water level data from 2009 to 2018 and presented in figures below to assess the water level trend.

The hydrograph of well M-56 at Charur Village shows increasing water level trends for pre-monsoon period and steady water level trend during post-monsoon period. The hydrograph of well M-46 situated at Panjhurni village shows increasing level trends during both pre-monsoon and post-monsoon period.



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rainfall	571.7	1547.7	885.4	1140.3	1832.5	535.3	753.1	1080.2	535.4	561.6
Post Mon	6.11	3.05	3.15	3.40	3.25	4.20	3.60		4.25	4.65
Pre Mon	8.56	8.37	7.68	8.80	7.75	6.20	6.20	7.00	6.55	7.75

Fig.1



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rainfall	571.7	1547.7	885.4	1140.3	1832.5	535.3	753.1	1080.2	535.4	561.6
Post-mon	9.78	7.30	7.25	5.50	5.85	8.95	7.70	6.85	6.90	8.65
Pre-Mon	9.68	11.72	11.60	11.85	11.20	8.65	9.65	9.90	9.45	11.20

Fig.2

2.9 GROUND WATER QUALITY

The groundwater quality in the area has been monitored by WCL through CMPDI, an ISO-9001 company and the results (2018-19) indicate that groundwater quality in the area does not contain any toxic elements. Generally, the pH value varies from6.8 -7.30which is within the desirable range of 6.5 to 8.5. The concentration of 'Total Dissolved Solids' (TDS) is low to high varying from 270 – 1550 mg/l which is within the permissible limit of 2000 mg/l. The Fluoride content ranges between 0.45 – 0.84

mg/l which falls within desirable limit of 1.0 mg/l and Nitrates ranges from 26-44 mg/l which is also within the desirable limit of 45 mg/l. Normally, the coal mining activity does not induce any unwanted chemical or elements into the groundwater except for 'Total Suspended Solids' (TSS). The ground water quality analysis data (2018-19) for Amalg. Yekona-I and II OC Mine is given below:

Groundwater Quality of CHARUR & WANOJA Village

Sl. No	Parameters	Test Method	Limits of Detection	Analysis Result **Sampling Code, Location & Sample collection date**		**Standard (IS : 10500 : 2012)**	
				CHARUR, M-56 27.11.2018	**WANOJA, M-58 27.11.2018**	**Desirable limit**	**PLV in the absence of alternate source**
1	Colour Hz)	IS 3025 /04:1983,Platinum Cobalt	1	17	1	5	15
2	Odour	IS 3025 /05:1983,Physical, Qualitative	Qualitative	Agreeable	Agreeable	Agreeable	Agreeable
3	Turbidity (NTU)	IS-3025/10:1984 Nephelometric	1.0	62	2	1	5
4	pH Value	IS-3025/11:1983 Electrometric	0.2	6.9	6.8	6.5 to 8.5	No relaxation
5	Total Hardness as $CaCO_3$ -mg/l	IS-3025/21:2009 EDTA	4.0	952	376	200	600
6	Iron -mg/l	IS-3025/53:2003 AAS-Flame	0.06	<0.06	<0.06	0.3	No relaxation
7	Chlorides - mg/l	IS-3025/32:1988, Argentometric	2.0	350	140	250	1000
8	Residual Chlorine -mg/l (min.)	APHA, 22nd Edition DPD	0.02	<0.02	<0.02	0.2	1
9	Fluoride- mg/l	APHA, 22nd Edition SPADNS	0.02	0.45	0.69	1.0	1.5
10	TDS -mg/l	IS-3025/16:1984 Gravimetric	25.0	1550	610	500	2000
11	Calcium -mg/l	IS-3025/40:1991 EDTA	1.6	176	72	75	200
12	Magnesium - mg/l*	APHA, 22nd Edition-Calculation EDTA	3	125	48	30	100
13	Copper -mg/l	IS-3025/42:1992 AAS-Flame	0.03	<0.03	<0.03	0.05	1.5
14	Manganese - mg/l	IS-3025/59:2006 AAS-Flame	0.02	<0.02	<0.02	0.1	0.3
15	Sulphate -mg/l	APHA, 22nd Edition Turbidity	2.0	178	42	200	400

16	Nitrates - mg/l	APHA, 22nd Edition UV-Spectrophotometric Turbidity Nesseler's	0.5	44	36	45	No relaxation
17	Cadmium - mg/l	APHA, 22nd Edition AAS-GTA	0.0005	<0.0005	<0.0005	0.003	No relaxation
18	Lead -mg/l	APHA, 22nd Edition AAS-GTA	0.005	<0.005	<0.005	0.01	No relaxation
19	Selenium – mg/l*	APHA, 22nd Edition AAS-VGA	0.005	<0.005	<0.005	0.01	No relaxation
20	Total Arsenic - mg/l*	APHA, 22nd Edition AAS-VGA	0.005	<0.005	<0.005	0.01	0.05
21	Zinc -mg/l	IS-3025/49:1994 AAS-Flame	0.01	0.0239	0.0341	5	15
22	Total Chromium -mg/l	IS 3025 (Part 52) : 2003 AAS-Flame	0.01	<0.01	<0.01	0.05	No relaxation
23	Boron -mg/l	APHA, 22nd EditionCarmine	0.2	<0.2	<0.2	0.5	1.0
24	Alkalinity -mg/l	IS-3025/23:1986, Titration	4.0	180	244	200	600
25	Nickel-mg/l	IS 3025 (Part 54) : 2003, AAS-Flame Method	0.02	<0.02	<0.02	0.02	No relaxation
26	Aluminum - mg/l*	APHA, 22nd Edition AAS-GTA	0.03	<0.005	<0.005	0.1	0.2

Groundwater Quality of Marda Village

Sl. No	Parameters	Test Method	Limits of Detection	Analysis Result **Sampling Code, Location & Sample collection date**	**Standard (IS : 10500 : 2012)**	
				MARDA, M-60 27.11.2018	**Desirable limit**	**PLV in the absence of alternate source**
1	Colour Hz)	IS 3025 /04:1983,Platinum Cobalt	1	2	5	15
2	Odour	IS 3025 /05:1983,Physical, Qualitative	Qualitative	Agreeable	Agreeable	Agreeable
3	Turbidity (NTU)	IS-3025/10:1984 Nephelometric	1.0	2	1	5
4	pH Value	IS-3025/11:1983 Electrometric	0.2	7.30	6.5 to 8.5	No relaxation
5	Total Hardness as $CaCO_3$ -mg/l	IS-3025/21:2009 EDTA	4.0	152	200	600
6	Iron -mg/l	IS-3025/53:2003 AAS-Flame	0.06	<0.06	0.3	No relaxation
7	Chlorides - mg/l	IS-3025/32:1988, Argentometric	2.0	40	250	1000
8	Residual Chlorine -mg/l (min.)	APHA, 22nd Edition DPD	0.02	<0.02	0.2	1

9	Fluoride- mg/l	APHA, 22nd Edition SPADNS	0.02	0.84	1.0	1.5
10	TDS -mg/l	IS-3025/16:1984 Gravimetric	25.0	270	500	2000
11	Calcium -mg/l	IS-3025/40:1991 EDTA	1.6	48	75	200
12	Magnesium - mg/l*	APHA, 22nd Edition-Calculation EDTA	3	9	30	100
13	Copper -mg/l	IS-3025/42:1992 AAS-Flame	0.03	<0.03	0.05	1.5
14	Manganese - mg/l	IS-3025/59:2006 AAS-Flame	0.02	<0.02	0.1	0.3
15	Sulphate -mg/l	APHA, 22nd Edition Turbidity	2.0	10	200	400
16	Nitrates - mg/l	APHA, 22nd Edition UV-Spectrophotometric	0.5	26	45	No relaxation
17	Cadmium - mg/l	APHA, 22nd Edition AAS-GTA	0.0005	<0.0005	0.003	No relaxation
18	Lead -mg/l	APHA, 22nd Edition AAS-GTA	0.005	<0.005	0.01	No relaxation
19	Selenium –mg/l*	APHA, 22nd Edition AAS-VGA	0.005	<0.005	0.01	No relaxation
20	Total Arsenic - mg/l*	APHA, 22nd Edition AAS-VGA	0.005	<0.005	0.01	0.05
21	Zinc -mg/l	IS-3025/49:1994 AAS-Flame	0.01	0.0751	5	15
22	Total Chromium -mg/l	IS 3025 (Part 52) : 2003 AAS-Flame	0.01	<0.01	0.05	No relaxation
23	Boron -mg/l	APHA, 22nd EditionCarmine	0.2	<0.2	0.5	1.0
24	Alkalinity -mg/l	IS-3025/23:1986, Titration	4.0	448	200	600
25	Nickel-mg/l	IS 3025 (Part 54) : 2003, AAS-Flame Method	0.02	<0.02	0.02	No relaxation
26	Aluminum - mg/l*	APHA, 22nd Edition AAS-GTA	0.03	<0.005	0.1	0.2

In addition to the above, baseline water quality analysis has been carried out during Pre-monsoon season i.e. Jan’20 to April’20. Details of which are placed below:

- The water quality characterization has been conducted by collecting water samples from drinking water, surface water and mine water discharge for subject project during post-monsoon season i.e. Jan’20 to April’20.

DRINKING WATER QUALITY MONITORING LOCATIONS:

Baseline water quality monitoring was conducted at 5 locations one of mine discharge and two each for surface water and drinking water.

SL. NO	LOCATION DETAILS	Sample	DATE OF SAMPLING
1	Mine Water Discharge	Mine Discharge	15-04-2020
2	Drinking water from Dandgaon village	Drinking Water	15-04-2020
3	Drinking water from Hiwara majra village	Drinking Water	15-04-2020
4	Wardha River (u/s)	Surface Water	09-04-2020
5	Wardha River (d/s)	Surface Water	09-04-2020

Monitoring Station: **Mine Water Discharge (BWW1)**
Sample Description: **Mine Water Discharge**

TSET REPORT NO.	RIN/TR/April-20/W48	DATE OF ISSUE	23.04.2020
NAME OF CUSTOMER	GM(ENV.),WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	WATER SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/346-348 DATED: 13.04.20		
TEST REQUIRED	IS 3025 (Part 11):1983, IS 3025 (Part 17):1984, IS 3025(Part 58):2006 & IS 3025(Part 39):1991		
NAME OF AREA	MAJRI AREA	SAMPLING METHOD : LSOP 5	
NAME OF PROJECT	YEKONA I& II OC	SAMPLING PLAN : LQR 47	

Sl. No	**Parameters**	**Test Method**	**Below Detection Limit**	**Standard for discharge Part A, Schedule VI**	Analysis Result	**Remarks**
1	pH Value	IS-3025/11:1983 Electrometric	0.2	5.5 to 9.0	7.8	
2	Temperature (^{0}C)	IS 3025 (Part 9) : 1984, Thermometric	4°	Te < Ts + 5°C	24.2^{O}C	
3	Colour (Hz)	APHA, 22nd Edition Platinum Cobalt	1	*	3	
4	Odour	IS 3025 /05:1983, Physical, Qualitative	--	Unobjectionable	Unobjectionable	
5	TSS –mg/l	IS-3025/17:1984 Gravimetric	10	100	28	
6	Oil & Grease –mg/l	IS-3025/39:1991 Partition Gravimetric	2	10	BDL	
7	C.O.D. – mg/l	APHA, 22nd Edition Closed Reflux	4	250	32	
8	B.O.D. (3 days at 27^{0}C)-mg/l	IS 3025 (Part 44) : 1993	2	30	2	
9	Residual Chlorine -mg/l	APHA, 22nd Edition DPD	0.02	1	BDL	
10	Ammonical Nitrogen-mg/l	IS 3025 (Part 34) : 1988	0.02	50	1.5	
11	Total Kjeldahl Nitrogen-mg/l	APHA, 22nd Edition Kjeldahl	1	100	6	
12	Dissolved Phosphate –mg/l	APHA, 22nd Edition Molybdovanadate	0.3	5	BDL	
13	Arsenic -mg/l	APHA, 22nd Edition AAS-VGA	0.005	0.2	BDL	
14	Lead -mg/l	APHA, 22nd Edition AAS-GTA	0.007	0.1	BDL	
15	Hexavalent Chromium -mg/l	APHA, 22nd Edition 1,5-Diphenylcarbohydrazide	0.01	0.1	0.02	
16	Total Chromium -mg/l	IS 3025 (Part 52) : 2003 AAS-Flame	0.06	2	BDL	
17	Copper -mg/l	IS-3025/42:1992 AAS-Flame	0.03	3	BDL	
18	Zinc -mg/l	IS-3025/49:1994 AAS-Flame	0.01	5	BDL	

19	Selenium –mg/l	APHA, 22nd Edition AAS-VGA	0.005	0.05	BDL	
20	Nickel -mg/l	IS 3025 (Part 54) : 2003, AAS-Flame	0.1	3	BDL	
21	Cadmium - mg/l	APHA, 22nd Edition AAS-GTA	0.005	2	BDL	
22	Fluoride - mg/l	APHA, 22nd Edition SPADNS	0.02	2	1.2	
23	Sulphide – mg/l	APHA, 22nd Edition Methylene blue	0.1	2	BDL	
24	Iron -mg/l	IS-3025/53:2003 AAS-Flame	0.06	3	BDL	
25	Manganese - mg/l	IS-3025/59:2006 AAS-Flame	0.02	2	BDL	
26	Nitrate Nitrogen - mg/l	APHA, 22nd Edition UV-Spectrophotometric	0.5	10	0.6	

Drinking Water Sample – Dandgaon Village

TSET REPORT NO.	RIN/TR/April20/DW1	DATE OF ISSUE	25.04.2020
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	WATER SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/346-348 DATED: 13.04.20		
TEST REQUIRED	IS 10500:2012		
NAME OF AREA	MAJRI	SAMPLING METHOD: LSOP 5	
NAME OF PROJECT	YEKONA I AND II OC	SAMPLING PLAN: LQR 47	
NO. OF PAGES	2		

NAME OF LOCATION:	Drinking water from Dandgaon village	SAMPLING DATE:	15-04-2020

SL. NO.	PARAMETER	TEST METHOD	DETECTION LIMIT	ANALYSIS RESULT	IS 10500:2012	
					REQUIREMENT (ACCEPTABLE LIMIT)	PERMISSIBLE LIMIT IN THE ABSENCE OF ALTERNATE SOURCE
1	Colour (Hazen)	IS 3025 Part-4	1	2	5	15
2	Odour	IS 3025 Part-5	Qualitative	Unobjectionable	Agreeable	Agreeable
3	Turbidity (NTU)	IS 3025 Part-10	1	1	1	5
4	pH Value	IS 3025 Part-11	2	7.3	6.5 to 8.5	No relaxation
5	Total Hardness (as CaCO3) -mg/l	IS 3025 Part-21	4	144	200	600
6	Iron (as Fe) -mg/l	IS 3025 Part-53	0.06	BDL	0.3	No relaxation
7	Chlorides (as Cl-)-mg/l	IS 3025 Part-32	2	28	250	1000
8	Residual Chlorine -mg/l	APHA, 22nd Edition DPD	0.02	BDL	0.2	1
9	Fluoride (as F-)-mg/l	APHA, 22nd Edition SPADNS	0.02	0.52	1	1.5
10	TDS -mg/l	IS 3025 Part-16	25	280	500	2000
11	Calcium (as Ca) -mg/l	IS 3025 Part-40	1.6	45	75	200
12	Magnesium (as Mg) -mg/l*	IS-3025/40: 1991 EDTA	3	24	30	100
13	Copper (as Cu) -mg/l	IS 3025 Part-42	0.03	BDL	0.05	1.5
14	Manganese as (Mn)- mg/l	IS 3025 Part-59	0.02	BDL	0.1	0.3
15	Sulphate (as SO4-2) -mg/l	APHA (22nd Edition) 4500E Turbidity Method	2	48	200	400
16	Nitrates (as NO3) -mg/l	IS-3025/34:1988 Nesseler's method	0.5	10	45	No relaxation

17	Cadmium as (Cd)-mg/l	APHA, 22nd Edition AAS-GTA	0.005	BDL	0.003	No relaxation
18	Lead as (Pb) -mg/l	APHA, 22nd Edition AAS-GTA	0.005	BDL	0.01	No relaxation
19	Selenium (Se) – mg/l	APHA, 22nd Edition AAS-VGA	0.005	BDL	0.01	No relaxation
20	Arsenic (Ar)-mg/l	APHA, 22nd Edition AAS-VGA	0.005	BDL	0.05	No relaxation
21	Zinc as (Zn) -mg/l	IS 3025 Part-49	0.01	BDL	5	15
22	Total Chromium - mg/l	IS 3025 Part-52	0.06	BDL	0.05	No relaxation
23	Boron as (B) -mg/l	APHA, 22nd Edition Carmine	0.2	BDL	0.5	1
24	Alkalinity -mg/l	IS 3025 Part-23	4	121	200	600
25	Nickel-mg/l	IS 3025 Part-54	0.1	BDL	0.02	No relaxation
26	Aluminum (Al)-mg/l	APHA (22nd Edition) 3114B AAS-VGA	0.005	BDL	0.1	0.2

Drinking Water Sample – Hiwara Majara Village

TSET REPORT NO.	RIN/TR/April20/DW2	DATE OF ISSUE	25-04-2020
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	WATER SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/346-348 DATED: 13.04.20		
TEST REQUIRED	IS 10500:2012		
NAME OF AREA	MAJRI	SAMPLING METHOD: LSOP 5	
NAME OF PROJECT	YEKONA I AND II OC	SAMPLING PLAN: LQR 47	
NO. OF PAGES	2		

NAME OF LOCATION:		Drinking water from Hiwara majra village		SAMPLING DATE:		15-04-2020
SL. NO.	**PARAMETER**	**TEST METHOD**	**DETECTION LIMIT**	**ANALYSIS RESULT**	**IS 10500:2012**	
					REQUIREMENT (ACCEPTABLE LIMIT)	**PERMISSIBLE LIMIT IN THE ABSENCE OF ALTERNATE SOURCE**
1	Colour (Hazen)	IS 3025 Part-4	1	2	5	15
2	Odour	IS 3025 Part-5	Qualitative	Unobjectionable	Agreeable	Agreeable
3	Turbidity (NTU)	IS 3025 Part-10	1	1	1	5
4	pH Value	IS 3025 Part-11	2	7.5	6.5 to 8.5	No relaxation
5	Total Hardness (as $CaCO_3$) -mg/l	IS 3025 Part-21	4	132	200	600

6	Iron (as Fe) -mg/l	IS 3025 Part-53	0.06	BDL	0.3	No relaxation
7	Chlorides (as Cl^-)-mg/l	IS 3025 Part-32	2	24	250	1000
8	Residual Chlorine -mg/l	APHA, 22nd Edition DPD	0.02	BDL	0.2	1
9	Fluoride (as F^-)-mg/l	APHA, 22nd Edition SPADNS	0.02	0.48	1	1.5
10	TDS -mg/l	IS 3025 Part-16	25	258	500	2000
11	Calcium (as Ca) -mg/l	IS 3025 Part-40	1.6	41	75	200
12	Magnesium (as Mg) -mg/l*	IS-3025/40: 1991 EDTA	3	22	30	100
13	Copper (as Cu) -mg/l	IS 3025 Part-42	0.03	BDL	0.05	1.5
14	Manganese as (Mn)- mg/l	IS 3025 Part-59	0.02	BDL	0.1	0.3
15	Sulphate (as SO_4^{-2}) -mg/l	APHA (22nd Edition) 4500E Turbidity Method	2	44	200	400
16	Nitrates (as NO3) -mg/l	IS-3025/34:1988 Nesseler's method	0.5	11	45	No relaxation
17	Cadmium as (Cd)-mg/l	APHA, 22nd Edition AAS-GTA	0.005	BDL	0.003	No relaxation
18	Lead as (Pb) -mg/l	APHA, 22nd Edition AAS-GTA	0.005	BDL	0.01	No relaxation
19	Selenium (Se) –mg/l	APHA, 22nd Edition AAS-VGA	0.005	BDL	0.01	No relaxation
20	Arsenic (Ar)-mg/l	APHA, 22nd Edition AAS-VGA	0.005	BDL	0.05	No relaxation
21	Zinc as (Zn) -mg/l	IS 3025 Part-49	0.01	BDL	5	15
22	Total Chromium -mg/l	IS 3025 Part-52	0.06	BDL	0.05	No relaxation
23	Boron as (B) -mg/l	APHA, 22nd Edition Carmine	0.2	BDL	0.5	1
24	Alkalinity -mg/l	IS 3025 Part-23	4	127	200	600
25	Nickel-mg/l	IS 3025 Part-54	0.1	BDL	0.02	No relaxation
26	Aluminum (Al)-mg/l	APHA (22nd Edition) 3114B AAS-VGA	0.005	BDL	0.1	0.2

	SURFACE WATER QUALITY DATA (Wardha River)					
	NAME OF LOCATION			DATE OF SAMPLING		
	WARDHA RIVER UPSTREAM			09.04.2020		
	WARDHA RIVER DOWNSTREAM			09.04.2020		
Sl. No.	**Parameter**	**Test method**	**Detection limit**	**IS 2296 Inland surface water (1982) class C**	**Analysis result**	
					Upstream	**Downstream**
1	pH Value	IS-3025/11:1983 Electrometric	0.2	6.5 to 8.5	6.9	7.1
2	Colour (Hz)	APHA, 22nd Edition Platinum Cobalt	1	300	3	4
3	TDS –mg/l	IS-3025/17:1984 Gravimetric	25	1500	262	275
4	Oil & Grease – mg/l	IS-3025/39:1991 Partition Gravimetric	2	0.1	BDL	BDL
5	Dissolved oxygen-mg/l	Is-3025/38.1989 Winkler Azide	0.1	4	4.3	4.2
6	B.O.D. (3 days at 27^0C)-mg/l	IS 3025 (Part 44) : 1993	2	3	3	4
7	Arsenic -mg/l	APHA, 22nd Edition AAS-GTA	0.005	0.2	BDL	BDL
8	Lead -mg/l	APHA, 22nd Edition AAS-GTA	0.005	0.1	BDL	BDL
9	Hexavalent Chromium -mg/l	APHA, 22nd Edition 1,5-Diphenylcarbohydrazide	0.01	0.05	BDL	BDL
10	Copper -mg/l	IS-3025/42:1992 AAS-Flame	0.03	1.5	BDL	BDL
11	Zinc -mg/l	IS-3025/49:1994 AAS-Flame	0.01	15	BDL	BDL
12	Selenium –mg/l	APHA, 22nd Edition AAS-VGA	0.005	0.05	BDL	BDL
13	Cadmium - mg/l	APHA, 22nd Edition AAS-GTA	0.005	0.01	BDL	BDL
14	Fluoride - mg/l	APHA, 22nd Edition SPADNS	0.02	1.5	0.62	0.64
15	Iron -mg/l	IS-3025/53:2003 AAS-Flame	0.06	50	BDL	BDL
16	Nitrate Nitrogen - mg/l	APHA, 22nd Edition UV-Spectrophotometric	0.5	50	2.1	2.4
17	Sulphate - mg/l	APHA, 22nd Edition Turbidity	2	400	60	66
18	Chlorides - mg/l	IS-3025/32:1988 AAS-Flame	2	600	24	28

From the above, It may be concluded that water quality characterization conducted for collecting water samples from drinking water, surface water and mine water discharge are well within the permissible limit.

Regular Monitoring of drinking water quality and mine water discharge is being carried out the latest monitoring results are also placed in subsequent slides.

Environment Laboratory GMPDI RI-IV, NAGPUR	Test Report Drinking water quality monitoring data	

TEST REPORT NO.	RI-VII/DSC/20/0635	DATE OF ISSUE	31.12.20
NAME OF LOCATION	[illegible]	SAMPLE DESCRIPTION	WATER SAMPLE
CUSTOMER LETTER REFERENCE NO.	[illegible]		
TEST REQUIRED	IS 10500:2012		
NATURE OF AREA	MINE	SAMPLING NO. [illegible]	
NATURE OF PROJECT	[illegible]	SAMPLING DATE [illegible]	
NO. OF PAGES	2		

NAME OF LOCATION	[illegible]	SAMPLING DATE	08.10.2020

SL. NO.	PARAMETER	TEST METHOD	DETECTION LIMIT	ANALYSIS RESULT	IS 10500:2012 ACCEPTABLE LIMIT (MAXIMUM) (mg/l)	IS 10500:2012 PERMISSIBLE LIMIT IN THE ABSENCE OF ALTERNATE SOURCE
1	Colour (Hazen)	IS 3025 Part-4 Photometric 2017	1	1	5	15
2	Odour	IS 3025 Part 5:2014	Qualitative	Agreeable	Agreeable	Agreeable
3	Turbidity (NTU)	IS 3025 Part 10 Nephelometric Method 2012	1	1	1	5
4	pH Value	IS 3025 Part-11 Electrometric Method 2017	2	7.21	6.5 to 8.5	No relaxation
5	Total hardness (as $CaCO_3$) (mg/l)	IS 3025 Part 21 EDTA Method 2014	4	156	200	600
6	Iron (as Fe) (mg/l)	IS 3025 Part 53 AAS Flame Method 2014	0.06	BDL	0.3	No relaxation
7	Chloride (as Cl) (mg/l)	IS 3025 Part 32 1988 Argentometric Method 2014	2	28	250	1000
8	Residual Chlorine (mg/l)	APHA, 23rd Edition 4500-Cl-B DPD Colorimetric method 2017	0.02	BDL	0.2	-
9	Fluoride (as F) (mg/l)	APHA, 23rd Edition 4500 F-C SPADNS Method 2017	0.02	0.83	1	1.5
10	TDS (mg/l)	IS 3025 Part 16 Gravimetric Method 2017	25	550	500	2000
11	Calcium (as Ca) (mg/l)	IS 3025 Part 40:2014	1.0	35	75	200
12	Magnesium (as Mg) (mg/l)	APHA 23rd Ed 3500-B Calculation Method 2017	1	20	30	100
13	Copper (as Cu) (mg/l)	IS 3025 Part 42 AAS Flame Method 2014	0.05	BDL	0.05	1.5
14	Manganese (as Mn) (mg/l)	IS 3025 Part 59 AAS Flame Method 2008	0.02	0.022	0.1	0.3
15	Sulphate (as SO_4^{2-}) (mg/l)	APHA 23rd Edition 4500E Turbidimetric Method 2017	2	220	200	400

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report Effluent water quality monitoring data	

TEST REPORT NO.	[illegible]	DATE OF ISSUE	[illegible]
NAME OF CUSTOMER	GMDWV L WCL/KHL NAGPUR	SAMPLE DESCRIPTION	WATER SAMPLE
CLIENT'S REF LETTER NO/DATE/REF NO.	WCL/HQ/ENV/[illegible]/588 dt 15.[illegible].20		
TEST REQUIRED	IS 10500:2012		
NAME OF AREA		[illegible]	
NATURE OF PRODUCT	[illegible]	SAMPLING PLAN [illegible]	
NO. OF PAGES	3		

NAME OF LOCATION	MINE WATER DISCHARGE			SAMPLING DATE	22.12.20
SL NO.	PARAMETER	TEST METHOD	DETECTION LIMIT	Standard for Discharge PARTA Schedule VI	Analysis result	Remarks
1	pH Value	IS 3025(11):2001 Electrometric	1	5.5 to 9.0	8.28	
2	Temperature (°C)	IS 3025 (Part 9)	4^{0}	Ts = Ts + 5°C	24.8	
3	Colour (Hazen)	APHA 23rd Edition Platinum Cobalt	1	-	4	
4	Odour	IS 3025/05: 1981 Physical, Qualitative	Qualitative	Unobjectionable	Unobjectionable	
5	TSS mg/l	IS 3025/17:1984 Gravimetric	10	100	28	
6	Oil & Grease mg/l	IS 3025/39:2005 Partition Gravimetric	2	10	BDL	
7	C.O.D. mg/l	APHA 23rd Edition Closed digital	4	250	32	
8	B.O.D. (3days at 27°C mg/l)	IS 3025 (Part 44) : 2001	1	30	4	
9	Residual Chlorine mg/l	APHA, 23rd Edition DPD	0.01	1	BDL	
10	Ammonical Nitrogen mg/l	IS 3025 (Part 34) : 1988	0.02	50	0.55	
11	Total Kjeldahl Nitrogen mg/l	APHA, 23rd Edition Kjeldahl	1	100	9	
12	Dissolved Phosphate mg/l	APHA, 23rd Edition Molybdovanadate	0.1	5	0.43	
13	Arsenic (As) mg/l	APHA, 23rd Edition AAS-VGA	0.005	0.2	BDL	
14	Lead as (Pb) mg/l	APHA, 23rd Edition AAS-GTA	0.005	0.1	BDL	
15	Hexavalent Chromium mg/l	APHA, 23rd Edition 1,5-Diphenylcarbohydrazide	0.01	0.1	BDL	
16	Total Chromium mg/l	IS 3025 (Part 52) : 2003 AAS Flame	0.06	2	BDL	
17	Copper (as Cu) mg/l	IS 3025/42 : 1992 AAS Flame	0.01	3	BDL	
18	Zinc as (Zn) mg/l	IS 3025/49 : 1994 AAS Flame	0.01	5	BDL	
19	Selenium (Se) mg/l	APHA, 23rd Edition AAS-VGA	0.005	0.05	BDL	
20	Nickel mg/l	IS 3025 (Part 54) : 2003 AAS Flame Method	0.1	3	BDL	
21	Cadmium as (Cd) mg/l	APHA, 23rd Edition AAS-GTA	0.005	2	BDL	
22	Fluoride (as F-) mg/l	APHA, 23rd Edition SPADNS	0.02	2	0.47	
23	Sulphide mg/l	APHA, 23rd Edition Methylene Blue	0.1	2	BDL	
24	Iron mg/l	IS 3025/53 : 2003 AAS Flame	0.06	3	BDL	
25	Manganese as (Mn) mg/l	IS 3025/59 : 2006 AAS Flame	0.02	2	BDL	
26	Nitrate Nitrogen as (NO3) mg/l	APHA, 23rd Edition UV - Spectrophotometric	0.1	10	3.3	

Environment Laboratory CMPDI RI IV, NAGPUR	Test Report Effluent water quality monitoring data	

TEST REPORT NO.	[illegible]	DATE OF ISSUE	[illegible]
NAME OF CUSTOMER	[illegible]	SAMPLE DESCRIPTION	WATER SAMPLE
CUSTOMER LETTER REFERENCE NO.	[illegible]		
TEST REQUIRED	[illegible]		
NAME OF AREA		[illegible]	
NAME OF PROJECT	[illegible]	[illegible]	
NO. OF PAGES	1		

NAME OF LOCATION	MINE WATER DISCHARGE			SAMPLING DATE	[illegible]	
Sl. NO.	Parameter	Test method	Detection limit	Standard for Discharge (MoEF&CC Schedule VI)	Analysis result	Remarks
1	pH Value	IS 3025/11:1983 Electrometric	1	5.5 to 9.0	8.26	
2	Temperature (°C)	IS 3025 (Part 9)	[illegible]	Ta < Tw + 5°C	28	
3	Colour (Hazen)	APHA 22nd Edition Platinum Cobalt	1	*	2	
4	Odour	IS 3025/05: 2003 Physical, Qualitative	Qualitative	Unobjectionable	Unobjectionable	
5	TSS mg/l	IS 3025/17: 1984 Gravimetric	20	100	32	
6	Oil & Grease mg/l	IS 3025/39: 1991 Partition Gravimetric	3	10	BDL	
7	C.O.D mg/l	APHA 22nd Edition Closed Reflux	4	250	39	
8	B.O.D. 3 Days at 27°C mg/l	IS 3025 (Part 44) : 1993	2	30	14	
9	Residual Chlorine mg/l	APHA, 22nd Edition 4500	0.02	1	BDL	
10	Ammoniacal Nitrogen mg/l	IS 3025 (Part 34) : 1988	0.02	50	0.43	
11	Total Kjeldahl Nitrogen mg/l	APHA, 22nd Edition Kjeldahl	2	100	6	
12	Dissolved Phosphate mg/l	APHA, 22nd Edition Molybdovanadate	0.4	5	0.38	
13	Arsenic (As) mg/l	APHA, 22nd Edition AAS-HGA	0.005	0.2	BDL	
14	Lead as (Pb) mg/l	APHA, 22nd Edition AAS-EDTA	0.005	0.1	BDL	
15	Hexavalent Chromium mg/l	APHA, 22nd Edition 3,3-Diphenylcarbohydrazide	0.01	0.1	BDL	
16	Total Chromium mg/l	IS 3025 (Part 52) : 2003 AAS Flame	0.06	2	BDL	
17	Copper (as Cu) mg/l	IS 3025/42 : 2003 AAS-Flame	0.01	3	BDL	
18	Zinc as (Zn) mg/l	IS 3025/49 : 2004 AAS-Flame	0.01	5	BDL	
19	Selenium (Se) mg/l	APHA, 22nd Edition AAS-HGA	0.005	0.05	BDL	
20	Nickel mg/l	IS 3025 (Part 54) : 2003 AAS Flame Method	0.1	3	BDL	
21	Cadmium as (Cd) mg/l	APHA, 22nd Edition AAS-EDTA	0.005	2	BDL	
22	Fluoride (as F) mg/l	APHA, 22nd Edition SPADNS	0.02	2	0.55	
23	Sulphide mg/l	APHA, 22nd Edition Iodimetric	0.1	2	BDL	
24	Iron mg/l	IS 3025/53 : 2003 AAS Flame	0.06	3	BDL	
25	Manganese as (Mn) mg/l	IS 3025/59 : 2006 AAS Flame	0.02	2	BDL	
26	Hexavalent Manganese (as Cr) mg/l	APHA, 22nd Edition [illegible]	0.5	10	2.8	

E.M. MONITORING REPORT
[illegible]

JOB NO [illegible]

Environmental Laboratory CVPCL Korba, Raigarh	Test Report	[illegible]

Test Report No. : [illegible] Date of Issue : [illegible]
Name of the Customer : [illegible] Sampling method : By the party
Customer Ref. No. : [illegible]
Sample Description : Water sample No. of pages : 2

EFFLUENT WATER QUALITY MONITORING DATA

NAME OF THE COMPANY : NCL YEAR : 2019
NAME OF THE AREA : [illegible] MONTH : OCT
NAME OF THE PRODUCT : [illegible] Sampling Date : [illegible]
Name of the Location : [illegible]

Sl. No.	Parameters	Test Method	Reporting Detection Limit	Standards [illegible] Prescribed Limit	Analysis Result	Remarks
1	pH value	[illegible]	0.2	5.5 to 9.0	7.70	
2	Temperature (°C)	[illegible]	4°	[illegible]	[illegible]	
3	Colour (Hazen)	[illegible]	1	-	[illegible]	
4	Odour	[illegible]	-	Unobjectionable	Unobjectionable	
5	TSS - mg/l	[illegible]	10	100	40	
6	Oil & Grease - mg/l	[illegible]	2	10	<2	
7	COD - mg/l	[illegible]	4	250	40	
8	B.O.D. 3 days at 27°C - mg/l	[illegible]	2	30	6	
9	Hexavalent Chromium - mg/l	[illegible]	0.01	-	<0.01	
10	Total Chromium - mg/l	[illegible]	0.01	2.0	0.06	
11	Total Kjeldahl Nitrogen - mg/l	[illegible]	1	100	10	
12	Free Ammonia (As N) - mg/l	[illegible]	0.5	5	0.06	
13	Arsenic - mg/l	[illegible]	0.005	0.2	<0.005	
14	Lead - mg/l	[illegible]	0.001	0.1	0.014	
15	Total Chromium - mg/l	[illegible]	0.01	2.0	0.060	
16	Total Phosphorus - mg/l	[illegible]	0.05	2	<0.05	
17	Copper - mg/l	[illegible]	0.05	3	<0.05	

E.M. MONITORING REPORT
[illegible]

JOB NO [illegible]
[illegible]

18	Zinc - mg/l	[illegible]	0.01	5	0.015	
19	Selenium - mg/l	[illegible]	0.05	0.05	<0.05	
20	Nickel - mg/l	[illegible]	0.1	3	<0.1	
21	Cyanide - mg/l	[illegible]	0.05	2	<0.05	
22	Fluoride - mg/l	[illegible]	0.12	2	0.64	
23	Sulphide - mg/l	[illegible]	0.1	2	<0.1	
24	Iron - mg/l	[illegible]	0.01	3	<0.36	
25	Manganese - mg/l	[illegible]	0.01	2	<0.32	
26	Total Chromium - mg/l	[illegible]	0.01	10	0.06	

From the above, it may be concluded that, based on latest water quality monitoring reports the water quality pertaining to Mine Discharge and Drinking water are confirming to prescribed standards.

It is further submitted that, the aforesaid reports are also available in the public domain i.e. WCL website.

The reports are also being submitted to the statutory agencies on the regular basis.

Chapter 3

FLORA FAUNA ANALYSIS

3.1 FLORA & FAUNA

Study of the biological environment is one of the most important aspect. This again has a special importance in case of mining project due its location. Mining leases and surrounding area are mostly located in the Agricultural Land, minor Forest area, Commercial area, Habitations and water body. The biological communities are good indicators of climatic and edaphic factors. It is important to conserve natural flora and fauna of an area. In the present study, mainly terrestrial ecosystem has been considered.

Primary survey was under taken in the Core zone and Buffer Zone in the year 2016.

The objectives of this study are as follows:

- To conduct brief study in cultivated and naturally occurring species in the core and buffer zone.
- Survey of terrestrial & aquatic flora and fauna for core and buffer zone.
- Survey of flora covering types e.g. agricultural crops, commercial crops, natural vegetation/forest types, grass lands.
- Survey of species protected by specific legislation (Rare, endangered, critically endangered, endemic and vulnerable).
- To identify locations and features of ecological significance.
- To generate secondary information with the help of public consultation for assessment of flora / fauna /avifauna and other life forms for different activity phases in the study area.

3.2 ACTIVITIES UNDERTAKEN DURING THE STUDY

1. Flora survey

- Identification and enumeration of different plant species such as Tree, shrub, herb, climber and grasses.
- Diversity assessment for different plant species
- Analysis of Rare-Endangered-Threatened flora

2. Fauna survey

- Documentation of Avian, Reptilian, Insect, Amphibian, Mammal and other faunal diversity
- Observations by direct and indirect evidences (Direct evidence- Sighting and hearing, Indirect evidence- Tracks and signs, nests, feathers/ hairs, Pellets/ scats and other signs
- Analysis of Scheduled species

3. Habitat/microhabitat diversity in the project site and surrounding areas within 10 km range from the site.

3.3 SURVEY LIMITATION

The survey recorded the flora and fauna evident during site visit and field survey. It does not record any flora or fauna that may appear at other times of the year, and as such, were not evident at the time of the visit. The report represents ecological status of the area evident during the period of the study.

The survey team has tried to collect the secondary information for the species which are not observed during site visit but can see in the study area through public consultation.

3.4 METHODOLOGY

Desk Study

The purpose of the desk study was to see land use of the study area through remote sensing images and species of local conservation value which may not have been present or apparent during the survey visit (e.g. spring/monsoon plants). The desk study was carried out by referring literature related to ecology and biodiversity of the region or other related areas encompassing the proposed site. Literature survey was also undertaken by collecting and stating research papers and reports specific to the region.

3.5 FLORA

An ecological survey was conducted during November 2016 to generate baseline data on flora and fauna of the project. The study has covered the following aspects to appraise the Environmental Impact Assessment (EIA) report:

S. No	Floral component
1.	Agricultural crops
2.	Commercial crops
3.	Plantations/Agro-forestry
4.	Natural Vegetation/Forest type
5.	Grassland Vegetation
6.	Endangered/ Endemic species
7.	Aquatic flora

Analysis of vegetation in relation to natural forest flora and croplands was conducted through reconnaissance field surveys and insight observations in core and buffer zone villages. The plant species identification was done based on the morphological characteristics and reproductive materials i.e. flowers, fruits and seeds.

Fauna and Avifauna:

The study of fauna takes substantial amount of time to understand the specific faunal characteristics of the area. The assessment of fauna has been done by extensive field survey of the area. During survey Line Transect method was used for the study of mammals and Transact and Patch Sampling were used for Amphibians. In addition the following sources were also used during survey.

- Sighting during ecological studies
- Animal call
- Foot mark and excreta

During survey, the presence of wildlife was also confirmed from the local inhabitants depending on the animal sightings and the frequency of their visits in the project area which was later confirmed from different government offices like forest department, wildlife department etc.

S. No	Faunal elements
1.	Total Listing of Faunal elements
2.	Endangered Species (wildlife schedules)
3.	Endemic Species
4.	Migratory Species
5.	Migratory corridors or Paths
6.	Breeding & Spawning Grounds
7.	Aquatic fauna

During Birds survey actual counts of birds were made following the standard survey technique. Observations were made during a walk through in the chosen transect for sighting birds. The number of birds observed in each sampling location was directly counted and listing was made. Birds were noted, counted and identified with the help of 8X40 "Optima Zenith" binocular and standard field identification guides.

Reptiles / Amphibians:

During survey observations were made by standard survey techniques. The reptiles and amphibians were counted by Transact and Patch Sampling. The number observed in each sampling location was directly counted and listing was made. The identification was made by using standard field identification guides.

3.6 SAMPLING STATIONS (STUDY AREA)

Majority of the region, falling in the 10 km radius consists of Agricultural landscape often interrupted by developmental activities. Wardha River flows on the western boundary of the project and covers study area from east to west. Sampling locations were strategically selected to collect maximum data on vegetation pattern, faunal diversity and Habitat diversity. Different land use were studied to get maximum diversity in areas demarcated as core zone (lease area) and buffer zone (upto 10 km from lease boundary) i.e.:-

YEKONA OC I & II MINE			
SL.NO.	Monitoring Code	Distance (IN KM)	Direction
1	E-1	1.10	NW
2	E-2	1.90	SW
3	E-3	2.20	SW
4	E-4	2.60	E
5	E-5	3.20	SW
6	E-6	3.80	NW

The observations for biological environment were taken in Agriculture field, Village wasteland, Barren Land, nearby waterbodies (Wardha River) etc.

Figure Marda Barrage under construction on Wardha River (December, 2016)

Observations

Observations were made for possible habitats and flora-fauna species in and around the site (except micro-organisms). All possible landscape features and areas in the site and buffer areas were visited to collect the required amount of data. The observations recorded are site, time and season specific. Further, the actual observation data was supported by the data obtained from secondary sources (reports, research papers, literature survey) to gather a wide and in-depth perspective.

The ecological richness and sensitivity of the locations were examined critically. The major habitats in the buffer area were visited and observation were recorded.

Habitat and Forest Type Diversity:

The region falling in the 10 km radius from the project location is not much more diverse forest only agricultural land existing in the study area. Actual field observations coupled with Toposheet were used to characterize and distinguish landscape diversity in the study site and the buffer area. The overall examination was carried out by making actual visits at various pre-marked locations in the core site (lease area) and the region falling within the 10 km radius of the project location (Buffer area).

Forest within Core Zone

No forest land is involved in the Phase-I of the project area. A patch of 0.62 ha of forest land (Jhudpi Jungle) is involved in the Phase-II of the project. Present EC application by project proponent is for Phase-I of the project.

Forest within Buffer Zone

Majority of the land area within study area is agriculture land. Following forest areas are located within the area.

S. No.	Name of Forest	Status/Type of forest	Distance from Project Area	Approx area of Forest land within Study Area
1	Phiski Reserve Forest	Reserve	8.0 kms (SW)	539 ha
2	Shegaon Reserve Forest	Reserve	7.5 kms (East)	355 ha
3	Kanda Protected Forest	Open scrub	5.5 kms (West)	38 ha
4	Pare Protected Forest	Open scrub	5.5 kms (West)	24 ha

"Abhayaranya" the manmade forest in Anandwan

"Anandwan" founded by social activist Baba Amte is located 5 kms east of mine boundary. The land on which Anandwan stands was originally barren, abandoned quarry with no surface water. Abhayaranya the manmade forest in Anandwan has been developed by its residents. Once an arid rocky wasteland, here there is now a colossal biomass bank spread over 60 acres. Over the years Abhayaranya has attracted a wide range of migratory birds which setup their nests in this oasis.

Forest types in the study area:

The forest of the study area can be classified into Tropical Dry Deciduous Forest in accordance with "Survey of Forest Types of India" by Champion and Seth (1968).

Dry deciduous forest:

These forests are found in areas having temperature of 25-32^{0}C and annual rainfall of 75-125 cm along with a dry season of about six months. Distribution of these forests in northern India is in areas of Punjab, Haryana, Uttar Pradesh, Bihar and Orissa. In the southern and central India, these forests are distributed in dry areas of Maharashtra, Tamilnadu, Karnataka and Madhya Pradesh.

Floristic structure and composition of the study area:

<u>The Core site:Yekona I & II OC</u>

The Lease area is dominated agriculture fields. A canal flowing through the mine lease area provides irrigation facility. A seasonal nallah also flows the project boundary.

List of tree species observed in the core zone

Sr. No.	Common Name	*Scientific Name*	Family
1.	Akasia	*Acacia auriculaeformis*	Mimosaceae
2.	Ambalata, Ambanasia	*Bauhinia racemosa*	Caesalpinaceae
3.	Anla	*Emblica officinalis*	Euphorbiaceae
4.	Amba	*Mangifera indica*	Anacardiaceae
5.	Ambada	*Spondian pinnata*	Anacardiaceae
6.	Arjun, Kaha	*Terminalia arjuna*	Combretaceae
7.	Asan, Sahaj	*Terminalia tomentosa*	Combretaceae
8.	Babul	*Acacia Arabica*	Mimosaceae
9.	Basanga	*Adhatoda vasica*	Acanthaceae
10.	Bel	*Aegle marmelos*	Rutaceae
11.	Borda, Kuliari	*Bauhinia purpurea*	Caesalpinaceae
12.	Bheru	*Chloroxvlon swietenia*	Meliaceae
13.	Bara	*Ficus benghalensis*	Moraceae

Sr. No.	Common Name	*Scientific Name*	Family
14.	Banakapas	*Kydia calycina*	Malvaceae
15.	Bahada	*Terminalia bellerica*	Combretaceae
16.	Barkoli, Buro	*Ziyphus jujube*	Rhambaceae
17.	Chhatian, Chhachina	*Alstonia scholaris*	Apocynaceae
18.	Chakunda	*Cassia siamea*	Caesalpinaceae
19.	Champa	*Michelia champaca*	Mangoliaceae
20.	Dhuben	*Dalbergia paniculata*	Papilionaceae
21.	Dimiri, Dumer	*Ficus glomerata*	Moraceae
22.	Debdaru	*Polyathia longifolia*	Anocaceae
23.	Gambhar	*Gmelina arborea*	Verbenaceae
24.	Gandhapalas	*Miliusa velutina*	Anonaceae
25.	Halda	*Diospyros Montana*	Ebenaceae
26.	Harida	*Terminalia chebula*	Combretaceae
27.	Jamu	*Syzyzium cumini*	Myrtaceae
28.	Bhor	*Zyzyphus jujube*	Rhamnaceae
29.	Kurum, Haldu	*Adina cordifolia*	Rubiaceae
30.	Kadam	*Anthocephalus cadamba*	Rubiaceae
31.	Kumbhi	*Cereya arborea*	Lecythidaceae
32.	Kendu	*Diospyros melanoxylon*	Ebenaceae
33.	Khajuri	*Phoenix sylvestris*	Palmaceae
34.	Karanja	*Pongamia pinnata*	Papilionaceae
35.	Khirna	*Wrightia tinctoria*	Apocynaceae
36.	Kangada	*Xylia xylocarpa*	Mimocaceae
37.	Mahalimba	*Ailanthus exelsa*	Simarubaceae
38.	Mundi, Muid	*Mitragyna parviflora*	Rubiaceae
39.	Munuga	*Moringa oleifera*	Moringaceae
40.	Phasi	*Anogeissus acuminata*	Combretaceae
41.	Panas	*Artocarpus heterophyllus*	Moraceae
42.	Phalsa, Palas	*Butea monosperma*	Papilionaceae
43.	Pahari sisssoo	*Dalbergia latifolia*	Papilionaceae
44.	Pipal	*Ficus religiosa*	Niraceae
45.	Phanphani	*Oroxylon indicum*	Bignoniaceae
46.	Poichandia	*Putranjiva roxburghii*	Euphorbiaceae
47.	Parel, padal	*Sterospermum suaveolens*	Bignoniaceae
48.	Pha kurjei	*Wrightia tomentosa*	Apocynaceae
49.	Rajmai	*Lannea coromondelica*	Anacardiaceae
50.	Siris, Sersuan	*Albizzia lebek*	Mimosaceae
51.	Simal	*Bombax ceiba*	Bambacaceae
52.	Sunari	*Cassia fistula*	Caesalpinaceae
53.	Senha, Sidha	*Legerstroemia parviflora*	Lythraceae
54.	Sal, Sargi, Rengal	*Shorea robusta*	Dipterocarpaceae
55.	Saguan	*Tectona grandis*	Verbenaceae
56.	Tentra, Dhala siris	*Albizzia procera*	Mimosaceae
57.	Thetel, Tetel	*Tamarindus indica*	Caesalpinaceae
58.	Neem	*Azadiracta indica*	Meliaceae
59.	Khais, Kasi	*Bridelia retusa*	Euphorbiaceae
60.	-	*Gardenia gummifera*	Rubiaceae

List of herb and shrub species observed in the Core zone

Sl No	Local Name	Botanical Name	Family
1.	Arakh	*Calotropis procera*	Asclepidaceae
2.	Dhatki, Dhutuk	*Woodfordia fruticosa*	Lythraceae
3.	Gila	*Caesalpinia digyna*	Caesalpinaceae
4.	Gangasiuli, Kharakhasa	*Nyctanthes arbortristis*	Oleaceae
5.	Ghotha	*Zyzyphus xylocarpus*	Rhamnaceae
6.	Hada Kankel	*Murraya exotica*	Rutaceae
7.	Jharnuli	*Antidesma ghaesembilla*	Euphorbiaceae

8.	Jungle vendi	*Thespesia populnea*	Malvaceae
9.	Kerenda koli	*Carissa inermis*	Apocynaceae
10.	Kumbhatua, kumti	*Clerodendrum infortunatum*	Verbenaceae
11.	Kath jamu	*Eugenia heyneana*	Myrtaceae
12.	Kurudu (ii)	*Gardenia turgid*	Rubiaceae
13.	Kurei	*Hallarrhena antidysenterica*	Apocynaceae
14.	Murmuri, kunduri	*Antidesma diandrum*	Euphorbiaceae
15.	Nirgundi	*Vitex negundo*	Verbenaceae
16.	Natibara	*Zizyphus fruticosa*	Rhamnaceae
17.	Pitabaranga	*Helicteres isoraa*	Sterculiaceae
18.	Sisal	*Agave sisalana*	Amaryllidaceae
19.	Siju	*Euphorbia nivulia*	Euphorbiaceae
20.	Telkurum	*Ixora parviflora*	Rutaceae
21.	Tilei	*Wendlandia tinctoria*	Rubiaceae
22.	Tinkoli	*Zyzyphus rugosa*	Rhamnaceae
23.	-	*Datura spp.*	Solanaceae
24.	-	*Zizyphus mauriana*	Rhamnaceae
25.	-	*Ixora parviflora*	Rubiaceae
26.	-	*Xanthium strumarium*	Asteraceae
27.	*Rankapas*	*Thespesia populnea*	Malvaceae
28.	-	*Ipomea carnea*	Convolvulaceae
29.	*Basanga*	*Adhatoda vasica*	Acanthaceae
30.	-	*Phyllanthus amarus*	Euphorbiaceae
31.	Poksunghau	*Ageratum conyzoides*	Asteraceae
32.	*Gokharu*	*Tribulus terrestris*	*Zygophyllaceae*
33.	*Pili kateri*	*Argemone Mexicana*	Papavaraceae
34.	-	*Marselia quadrifolia*	Marsileaceae
35.	-	*Cassia tora*	Caesalpinaceae
36.	*Vilayati tulsi*	*Hyptis suaveolens*	Lamiaceae
37.	Girel phul	*Indigofera pulchella*	Papillionaceae
38.	*Gajar Ghass*	*Parthenium hysterophorus*	Asteraceae
39.	*Sida*	*Sida acuta*	Malvaceae
40.	-	*Alternanthera sessalis*	Amarantheceae
41.	-	*Euphorbia hirta*	Euphorbiaceae
42.	-	*Tridax procumbens*	Asteraceae

List of grasses/ climbers/ bamboo species observed in the Core zone

GRASSES			
SL No.	**Local Name**	**Botanical Name**	**Family**
1.	Ghoda lenji, Sinkula	*Arsitida setaceae*	Gramineae
2.	Khar	*Cymbopogon martini*	Poaceae
3.	Khas khas	*Vetiveria zizanioides*	Gramineae
4.	Sukla	*Heteropogon contortus*	Gramineae
5.	Duba	*Cynodom dactylon*	Poaceae
6.	Sabai, panasi	*Eulaliopsis binata*	Poaceae
7.	Tenda, Kastandi	*Saccharum spontaneum*	Poaceae
8.	Atundi	*Combretum decandum*	Combretaceae
9.	Arkawla	*Milletia auriculata*	Papillionaceae
10.	Budel, latapalas	*Butea superb*	Papillionaceae
11.	Badi chand	*Symphorema polyandrum*	Verbenaceae
12.	Gapkanu	*Crytolepsis buchanani*	Ascleipidaceae
13.	Kantei koli	*Zizyphus oenoplia*	Rhamnaceae
14.	Murdha	*Butea parviflora*	Papillionaceae
15.	Osta, Gila	*Entada scandens*	Mimosaceae
16.	Penga, Kharsan	*Celastrus paniculata*	Celastraceae
17.	Pitalu	*Dioscorea bulbifera*	Dioscoreaceae
18.	Siali	*Bauhinia vahlii*	Caesalpinaceae
19.	Salia bans	*Dendrocalamus strictus*	Gramineae

Source: Survey team in consultation with concern state forest officials, secondary sources and local people

Buffer Zone:

The land use of the study area is mainly divided into habitation, agriculture fields, minor forest area, Water Body (i.e. Wardha River and its tributeries, few seasonal nalas etc.). The dominant plant species observed in this section are Mangifera indica, Terminalia arjuna, Ficus benghalensis, Alstonia scholaris, Butea monosperma, Ficus religiosa, Sapindus emarginatus, Albizzia lebek, Bombax ceiba, Boswellia serrata, Cassia fistula, Legerstroemia parviflora, Shorea robusta, Tectona grandis, Albizzia procera, Tamarindus indica etc.

Flora of the region was classified in to natural vegetation of forest origin, agriculture crop varieties and cash crops of commercial importance.

List of tree species observed in the study area (Buffer zone)

Sr. No.	Common Name	*Scientific Name*	Family
1.	Akasia	*Acacia auriculaeformis*	Mimosaceae
2.	Ankula	*Alangium lamarckii*	Cornaceae
3.	Ambalata, Ambanasia	*Bauhinia racemosa*	Caesalpinaceae
4.	Anla	*Emblica officinalis*	Euphorbiaceae
5.	Amba	*Mangifera indica*	Anacardiaceae
6.	Akashmali	*Mellingtonia hortensis*	Bignoniaceae
7.	Achu	*Morinda tinctoria*	Rubiaceae
8.	Ashok	*Saraca ubduca*	Caesalpinaceae
9.	Ambada	*Spondian pinnata*	Anacardiaceae
10.	Arjun, Kaha	*Terminalia arjuna*	Combretaceae
11.	Apta	*Bahunia racemosa*	Caesalpinaceae
12.	Asan, Sahaj	*Terminalia tomentosa*	Combretaceae
13.	Babul	*Acacia Arabica*	Mimosaceae
14.	Basanga	*Adhatoda vasica*	Acanthaceae
15.	Bel	*Aegle marmelos*	Rutaceae
16.	Borda, Kuliari	*Bauhinia purpurea*	Caesalpinaceae
17.	Benimanj, Khakra	*Casearia tomentosa*	Flocourtiaceae
18.	Bheru	*Chloroxvlon swietenia*	Meliaceae
19.	Bahalphal, Dhumko	*Cordia myxa*	Boraginaceae
20.	Baruna	*Crataeva religiosa*	Capparidaceae
21.	Bara	*Ficus benghalensis*	Moraceae
22.	Banakapas	*Kydia calycina*	Malvaceae
23.	Bhenta	*Limonia acidissima*	Rutaceae
24.	Bhalia, Bheluan	*Semecarpus anacardium*	Anacardiaceae
25.	Bahada	*Terminalia bellerica*	Combretaceae
26.	Bakom, Mundika	*Walsura piscida*	Meliaceae
27.	Barkoli, Buro	*Ziyphus jujube*	Rhambaceae
28.	Chhatian, Chhachina	*Alstonia scholaris*	Apocynaceae
29.	Choari	*Bauhinia retusa*	Caesalpinaceae
30.	Char	*Buchanania lanzan*	Anacardiaceae
31.	Chakunda	*Cassia Siamea*	Caesalpinaceae
32.	Champa	*Michelia champaca*	Mangoliaceae
33.	Dhaura	*Anogeissus latifolia*	Combretaceae
34.	Dhuben	*Dalbergia paniculata*	Papilionaceae
35.	Dimiri, Dumer	*Ficus glomerata*	Moraceae
36.	Dhawda	*Anogiessus latifolia*	Combretaceae
37.	Gohira	*Acacia leucophloea*	Mimosaceae
38.	Gharanji	*Holoptelia integrifolia*	Ulmaceae
39.	Jamu	*Syzyzium cumini*	Myrtaceae
40.	Khair	*Acacia cathechu*	Mimosaceae

Sr. No.	Common Name	*Scientific Name*	Family
41.	Kurum, Haldu	*Adina cordifolia*	Rubiaceae
42.	Kadam	*Anthocephalus cadamba*	Rubiaceae
43.	Koteli	*Bauhinia malabarica*	Caesalpinaceae
44.	Kanchana, Thoro	*Bauhinia veriegata*	Caesalpinaceae
45.	Khais, Kasi	*Bridelia retusa*	Euphorbiaceae
46.	Kumarchikni	*Canthium didymium*	Rubiaceae
47.	Kumbhi	*Cereya arborea*	Lecythidaceae
48.	Kermala	*Dillenia aurea*	Dilleniaceae
49.	Kendu	*Diospyros melanoxylon*	Ebenaceae
50.	Kalicha	*Diospyros sylvatica*	Ebenaceae
51.	Kaitha	*Feronia elephantum*	Rutaceae
52.	Kaujari	*Ficus infectoria*	Moraceae
53.	Katranga	*Gardenia latifolia*	Rubiaceae
54.	Kurundu	*Gardenia lucida*	Rubiaceae
55.	Ketkat, Kenkar	*Garuga pinnata*	Burseraceae
56.	Kalchua, Chikini	*Glochidium lanceolarium*	Euphorbiaceae
57.	Kanas	*Hymenodictyon excelsum*	Rubiaceae
58.	Kamalagundi	*Mallotus phillipinensis*	Euphorbiaceae
59.	Khajuri	*Phoenix sylvestris*	Palmaceae
60.	Karanja	*Pongamia pinnata*	Papilionaceae
61.	Kusum	*Schleichera oleosa*	Saoubdaceae
62.	Koya, Katoka	*Strychnos potatorum*	Loganiaceae
63.	Kharkhas	*Trema orientalis*	Ulmaceae
64.	Khirna	*Wrightia tinctoria*	Apocynaceae
65.	Kangada	*Xylia xylocarpa*	Mimocaceae
66.	Moi	*Lannea coromandelica*	Anacardiaceae
67.	Mahalimba	*Ailanthus exelsa*	Simarubaceae
68.	Makarkendu	*Diospyros peregrine*	Edenaceae
69.	Manjari	*Erythrina vareigata*	Papilionaceae
70.	Mundi, Muid	*Mitragyna parviflora*	Rubiaceae
71.	Munuga	*Moringa oleifera*	Moringaceae
72.	Muchukunda	*Pterospermum acerifolium*	Sterculiaceae
73.	Nunia, Baldia	*Emblica robusta*	Myrsinaceae
74.	Niras	*Memcylon edule*	Melastromaceae
75.	Nageshwar	*Mesua ferrea*	Guttiferaceae
76.	Panigambhar, gutel	*Trewia nudiflora*	Euphorbiaceae
77.	Phasi	*Anogeissus acuminata*	Combretaceae
78.	Panas	*Artocarpus heterophyllus*	Moraceae
79.	Phalsa, Palas	*Butea monosperma*	Papilionaceae
80.	Punang	*Calophyllum inopnyhllum*	Guttiferaceae
81.	Pahari sisssoo	*Dalbergia latifolia*	Papilionaceae
82.	Patragundi, Poinsia	*Elaeocarps robusta*	Tiliaceae
83.	Paldhua	*Erythrina suberosa*	Papilionaceae
84.	Patkoli	*Ficus cunia*	Niraceae
85.	Pipal	*Ficus religiosa*	Niraceae
86.	Phanphani	*Oroxylon indicum*	Bignoniaceae
87.	Pitmasu	*Polyalthia cerasiodes*	Anonaceae
88.	Poichandia	*Putranjiva roxburghii*	Euphorbiaceae
89.	Potua, Mohana, Sarla	*Randia dumetorom*	Rubiaceae
90.	Parel, padal	*Sterospermum suaveolens*	Bignoniaceae
91.	Patali	*Stereospermum tetragonum*	Bignoniaceae
92.	Poijamu	*Syyium operculatum*	Myrtaceae
93.	Pha kurjei	*Wrightia tomentosa*	Apocynaceae
94.	Rai, Keringila	*Dillenia pentagyna*	Dilleniaceae
95.	Rajkusum	*Garcini cowa*	Guttiferaceae
96.	Rajmai	*Lannea coromondelica*	Anacardiaceae

Sr. No.	Common Name	*Scientific Name*	Family
97.	Rita, Muktamanj	*Sapindus emarginatus*	Sapindaceae
98.	Rohini	*Soymida febrifuga*	Meliaceae
99.	Ranikodel	*Sterculia colorata*	Sterculiaceae
100.	Sissoo	*Dalbergia latifolia*	Fabaceae
101.	Siris, Sersuan	*Albizzia lebek*	Mimosaceae
102.	Sakta	*Bixa orellana*	Bixaceae
103.	Simal	*Bombax ceiba*	Bambacaceae
104.	Salei	*Boswellia serrata*	Burseraceae
105.	Sangambhari, Bora	*Calicarpa arborea*	Verbenaceae
106.	Sil	*Calicopteris floribunda*	Combretaceae
107.	Sunari	*Cassia fistula*	Caesalpinaceae
108.	Salap	*Caryota urens*	Palmaceae
109.	Samarsinga	*Cordia macleodii*	Boraginaceae
110.	Senha, Sidha	*Legerstroemia parviflora*	Lythraceae
111.	Sal, Sargi, Rengal	*Shorea robusta*	Dipterocarpaceae
112.	Sahada	*Streblus asper*	Moraceae
113.	Saguan	*Tectona grandis*	Verbenaceae
114.	Tengada, Sahalia	*Actinodaphne augustofolia*	Lauraceae
115.	Tinia	*Albizzia odoratissima*	Mimosaceae
116.	Tentra, Dhala siris	*Albizzia procera*	Mimosaceae
117.	Toon	*Cedrela toona*	Meliaceae
118.	Thelko	*Randia uliginosa*	Rubiaceae
119.	Thetel, Tetel	*Tamarindus indica*	Caesalpinaceae
120.	Tilei	*Wendlandia exserta*	Tubiaceae
121.	Udal	*Sterculia villosa*	Sterculiaceae
122.	Versunga	*Murraya koengii*	Rutaceae

List of herb and shrub species observed in the study area (Buffer zone)

Sl No	Local Name	Botanical Name	Family
1.	Agnijal	*Clausena excavate*	Rutaceae
2.	Arakh	*Calotropis procera*	Asclepidaceae
3.	Baincha	*Flacourtia indica*	Flacourtiaceae
4.	Bhainsdera	*Strobilanthes auriculata*	Acanthaceae
5.	Bankulthia	*Aatylosia scarabaeoides*	Papillionaceae
6.	Banan jatangii	*Veronia roxburghii*	Compositae
7.	Ban soris	*Veronia trees*	Compositae
8.	Dureikoli	*Opilia amentacea*	Olacaceae
9.	Dhatki, Dhutuk	*Woodfordia fruticosa*	Lythraceae
10.	Gila	*Caesalpinia digyna*	Caesalpinaceae
11.	Gamuch	*Homonoia riparia*	Euphorbiaceae
12.	Girel phul	*Indigofera pulchella*	Papillionaceae
13.	Gangasiuli, Kharakhasa	*Nyctanthes arbortristis*	Oleaceae
14.	Ghotha	*Zyzyphus xylocarpus*	Rhamnaceae
15.	Haumanicha	*Glycosmis pentaphylla*	Rutaceae
16.	Hada Kankel	*Murraya exotica*	Rutaceae
17.	Jharnuli	*Antidesma ghaesembilla*	Euphorbiaceae
18.	Jungle vendi	*Thespesia populnea*	Malvaceae
19.	Kerenda koli	*Carissa inermis*	Apocynaceae
20.	Kumbhatua, kumti	*Clerodendrum infortunatum*	Verbenaceae
21.	Kath jamu	*Eugenia heyneana*	Myrtaceae
22.	Kurudu (i)	*Gardenia gummifera*	Rubiaceae
23.	Kurudu (ii)	*Gardenia turgid*	Rubiaceae
24.	Kurei	*Hallarrhena antidysenterica*	Apocynaceae
25.	Khirkinchi, kanta	*Mimusa Himalayan*	Mimosaceae
26.	Murmuri, kunduri	*Antidesma diandrum*	Euphorbiaceae
27.	Mirigachara, Barenga	*Grewia elastic*	Tiliaceae
28.	Nahalbeli	*Cipadessa fruticosa*	Meliaceae
29.	Nirgundi	*Vitex negundo*	Verbenaceae

30.	Natibara	*Zizyphus fruticosa*	Rhamnaceae
31.	Pitabaranga	*Helicteres isoraa*	Sterculiaceae
32.	Sisal	*Agave sisalana*	Amaryllidaceae
33.	Siju	*Euphorbia nivulia*	Euphorbiaceae
34.	Telkurum	*Ixora parviflora*	Rutaceae
35.	Tirsi birsi	*Phyllanthus lawii*	Euphorbiaceae
36.	Tilei	*Wendlandia tinctoria*	Rubiaceae
37.	Tinkoli	*Zyzyphus rugosa*	Rhamnaceae
38.	-	*Datura spp.*	Solanaceae
39.	-	*Zizyphus mauriana*	Rhamnaceae
40.	-	*Ixora parviflora*	Rubiaceae
41.	-	*Xanthium strumarium*	Asteraceae
42.	*Rankapas*	*Thespesia populnea*	Malvaceae
43.	-	*Ipomea carnea*	Convolvulaceae
44.	*Basanga*	*Adhatoda vasica*	Acanthaceae
45.	-	*Phyllanthus amarus*	Euphorbiaceae
46.	Poksunghau	*Ageratum conyzoides*	Asteraceae
47.	*Gokharu*	*Tribulus terrestris*	*Zygophyllaceae*
48.	*Pili kateri*	*Argemone Mexicana*	Papavaraceae
49.	-	*Marselia quadrifolia*	Marsileaceae
50.	-	*Cassia tora*	Caesalpinaceae
51.	*Vilayati tulsi*	*Hyptis suaveolens*	Lamiaceae
52.	Girel phul	*Indigofera pulchella*	Papillionaceae
53.	*Gajar Ghass*	*Parthenium hysterophorus*	Asteraceae
54.	*Sida*	*Sida acuta*	Malvaceae
55.	-	*Alternanthera sessalis*	Amarantheceae
56.	-	*Euphorbia hirta*	Euphorbiaceae
57.	-	*Tridax procumbens*	Asteraceae

Source: Survey team in consultation with concern state forest officials, secondary sources and local people

List of grasses/ climbers/ bamboo species observed

GRASSES			
SL No.	**Local Name**	**Botanical Name**	**Family**
1	Ghoda lenji, Sinkula	*Arsitida setaceae*	Gramineae
2	Khar	*Cymbopogon martini*	Poaceae
3	Khas khas	*Vetiveria zizanioides*	Gramineae
4	Sukla	*Heteropogon contortus*	Gramineae
5	Chepti	*Evolvulus alsinoides*	Convolvulaceae
6	Duba	*Cynodom dactylon*	Poaceae
7	Ghonda Bena	*Bothriochloa bladhii*	Poaceae
8	Mutha	*Lipocarpha sphacelata*	Poaceae
9	Nalisugandhi	*Phragmitis karka*	Poaceae
10	Panighasa	*Eragrostis japonica*	Poaceae
11	Phulchanchani, phuljadu	*Thysanolaena maxima*	Poaceae
12	Sabai, panasi	*Eulaliopsis binata*	Poaceae
13	Tenda, Kastandi	*Saccharum spontaneum*	Poaceae
14	Atundi	*Combretum decandum*	Combretaceae
15	Arkawla	*Milletia auriculata*	Papillionaceae
16	Budel, latapalas	*Butea superb*	Papillionaceae
	Bhaduali	*Olax scandens*	Olacaceae
17	Badi chand	*Symphorema polyandrum*	Verbenaceae
18	Gapkanu	*Crytolepsis buchanani*	Ascleipidaceae
19	Kantei koli	*Zizyphus oenoplia*	Rhamnaceae
20	Murdha	*Butea parviflora*	Papillionaceae
21	Muter, Mutri	*Smilax macrophylla*	Liliaceae
22	Osta, Gila	*Entada scandens*	Mimosaceae

23	Penga, Kharsan	*Celastrus paniculata*	Celastraceae
24	Pitalu	*Dioscorea bulbifera*	Dioscoreaceae
25	Siali	*Bauhinia vahlii*	Caesalpinaceae
26	Sugandhi, Anantamuli	*Hemidesmus indicus*	Ascleipidaceae
27	Suam, Nai	*Ichnocarpus frutescens*	Apocynaceae
28	Bans	*Cephalostachyum pergracile*	Gramineae
29	Balangi bans	*Oxytenanthera nigrociliata*	Gramineae
30	Daba bans	*Bambusa arundinaceae*	Gramineae
31	Salia bans	*Dendrocalamus strictus*	Gramineae

Source: Survey team in consultation with concern state forest officials, secondary sources and local people

Agricultural Crops

There were mainly agriculture land in Study area. Agriculture crops are mainly Kappas Crops, Legume Crops (Soyabean, Arhar etc.), Paddy Crops, Tomatoes etc. Detailed list in table below:

List of Agriculture crops observed in the study area

Sr. No.	Common Name	Scientific Name	Family	Core zone	Buffer zone
Crops					
1.	Paddy	*Oriza sativa*	Poaceae	+	+
2.	Wheat	*Triticum aestivum*	Poaceae	+	+
3.	Makkha/Maize	*Zey mays*	Poaceae	+	+
4.	Bajra	*Pennisetum americanum*	Poaceae	+	+
5.	Jawar	*Sorghum vulgare*	Poaceae		
6.	Green Gram	Vigna radiate	Fabaceae	-	+
7.	Ground nut	Arachis hypogaea	Fabaceae	-	+
8.	Arhar/Tuar	*Cajanus cajan*	Fabaceae	+	+
9.	Channa	*Cicer arietinum*	Fabaceae	+	+
10	Kultha	*Dolichus lablab*	Fabaceae	+	+
11	Mung	*Phaseolus mungo*	Fabaceae	+	+
12	Udith	*Phaseolus angularis*	Fabaceae		
13	Moth	*Phaseolus aconitifoliu*	Fabaceae		
Horticulture crop					
1.	Mango	Mangifera indica	Anacardiacece	+	+
2.	Guava	Psidium Guajava	Myrtaceae	+	+
3.	Citrus	Citrus spp.	Rutaceae	+	+
4.	Sapota	Achras *sapota*,	Sapotaceae	-	+
5.	Litchi	*Litchi* chinensis	Sapindaceae	-	+
6.	Banana	Musa acuminate	Musaceae	+	+
7.	Cashew nut	Anacardium Occidentale	Anacardiaceae	-	+
Vegetable crops					
1.	Potato	Solanum tuberosum	Solanaceae	+	+
2.	Onion	Allium cepa.	Lilliaceae	+	+
3.	Tomato	Lycopersicon esculentum	Solanaceae	+	+
4.	Brinjels	Solanum melongena	Salanaceae	+	+
5.	Chilli	Capsicum annuum	Solanaceae	+	+

Commercial Crops

Commercial crops like cotton, pulses and oil seeds are cultivated in the crop lands of the project areas along with traditional crop varieties during post-monsoon period of November, December and January for subsistence income generation and livelihood of local communities. The list of commercial crops grown in the project areas are presented in table below.

Source: Secondary sources, Public Consultation and Field survey

List of Cash (Commercial) Crops in Buffer Zone

Crop variety	Family name	Botanical name	Local /Trade name
Pulses,Vegetables, Beans etc.	Fabacea	*Cajanus cajan*	Tuar
		Phaseolus mungo	Mung
		Dolichos lablab	Sem
	--	*Glycine Max*	Soyabean
	Linaceae	*Linum usitatissimum*	Alsi/Linseed
	Malvaceae	*Hibiscus subdrifolia*	Lalambadi
		Gossypium hirsute	Kappas
	Pedaliaceae	*Sessamum indicum*	Til
	Euphorbiaceae	*Ricinus communis*	Arandi
	Cucurbiataceae	*Coccinia indica*	Kundru
	Solanacea	*Lycopersicon lycopersicum*	*Tomato*
	Solanaceae	*Capsicum annum*	Mirchi

Grass Lands

The grass lands are mixed up with natural forest vegetation of low lands and in cultivable waste lands.

Endangered Flora

No endangered plant species in the Core zone of Mining project was recorded.

Endemic Flora

No endemic plant species have been recorded in the Core and Buffer zones of the project areas.

Aquatic Flora

No perennial aquatic bodies are present in the Core and in Buffer zones there is aquatic body (i.e. Wardha River and tributaries Etc.). The aquatic flora observed in the village ditches and stretches of river Wardha.

Table Aquatic plants of Buffer zone

Family name	Botanical name	Local/Trade name
Convolvulaceae	*Ipomoea aquatica*	Water spinach
Nelumbonaceae	*Nelumbo nucifera*	Lotus
Gentianaceae	*Nymphoides indica*	Floating Leaf

3.7 ECOLOGICALLY IMPORTANT PLANT SPECIES

Plants are essential for the existence of life on Earth. They play a major role in maintaining the ecological balance on Earth. They exist in the food chain as the primary producers and provide life to animals at the higher trophic level. Also, the exchange of gases in the atmosphere takes place through the cycle of photosynthesis. They adhere to the substratum and provide a stable base for soil. They play an important role in the water cycle where transpiration and evaporation of water from leaves results in formation of water vapor which subsequently results in rain. Different plant communities have diverse roles to play. Starting from the Phyto-planktons, these minute creatures are the primary producers and exist in vast oceans where they trap

atmospheric CO2 and also act as food for the zooplanktons. On land we have groups of lichens, bryophytes, pteridophtyes, gymnosperms and angiosperms.

In the Biosphere, a good number of birds and animals are totally dependent on plants for food and shelter. Grasses are a good source of food for animals. Also, they provide a good hiding place for animals. Few bird species build their nests in the grasslands as abundant food (grass seeds) is available for the young ones. The agriculture fields of the study area have attracted Great Indian Bustard in the region. Bushy vegetation provides good shelter for borrowing animals and reptiles. Also, they serve as good nesting places for passiformes. Large trees are most suitable for nesting by large birds like raptures and vultures. They also provide shade and food for foraging animals.

List of ecologically important plant species observed in the Buffer zone

Sr. No.	Plant species	Common Name	Family	Habit	Status	Main Attractant for animals
1	*Aegele marmelos*	Bel	Rutaceae	Tree	Native	Flowers and fruits
2	*Albizia lebbeck*	Kala-siris	Leguminosae	Tree	Native	Flower and Fruits
3	*Anogeissus latifolia*	Dhaora	Sappotaceae	Tree	Native	Fruits
4	*Bauhinia racemosa*	Asta	Leguminosae	Tree	Native	Flowers
5	*Bombax ceiba*	Semal	Malvaceae	Tree	Native	Flowers
6	*Buchanania latifolia*	Achar	Anacardiaceae	Tree	Native	Fruits
7	*Butea monosperma*	Palas	Leguminosae	Tree	Native	Flowers
8	*Cassia fistula*	Amaltas	Leguminosae	Tree	Native	Fruits
9	*Dalbergia sisoo*	Sisoo	Leguminosae	Tree	Native	Fruits
10	*Diospyros melanoxylon*	Tendu	Ebenaceae	Tree	Native	Fruits
11	*Ficus benghalensis*	Bar	Moraceae	Tree	Native	Fruits
12	*Ficus glomerata*	Gular	Moraceae	Tree	Native	Fruits
13	*Ficus religiosa*	Pipal	Moraceae	Tree	Native	Fruits
14	*Lagerstroemia parviflora*	Seja	Lythraceae	Tree	Native	Flower
15	*Madhuca longifolia*	Mahua	Euphorbiaceae	Tree	Native	Flowers
16	*Mangifera indica*	Am	Anacardiaceae	Tree	Native	Flower and Fruits
17	*Pongamia pinnata*	Karanj	Leguminosae	Tree	Native	Flowers
18	*Shorea robusta*	Sal	Dipterocarpaceae	Tree	Native	Fruits
19	*Tamarindus indica*	Imli	Leguminosae	Tree	Introduced	Fruits
20	*Tectona grandis*	Sagon	Verbenaceae	Tree	Native	Flowers
21	*Terminalia arjuna*	Arjun	Combretaceae	Tree	Native	Fruits and flowers
22	*Terminalia belerica*	Bahera	Combretaceae	Tree	Native	Flowers

Source: Survey team in consultation with concern state forest officials, secondary sources and local people

Faunal diversity:

Faunal assessment provides a basis for determining relative abundance and rarity of each species which is important for assessing the diversity of fauna of a particular area. Since animals are capable of movements from one place to another, this makes their study entirely different. Different animals prefer different types of habitat for food and shelter.

The Core zone of the study area is dominated by Minor Vegetation and agricultural fields. Some and other with shrubby vegetation therefore not much sightings of Fauna was possible. The Faunal diversity in the core site was limited to Reptiles, Butterflies and some insect species.

In the Buffer region due to the presence of different land-uses, good diversity of faunal groups observed. It was learnt through the consultation with local public that Great Indian Bustard which is an endangered species have been sighted occasionally in the agriculture fields of the study area.

Mammal diversity

No mammals other than common Squirrel and domesticated cows and dogs were seen in and around the core site. According to the information collected from forest and wildlife department, Indian plam squirrel (Funambulus palmarum), Little Indian field mouse (Mus booduga) etc. are generally observed in and around the core zone.

The buffer zone of 10 km from the project boundary was taken for the study of mammalian diversity of the study area. The species like Indian grey mongoose (Herpestes edwardsi) and Indian plam squirrel (Funambulus palmarum). List of Mammals that can be found in core and buffer zone is attached in the table below.

List of mammals observed in the core zone

Sl No.	Local Name	English name	Scientific Name	Family	IUCN category	Schedule as per WPA
1.	Chuchundra	House shrew	*Suncus murinus*	Soridae	Least Concern	Schedule IV
2.	Pati	Rhesus macaque	*Macaca mulatta*	Cercopithecidae	Least Concern	Schedule III
3.	Hatia neula	Indian grey mongoose	*Herpestes edwardsi*	Herpestidae	Least Concern	Schedule IV
4.	Barha	Wild boar	*Sus scrofa*	Suidae	Least Concern	Schedule III
5.	Indian Grey Mongoose	Indian Grey Mongoose	*Herpestes edwardsi*	-----	Least Concern	Schedule-IV Section, 6A
6.	Sasa, Thekua	Indian hare	*Lepus nigricollis ruficaudatus*	Leporidae	Least Concern	Schedule IV
7.	Patta musa	common plam squirrel	*Funambulus palmarum*	Sciuridae	Least Concern	Schedule IV
8.	Jhinka	Indian crested porcupine	*Hystrix indica indica*	Hystricidae	Least Concern	Schedule IV
9.	Musa	Rufous house rat	*Rattus rattus*	Muridae	Least Concern	Not enlisted

10.	-	Little Indian field mouse	*Mus booduga*	Muridae	Least Concern	Schedule

LC – Least Concern, NT – Near Thretened, VU – Vulnerable, EN – Endengered

List of mammals observed in the study area (Buffer zone)

SL No.	Local Name	English name	Scientific Name	Family	IUCN category	Schedule as per WPA
1	Baduri	Indian flying fox	*Pteropus giganteus*	Pteropodidae	Least Concern	Schedule V
2	-	Indian fulvous bat	*Rousettus leschenaulti*	Pteropodidae	Least Concern	Schedule V
3	Chemani	Short-nosed fruit bat	*Cynopterus sphinx*	Pteropodidae	Least Concern	Schedule V
4	-	Black beared sheath tailed bat	*Taphozous melanopogon*	Emballonuridae	Least Concern	Schedule IV
5	Chuchundra	House shrew	*Suncus murinus*	Soridae	Least Concern	Schedule IV
6	Pati	Rhesus macaque	*Macaca mulatta*	Cercopithecidae	Least Concern	Schedule III
7	Saliapatiri, Musa bilei	Indian small civet	*Viverricula indica*	Veverridae	Least Concern	Schedule IV
8	Katasha, odha	Common palm civet	*Paradoxurus hermaphrodites*	Veverridae	Least Concern	Schedule IV
9	Hatia neula	Indian grey mongoose	*Herpestes edwardsi*	Herpestidae	Least Concern	Schedule IV
10	Gadhia, Hundala, Hetabagha	Striped Hyaena	*Hyaena hyaena*	*Hyaenidae*	Near threatened	Schedule III
11	Barha	Wild boar	*Sus scrofa*	Suidae	Least Concern	Schedule III
12	Kutra, Kutura	Barking deer	*Munitiacus muntjak malabaricus*	Cervidae	Least Concern	Schedule III
13	Chital, Singala	Spotted deer	*Axis axis*	Cervidae	Least Concern	Schedule III
14	Sambhar	Sambhar	*Rusa unicolor*	Cervidae	Least Concern	Schedule III
15	Sasa, Thekua	Indian hare	*Lepus nigricollis ruficaudatus*	Leporidae	Least Concern	Schedule IV
16	Patta musa	common plam squirrel	*Funambulus palmarum*	Sciuridae	Least Concern	Schedule IV
17	Jhinka	Indian crested porcupine	*Hystrix indica indica*	Hystricidae	Least Concern	Schedule IV
18	Musa	Rufous house rat	*Rattus rattus*	Muridae	Least Concern	Not enlisted
19	-	Little Indian	*Mus booduga*	Muridae	Least Concern	Schedule

SL No.	Local Name	English name	Scientific Name	Family	IUCN category	Schedule as per WPA
		field mouse				

LC – Least Concern, NT – Near Threatened, VU – Vulnerable, EN – Endangered

Source: Survey team in consultation with concern state forest officials, secondary sources and local people

Reptiles and Amphibians:

Many species of reptiles and amphibians are observed in the study area. During field visit common species were observed in different locations of core and buffer zone.

The list of Reptiles and Amphibians recorded in core and buffer zone of the study area of proposed project site is presented in table below.

List of reptiles and amphibians observed in the core zone

SL No.	Local Name	English Name	Scientific Name	Family	WPA	IUCN
I.	**Lizards**					
1.	Jhitpiti	House lizard	*Hemidactylus brooki gray*	Gekkonidae	-	-
2.	Endua	Rock gaeko	*Hemidactylus maculates*	Gekkonidae	-	-
3.	Bahurupi kuasap	Garden gaeko	*Colotes versicolor*	Gekkonidae	-	-
4.	Bahurupi	Indian chameleon	*Chamaeleo zeylanicus*	Chamaeleo nidae	-	-
5.	Champeineul	Skink	*Mabuya bibroni*	Sciencidae	-	-
II.	**Snakes**					
1.	Tambanag	Copper head	*Elephe Helena*	Colubridae	IV	-
2.	Dhamana sap	-	*Elephe radiate*	Colubridae	IV	-
3.	Kandanali	Tree snake	*Lycodon straitus*	Colubridae	IV	-
4.		Tree snake	*Dendrelaphis tristis*	Colubridae	IV	-
5.	Chitti sap	Common Indian krait	*Dendrelaphis ahaetulla*	Colubridae	IV	-
6.	Luni benga	Common Indian toad	*Bufo melanosticus*	Bufonidae	-	LC
7.	-	Marbled toad	*Bufo somasticus*	Microhylida e	-	LC
8.	-	Balloon frog	*Uperodon globulosus*	Microhylida e	-	LC
9.	Brahmani benga	Skipping frog	*Rana cyanophlyctis*	Ranidae	IV	LC
10.	Brahmani benga	Indian bull frog	*Rana tigerina*	Ranidae	IV	LC
11.	-	Paddy field frog	*Rana limnocharis*	Ranidae	IV	LC

List of reptiles and amphibians observed in the study area (Buffer zone)

SL No.	Local Name	English Name	Scientific Name	Family	WPA	IUCN
I. Lizards						
1.	Jhitpiti	House lizard	*Hemidactylus brooki gray*	Gekkonidae	-	-
2.	Pahadi endua	-	*Crytodactylus nebulosus*	Gekkonidae	-	-

SL No.	Local Name	English Name	Scientific Name	Family	WPA	IUCN
3.	Gachha endua	-	*Hemidactylus leschenaultia*	Gekkonidae	-	-
4.	Endua	Rock gaeko	*Hemidactylus maculates*	Gekkonidae	-	-
5.	Bakula jhitpiti	-	*Hemidactylus faviviridis*	Gekkonidae	-	-
6.	Mutalangia endua	Fat tailed gaeko	*Eublepharis hardwickii*	Gekkonidae	-	-
7.	Bahurupi kuasap	Garden gaeko	*Colotes versicolor*	Gekkonidae	-	-
8.	Bahurupi	Indian ohameleon	*Chamaeleo zeylanicus*	Chamaeleonidae	-	-
9.	Champeineul	Skink	*Mabuya bibroni*	Sciencidae	-	-
10.	Deemundia	-	*Barkudia insularis*	Sciencidae	-	LC
III. Snakes						
1.	Telia sap	Common blind snake	*Ramphotyphlops braminus Ramphotyphlops braminus*	Typhlopidae	-	-
3.	Boda sap	Russell's earthboa	*Eryx conicus*	Boidae	IV	-
4.	Danda sap, panidhanda	-	*Enhydris enhydris*	Colubridae	IV	-
5.	Matibirali	-	*Enhydris sieboldi*	Colubridae	IV	-
6.	Tambanag	Copper head	*Elephe Helena*	Colubridae	IV	-
7.	Dhamana sap	-	*Elephe radiate*	Colubridae	IV	-
8.	Panidhandu sap	Checkered keelback	*Phyas mucosus*	Colubridae	IV	-
9.	Kauchia	Amphiesms stolata	*Xemochroptis piscator*	Colubridae	IV	-
10.	Boda	Wmmon boa	*Amphiesma stolata*	Colubridae	IV	-
11.	Boda	-	*Lycodon aulicus*	Colubridae	IV	-
12.	Kandanali	Tree snake	*Lycodon straitus*	Colubridae	IV	-
13.		Tree snake	*Dendrelaphis tristis*	Colubridae	IV	-
14.	Chitti sap	Common Indian krait	*Dendrelaphis ahaetulla*	Colubridae	IV	-
15.	Rana sap	Banded krait	*Bungarus caeruleus*	Elapidae	IV	-
16.	Tampa sap	Mono callota cobra	*Bungarus faseiatus*	Elapidae	IV	LC
21.	Luni benga	Common Indian toad	*Bufo melanosticus*	Bufonidae	-	LC
22.	-	Marbled toad	*Bufo somasticus*	Microhylidae	-	LC
23.	-	Marbled balloon frog	*Uperodon systoma*	Microhylidae	-	LC
24.	-	Balloon frog	*Uperodon globulosus*	Microhylidae	-	LC

SL No.	Local Name	English Name	Scientific Name	Family	WPA	IUCN
25.	-	Ornale microhylid	*Microhyla ornate*	Microhylidae	-	LC
26.	-	Variable ramanella	*Ramanella variegate*	Microhylidae	-	LC
27.	Brahmani benga	Skipping frog	*Rana cyanophlyctis*	Ranidae	IV	LC
28	-	Leaping frog	*Rana erythraea*	Ranidae	IV	LC
29.	Brahmani benga	Indian bull frog	*Rana tigerina*	Ranidae	IV	LC
30.	-	Jordon,s bull frog	*Rana crassa*	Ranidae	IV	LC
31.	-	Fungoid frog	*Rana malabarica*	Ranidae	IV	LC
32.	-	Gunther's warty frog	*Rana keralensis*	Ranidae	IV	CR
33.	-	Paddy field frog	*Rana limnocharis*	Ranidae	IV	LC
34.	-	Bowing frog	*Tamopterna breviceps*	Ranidae	IV	LC
35.	-	Tree frog	*Polypedates maculans*	Ranidae	IV	LC

Source: Survey team in consultation with concern state forest officials, secondary sources and local people

Avifauna:

Diversity of avifauna is one of the most important ecological indicators to evaluate the quality of habitats. Now-a-days, avifaunal diversity has been decreasing due to the destruction of natural habitats and human disturbances. Random destruction of natural habitats by cutting nesting trees and foraging plants for commercial use of woods and lands are the main factor responsible for narrow down in avian foraging habitat and their nesting sites. Thus, many species of birds may be forced to inhabit in the urban areas and constrain them to breed there. Birds are essential animal group of an ecosystem and maintain a trophic level. Therefore, detail study on avifauna and their ecology is important to protect them.

The bird diversity has been estimated in five major habitat types, i.e. human habitation, cultivated land, agriculture fields, forest area and wetlands. The observations were made based on direct sightings and birdcalls. The core zone of the study area covers plantations near four villages and consists of bushy vegetation which attracts passerine birds. Water body in the buffer zones are Wardha River and its tributaries. This place is most suitable for winter migratory birds which have been reported to congregate in large numbers in the winter months.

These rivers attract many birds including species like Indian pond heron (Ardeola grayii), Cattle egret (Bubucus ibis), Red wattled lapwing (Vanellus indicus), Indian small blue kingfisher (Alcedo attahis), Indian white breasted kingfisher (Halcyon smyrnensis), Indian little ringed plover (Charadrius dubius) etc.

During the survey within villages, several species of birds were observed in the agriculture fields. The most common species observed were Indian spotted dove (Stretopelia chinensis), Indian little brown dove (Stretopelia senegalensis), Large Indian parakeet (Psittacula eupatria), Rose- ringed parakeet (Psittacula krameri), Indian small green bee-eater (Merops orientalis), Indian golden oriole (Oriolus oriolus), South Indian black drongo (Dicrurus adsimilis), Indian myna (Acridotheres tristis), Indian house crow (Corvus splendens) and Indian house sparrow (Passer domesticus) etc.

Great Indian Bustard has been earlier sighted and reported by local public within the study area. The Great Indian Bustard are magnificent, large flying bird and was previously found throughout India and parts of Pakistan. In India, it was distributed throughout the grasslands of North India and the Deccan Landscape, but in last three decades there has been a drastic change in its former range. Only about 250 individuals survive today in the parts of India, with no breeding range outside the India. The largest population of 100-150 birds is found in the state of Rajasthan followed by less than 35 individuals in the states Gujarat, Madhya Pradesh, Maharashtra and Andhra Pradesh. GIB is listed under Schedule 1 species as per Wildlife (Protection) Act 1972, and listed as Endangered or Appendix 1 species of CITES.

Another species of bird Indian pied hornbill, a Schedule 1 species as per Wildlife (Protection) Act 1972, has been also observed during the baseline data generation in December, 2016. The great hornbill (Buceros bicornis) also known as the concave-casqued hornbill, great Indian hornbill or great pied hornbill, is one of the larger members of the hornbill family. It is found in the Indian subcontinent and Southeast Asia. Its impressive size and color have made it important in many tribal cultures and rituals. The great hornbill is long-lived, living for nearly 50 years in captivity. It is predominantly frugivorous, but is an opportunist and will prey on small mammals, reptiles and birds. The species is listed as Near Threatened (NT) for conservation status.

Wildlife Institute of India (WII) has published a report on status of Great Indian Bustard and associated species in the state of Maharashtra in association with Forest department of Maharashtra in 2018. During the survey, no GIB was sighted during the survey. The report concluded that the number of GIB are 0 to 8 in Maharashtra.

List of birds observed by direct sighting or through secondary sources during the baseline data generation in December, 2016 are detailed below in tables.

List of bird species observed in the core zone

Sl. No.	Local Name	English name	Scientific Name	Family	WPA	IUCN
1.	Chota kantia baga	Indian pond heron, paddy bird	*Ardeola grayii grayii*	Ardeidae	Sch-IV	LC
2.	Nandi baga	Cattle egret	*Bubulcus ibis coromandus*	Ardeidae	Sch-IV	LC

Sl. No.	Local Name	English name	Scientific Name	Family	WPA	IUCN
3.	-	Black-winged kite	*Elanus caeruleus vociferous*	Accipitridae	Sch-IV	LC
4.	Baza	Indian Shikra	*Accipiter badius dussumieri*	Accipitridae	Sch-IV	LC
5.	Ganga bankukuda	Indian red jungle fowl	*Gallus gallus murgi*	Phadianidae	Sch-IV	LC
6.	Tentei	Red wattled lapwing	*Vanellus indicus indicus*	Charadriinae	Sch-IV	LC
7.	Cha chedhei	Indian black winged stilt	*Himantopus himantopus himantopus*	Charadriinae	Sch-IV	LC
8.	Kapota	Indian spotted dove	*Stretopelia chinensis suratensis*	Columbidae	Sch-IV	LC
9.	Panka (Kapota)	Little brown dove	*Stretopelia senegalensis*	Columbidae	Sch-IV	LC
10.	-	Large Indian parakeet	*Psittacula eupatria nepalensis*	Psittacidae	Sch-IV	NT
11.	Chandana	Rose- ringed parakeet	*Psittacula krameri marillensis*	Psittacidae	Sch-IV	LC
12.	Chandani	Plum-headed parakeet	*Psittacula cyarocephala Cyarocephala*	Psittacidae	Sch-IV	LC
13.	Koili	Cuckoo	*Cuculus canorus canorus*	Cuculidae	Sch-IV	LC
14.	Koili	Asian koel	*Eudynamys scolopacea scolopacea*	Cuculidae	Sch-IV	LC
15.	Kumbhati	Crow peasant	*Centropus sinensis parroti*	Cuculidae	Sch-IV	LC
16.	-	Indian white breasted kingfisher	*Halcyon smyrnensis fusca*	Alcedinidae	Sch-IV	LC
17.	Balishua	Indian small green bee eater	*Merops orientalis orientalis*	Meropidae	Sch-IV	LC
18.	Chasha pakshi	Northern roller	*Coracias benghalensis*	Coraciidae	Sch-IV	LC
19.	Kathahana	Ceylon hoopee	*Upupa epops ceylonensis*	Upuciidae	Sch-IV	LC
20.	Kathakkhumpa	Lesser golden backed woodpecker	*Dinopium benghalensis benghalensis*	Picidae	Sch-IV	LC
21.	Haladibasanta	Indian golden oriole	*Oriolus oriolus kundoo*	Orididae	Sch-IV	LC
22.	Haladibasanta	South Indian black headed oriole	*Oriolus xanthornus maderaspatanus*	Orididae	Sch-IV	LC
23.	Kajalapati	South Indian black drongo or king crow	*Dicrurus adsimilis macrocercus*	Dicruridae	Sch-IV	LC
24.	-	Grey headed maina	*Sturnus malabaricus*	Sturnidae	Sch-IV	LC
25.	Telhiamaina	Black headed myna	*Sturnus pagodarum*	Sturnidae	Sch-IV	LC
26.	Karkara chadhei	Rufous treepie	*Dendrocitta vagabunda vagabunda*	Corvidae	Sch-IV	LC

Sl. No.	Local Name	English name	Scientific Name	Family	WPA	IUCN
27.	Kuwa	Indian house crow	*Corvus splendens splendens*	Corvidae	Sch-IV	LC
28.	Damara kua	Indian jungle crow	*Corvus macrorhyachos culminates*	Corvidae	Sch-IV	LC
29.	Dayal	Indian magpie robin	*Copsychus saularis saularis*	Pycnonotidae	Sch-IV	LC
30.	Shuee	Indian robin	*Saxicoloides fulicata erythrura*	Pycnonotidae	Sch-IV	LC
31.	Phulchuhi	Indian purple sunbird	*Nectarinia asiatica asiatica*	Nectarinidae	Sch-IV	LC
32.	Gharachatia	Indian house sparrow	*Passer domesticus indicus*	Ploceidae	Sch-IV	LC
33.	Baya	Indian baya	*Plocues philippinus*	Ploceidae	Sch-IV	LC

LC: Least Concern, NT: Near Thretened

List of bird species observed in the study area (Buffer zone)

SL No.	Local Name	English name	Scientific Name	Family	WPA	IUCN
1	Raj hansa	Grest crested grebe	*Podiceps cristatus cristatus*	Podicipedidae	Sch-IV	LC
2	Hansarali, pani hansa	Little grebe, dabchick	*Podiceps ruficollics capensis*	Podicipedidae	Sch-IV	LC
3	Chota kantia baga	Indian pond heron, paddy bird	*Ardeola grayii grayii*	Ardeidae	Sch-IV	LC
4	Nandi baga	Cattle egret	*Bubulcus ibis coromandus*	Ardeidae	Sch-IV	LC
5	Rati baga	Night heron	*Nycticorax nycticorax nycticorax*	Ardeidae	Sch-IV	LC
6	Gendalia, Kaansha	Openbill stork	*Anastomus oscitans*	Ciconiidae	Sch-IV	LC
7	Hansharali	Lesser whistling duck	*Dendrocygna javanica*	Anatidae	Sch-IV	LC
8	Pandahansha	Northern Pintail	*Anas acuta*	Anatidae	Sch-IV	LC
9	Kuji hansa	Gadwall	*Anas strepera*	Anatidae	Sch-IV	LC
10		Garganey	*Anas querquedula*	Anatidae	Sch-IV	LC
11	Jala chataka	Cotton teal	*Nettapus coromandelianus coromandelianus*	Anatidae	Sch-IV	LC
12	-	Black-winged kite	*Elanus caeruleus vociferous*	Accipitridae	Sch-IV	LC
13	-	Great Indian Bustard	*Ardeotis nigriceps*	Otididae	Sch-I	En.
14	Baza	Indian Shikra	*Accipiter badius dussumieri*	Accipitridae	Sch-IV	LC
15	Ganga bankukuda	Indian red jungle fowl	*Gallus gallus murgi*	Phadianidae	Sch-IV	LC
16	Panidahuka	Bronze winged jacana	*Metopidius indicus*	Jacanidae	Sch-IV	LC
17	Tentei	Red wattled lapwing	*Vanellus indicus indicus*	Charadriinae	Sch-IV	LC

SL No.	Local Name	English name	Scientific Name	Family	WPA	IUCN
18	Tentei	Yellow wattled lapwing	*Vanellus malabaricus*	Charadriinae	Sch-IV	LC
19	-	Indian little ringed plover	*Charadrius dubius ferdoni*	Charadriinae	Sch-IV	LC
20	Cha chedhei	Wood sandpiper	*Tringa glareola*	Charadriinae	Sch-IV	LC
21	Cha chedhei	Common sand piper	*Tringa hypoleucos*	Charadriinae	Sch-IV	LC
22	Cha chedhei	Little stint	*Calidris minuta*	Charadriinae	Sch-IV	LC
23	Cha chedhei	Indian black winged stilt	*Himantopus himantopus himantopus*	Charadriinae	Sch-IV	LC
24	Machhakhia	Black headed gull	*Larus ridibundus*	Laridae	Sch-IV	LC
25	Haradakhai	South green pigeon	*Treron phoenicoptera chlorigaster*	Columbidae	Sch-IV	LC
26	Kapota	Indian spotted dove	*Stretopelia chinensis suratensis*	Columbidae	Sch-IV	LC
27	Panka (Kapota)	Little brown dove	*Stretopelia senegalensis*	Columbidae	Sch-IV	LC
28	-	Indian emerald dove	*Chalocophaps indica indica*	Columbidae	Sch-IV	LC
29	-	Large Indian parakeet	*Psittacula eupatria nepalensis*	Psittacidae	Sch-IV	NT
30	Chandana	Rose- ringed parakeet	*Psittacula krameri marillensis*	Psittacidae	Sch-IV	LC
31	Chandani	Plum-headed parakeet	*Psittacula cyarocephala Cyarocephala*	Psittacidae	Sch-IV	LC
32	-	Common hawk cuckoo	*Cuculus varius varius*	Cuculidae	Sch-IV	LC
33	Koili	Cuckoo	*Cuculus canorus canorus*	Cuculidae	Sch-IV	LC
34	-	Indian plaintive cuckoo	*Cacomantis merulinus passerines*	Cuculidae	Sch-IV	LC
35	Koili	Asian koel	*Eudynamys scolopacea scolopacea*	Cuculidae	Sch-IV	LC
36	Kumbhati	Crow peasant	*Centropus sinensis parroti*	Cuculidae	Sch-IV	LC
37	-	Oriental scops owl	*Otus scops sunia*	Strigidae	Sch-IV	LC
38	Raja pecha	Indian collared scops	*Otus bakkamoena marathae*	Strigidae	Sch-IV	LC
39	Hunha	Brown fish owl	*Bubo zeylonensis leschenault*	Strigidae	Sch-IV	LC
40	Hulhulia pecha	Barred jungle owlet	*Glaucidium radiatum radiatum*	Strigidae	Sch-IV	LC
41	Raja pecha	Spotted owlet	*Athene brama indica*	Strigidae	Sch-IV	LC
42	-	Indian jungle nightjar	*Caprimulgus indicus indicus*	Caprimulgidae	Sch-IV	LC

SL No.	Local Name	English name	Scientific Name	Family	WPA	IUCN
43	Bhuinchhapuli	Indian little nightjar	*Caprimulgus asiaticus asiaticus*	Caprimulgidae	Sch-IV	LC
44	Chatak	Indian house swift	*Apus affinis affinis*	Apodidae	Sch-IV	LC
45	-	Malabar trogon	*Harpactes fasciatus legerli*	Trogonidae	Sch-IV	LC
46	Machharanka	Indian small blue kingfisher	*Alcedo attahis bengalensis*	Alcedinidae	Sch-IV	LC
47	-	Indian white breasted kingfisher	*Halcyon smyrnensis fusca*	Alcedinidae	Sch-IV	LC
48	Bangstapaturi	Chestnut headed bee eater	*Merops lesshenaulti lesshenaulti*	Meropidae	Sch-IV	LC
49	Balishua	Indian small green bee eater	*Merops orientalis orientalis*	Meropidae	Sch-IV	LC
50	Chasha pakshi	Northern roller	*Coracias benghalensis*	Coraciidae	Sch-IV	LC
51	Kathahana	Ceylon hoopee	*Upupa epops ceylonensis*	Upuciidae	Sch-IV	LC
52	Bahadakhai	Indian pied hornbill	*Tockus birostris*	Bucerotidae	Sch-IV	LC
53	Kochilakhai	Indian pied hornbill	*Anthracoceros malabaricus malabaricus*	Bucerotidae	Sch-I	NT
54	Kathakkhumpa	Lesser golden backed woodpecker	*Dinopium benghalensis benghalensis*	Picidae	Sch-IV	LC
55	-	Greater golden backed woodpecker	*Chrysocolaptes lucidus guttacristatus*	Picidae	Sch-IV	LC
56	-	Black headed shrike	*Lanius schach tricolor*	Laniidae	Sch-IV	LC
57	Haladibasanta	Indian golden oriole	*Oriolus oriolus kundoo*	Orididae	Sch-IV	LC
58	Haladibasanta	South Indian black headed oriole	*Oriolus xanthornus maderaspatanus*	Orididae	Sch-IV	LC
59	Kajalapati	South Indian black drongo or king crow	*Dicrurus adsimilis macrocercus*	Dicruridae	Sch-IV	LC
60	-	Indian grey drongo	*Dicrurus leucophaeus longica udatus*	Dicruridae	Sch-IV	LC
61	Kajalapati	Indian white bellied drongo	*Dicrurus caerulescens caerulescens*	Dicruridae	Sch-IV	LC
62	-	Grey headed maina	*Sturnus malabaricus*	Sturnidae	Sch-IV	LC
63	Telhiamaina	Black headed myna	*Sturnus pagodarum*	Sturnidae	Sch-IV	LC
64	Gukhai maina	Indian pied maina	*Sturnus contra contra*	Sturnidae	Sch-IV	LC

SL No.	Local Name	English name	Scientific Name	Family	WPA	IUCN
65	Rajabani, Rajamaina	Indian myna	*Acridotheres tristis tristis*	Sturnidae	Sch-IV	LC
66	Guhabani, ghukalika	Northern jungle maina	*Acritheres fuscus fuscus*	Sturnidae	Sch-IV	LC
67	Shari	Northern hill maina	*Gracula religiosa intermedia*	Sturnidae	Sch-IV	LC
68	Karkara chadhei	Rufous treepie	*Dendrocitta vagabunda vagabunda*	Corvidae	Sch-IV	LC
69	Kuwa	Indian house crow	*Corvus splendens splendens*	Corvidae	Sch-IV	LC
70	Damara kua	Indian jungle crow	*Corvus macrorhyachos culminates*	Corvidae	Sch-IV	LC
71	Sundari	East Indian minivet	*Pericrocotus flammeus semiruber*	Campephagidae	Sch-IV	LC
72	-	Central Indian Iora	*Aegithina tiphia humei*	Lrenidae	Sch-IV	LC
73	Maraba chadhei	Northern gold fronted chloropsis	*Chloropsis aurifrons aurifrons*	Lrenidae	Sch-IV	LC
74	Kanaka champa	Jerdon's chloropsis	*Chloropsis cochinchinensis jerdoni*	Lrenidae	Sch-IV	LC
75	-	Black crested yellow bulbul	*Pycnonotus melanicterus flaviventris*	Pycnonotidae	Sch-IV	LC
76	Bulbul	Bengal red whiskered bulbul	*Pycnonotus jocosus emerica*	Pycnonotidae	Sch-IV	LC
77	Champa	Orissa red vented bulbul	*Pycnonotus cafer wetmorei*	Pycnonotidae	Sch-IV	LC
78	Kundakhai	Orissa jungle babbler	*Turdoides striatus orissae*	Pycnonotidae	Sch-IV	LC
79	-	Northern white browed fantail flycatcher	*Rhipidura aureola aureola*	Pycnonotidae	Sch-IV	LC
80	-	Orissa white throated fantail fly catcher	*Rhipidura albicollis arissae*	Pycnonotidae	Sch-IV	LC
81	-	Indian black naped monarch flycathcher	*Hypothymis azurea styani*	Pycnonotidae	Sch-IV	LC
82	Tiki chadhei	Indian tailor bird	*Orthotomus sutorius quzuratus*	Pycnonotidae	Sch-IV	LC
83	Dayal	Indian magpie robin	*Copsychus saularis saularis*	Pycnonotidae	Sch-IV	LC
84	Shuee	Indian robin	*Saxicoloides fulicata erythrura*	Pycnonotidae	Sch-IV	LC
85	-	Indian thick-billed flower pecker	*Dicae agile agile*	Dicadae	Sch-IV	LC

SL No.	Local Name	English name	Scientific Name	Family	WPA	IUCN
86	Phulchuhi	Indian purple sunbird	*Nectarinia asiatica asiatica*	Nectarinidae	Sch-IV	LC
87	Gharachatia	Indian house sparrow	*Passer domesticus indicus*	Ploceidae	Sch-IV	LC
88	Chatia	Indian yellow throated sparrow	*Petronia xanthocollis xanthocollis*	Ploceidae	Sch-IV	LC
89	Baya	Indian baya	*Plocues philippinus*	Ploceidae	Sch-IV	LC
90	Patruni	Southern white backed munia	*Lonchura straita straita*	Ploceidae	Sch-IV	LC
91	Baramashi	Indian spotted munia	*Lonchura punctulata punctulata*	Ploceidae	Sch-IV	LC

3.8 AQUATIC FLORA

No perennial aquatic bodies are present in the Core zone however Buffer zones there are aquatic bodies (i.e. Wardha River and tributaries etc). The aquatic flora observed in the village ditches and stretches of river Wardha are detailed below in tables.

(a) Fishes:

Aquatic Fauna in Study Area

Zoological name	Common name	Status in Wild life(Protection) Act	IUCN Red list status
Channa punctatus	Spotted murrel	Not Applicable	DD
Clarias batrachus	Magur	Not Applicable	DD
Mugil cephalous	Mullet	Not Applicable	DD
Labeo rohita	Rohu	Not Applicable	DD
Labeo gonious	Minor carp	Not Applicable	DD
Catla catla	Catla	Not Applicable	DD

(b) Crustaceans

Zoological name	Common name	Status in Wild life(Protection) Act	IUCN Red list status
Macrobrachium rosenbergi	Freshwater Prawn	Not Applicable	DD
Macrobrachiummalcolmsoni	Small Prawn	Not Applicable	DD

(c) Mollusc

Zoological name	Common name	Status in Wild life(Protection) Act	IUCN Red list status
Planoxis sulcatus	Ground snail	Not Applicable	DD
Littorina sp.	Common snail	Not Applicable	DD

3.9 SUPPORTIVE CARRYING CAPACITY OF THE RIVERINE ECOSYSTEM

3.9.1 GROUND WATER DRAFT

The groundwater withdrawal here is generally for irrigation, domestic and Mine use and is quantified as under:

Gross Groundwater Draft for 'All Uses'

	GROUNDWATER DRAFT	Monsoon (120 days)	Non-monsoon (245 days)	Total
		M m³	**M m³**	**M m³**
1	**Net irrigation use**			
i.	Proportional quantity for 2134.75 Ha area {Draft from Irrigation in Warora development block }	0.00	**0.23**	**0.23**
2	**COMMUNITY USE**			
i.	Projected population (i.e. 2025 AD) = 83266 (@ 60 lpcd)	0.60	1.22	1.82
ii.	**Mine use (mine water & tubewell):**			
1	1 mine in buffer zone	0.03	0.07	0.10
	Total	**0.03**	**0.07**	**0.10**
	Sub-Total (2(i)+2(ii))	***0.63***	***1.29***	***1.92***
3	**Net Annual Mine Discharge (M m³)**	**Monsoon**	**Non-monsoon**	**Total**
i	1 mine in buffer zone	0.52	1.06	1.58
Total Mine Pumping in the Area		0.52	1.06	1.58
Mine use		0.03	0.07	0.10
Total discharge after mine use		0.49	0.99	1.48
Net mine discharge in the area		**0.49**	**0.99**	**1.48**
Gross Annual Groundwater Draft for 'All uses' in Buffer Zone		***1.12***	***2.51***	***3.63***

3.9.2 GROUND WATER RECHARGE:

Rainfall Recharge in the study area by Rainfall infiltration method during monsoon and non-monsoon season

	Description of items		
1	**Area**		
	a. Sedimentary Area (km²)	**154**	
	i) Alluvium/Kamthi	154	
	b. Hard Rock Area (km²)	**160**	
	i) Basalt	160	
2	Average Rainfall (mm) during	1163.1	
	a. Monsoon season rainfall (mm) (June to Sept)	1017.5	
	b. Non-monsoon season rainfall (mm) (Oct to May)	145.6	
	c. Minimum threshold value of rainfall (mm)	116.31	
	d. Maximum threshold value of rainfall (mm)	3000	
3	Rainfall infiltration factor	Sedimentary	Hard Rock
		Alluvium/Kamthi-0.15	Basalt-0.07
4	Rainfall recharge in the study area by rainfall infiltration factor method		

	a. **Monsoon season (M m³)** = [(1) * {(2d)-(2c)} *(3)/1000] if (2a) > (2d) = [(1) * {(2a)-(2c)} * (3)/1000] if (2a) <= (2d)	***30.91***
	i) Sedimentary	20.82
	ii) Hard Rock	10.09
	b. **Non-monsoon season (M m³)** = Nil if (2b) <= (2c) = [(1) * {(2b) - (2c)} * (3)/1000 if (2b) > (2c)]	***1.01***
	i) Sedimentary	0.68
	ii) Hard Rock	0.33
	Gross Rainfall Recharge [a) + (b)]	***31.92***

Rainfall Recharge in the study area by Water Table Fluctuation Method during monsoon season

Description of items		Sedimentary	Hard Rock
1	Area (km²)	154	160
2	Water table fluctuation (m)	2.14	2.80
3	Specific yield	0.03	0.02
4	Change in groundwater storage [(1) * (2) * (3)] (M m³)	9.89	8.96
5	**Total (M m³)**	***18.85***	
6	Gross groundwater extraction for 'All Uses' during monsoon season (M m³)	1.12	
7	Recharge from 'Other Sources' during monsoon season (M m³)	0.05	
8	Gross Rainfall Recharge (M m³) [(5) + (6)-(7)]	19.92	

Rainfall Recharge during Monsoon season after comparing results from Water Table Fluctuation Method and Rainfall Infiltration Factor Method during monsoon season

	Description of items	**Quantity**
1	Rainfall Recharge during monsoon season	
	a. By Water Table Fluctuation Method (M m³)	**19.92**
	b. By Rainfall Infiltration Factor Method (M m³)	**30.91**
2	Difference between (1a) and (1b) expressed as a percentage of (1b), 'PD' $PD = \frac{[(1a)-(1b)]}{(1b)} * 100$	**-35.55%**
3	Rainfall Recharge in the study area during monsoon season after considering the 'PD'	**24.73**
	[= (1a) if 'PD' is between -20 and +20%	
	= 0.8 * (1b) if 'PD' is less than -20%	
	= 1.20 * (1b) if 'PD' is greater than +20%]	

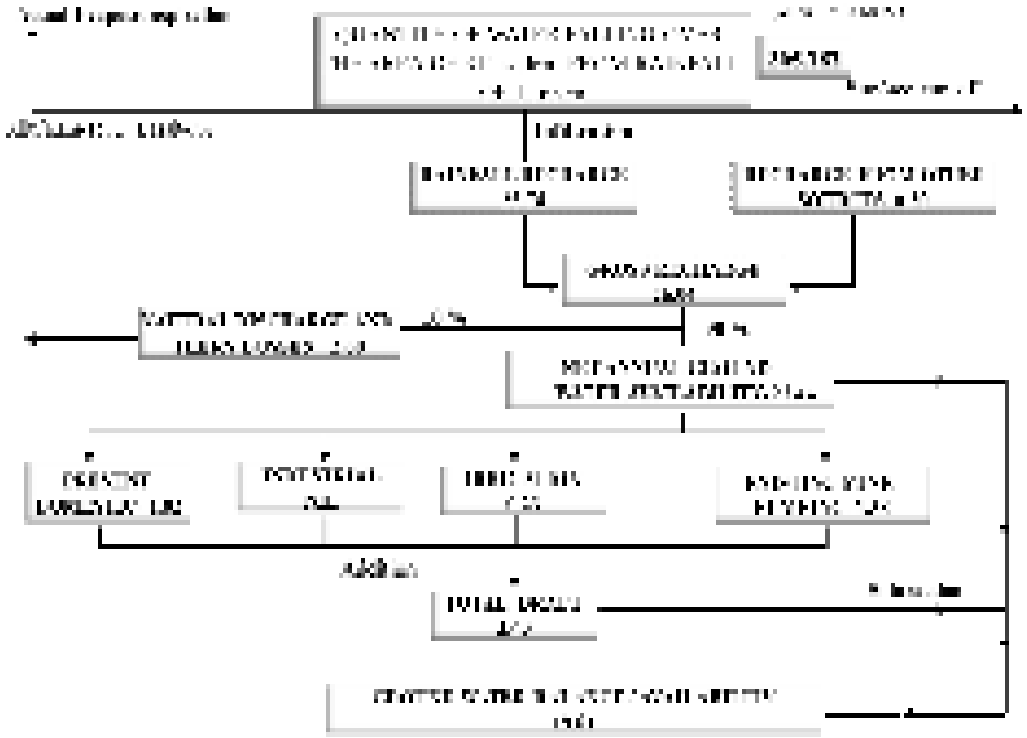
Net Groundwater Availability in the study area

	Description of items	M m^3
1	Rainfall Recharge in the study area	
	a. During Monsoon season (Rainfall Infiltration Method)	24.73
	b. During Non-monsoon season (Rainfall Infiltration Method)	1.01
	c. Annual [(1a) + (1b)]	**25.74**
2	Recharge from 'Other Sources'	
	a. During Monsoon season	0.05
	Return flow from Excess mine water [20% as seepage factor]	0.01
	Recharge through water bodies in the area (0.75 x 18750 m^3 (storage capacity) x 3 (total no. of fillings))	0.04
	b. During Non-monsoon season	0.25
	Return flow from Irrigation [20 % of Irrigation Draft]	0.05
	Return flow from Excess mine water [20% as a seepage factor]	0.20
	Recharge through water bodies in the area	negligible
	c. Annual [(2a) + (2b)] M m^3	**0.30**
3	Are Environmental Flows assessed (Yes/No)	No
4	Total Annual Groundwater Recharge [(1c) + (2c)]	**26.04**
5	Environmental flows in (M m^3)	**2.60**
	a. [0.05 * (4)] if response to (3) is "NO" and rainfall recharge during monsoon season computed by 'Water table Fluctuation Method'	-
	b. [0.10 * (4)] if response to (3) is "NO" and rainfall recharge during monsoon season is "NOT" computed by 'Water table Fluctuation Method'	2.60
6	Net Annual Groundwater Availability in the study area [(4) – (5)] M m^3	**23.44**
7	Annual Gross Groundwater Draft for all uses in the study area	**3.63**
8	Balance Available Annual Groundwater Recharge (Net Annual Groundwater Availability – Gross Annual Groundwater Draft)	**19.81**

Stage of Groundwater Extraction in the study area

Description of items	Buffer Zone
1. Stage of Groundwater Extraction	**15.49%**
a. Net Groundwater Availability (M m^3)	23.44
b. Annual Gross Groundwater Draft (M m^3)	3.63
c. Balance Available Annual Groundwater Recharge (M m^3)	19.81

Ground water Balance Flowchart for Yekona-I and II OC Mine

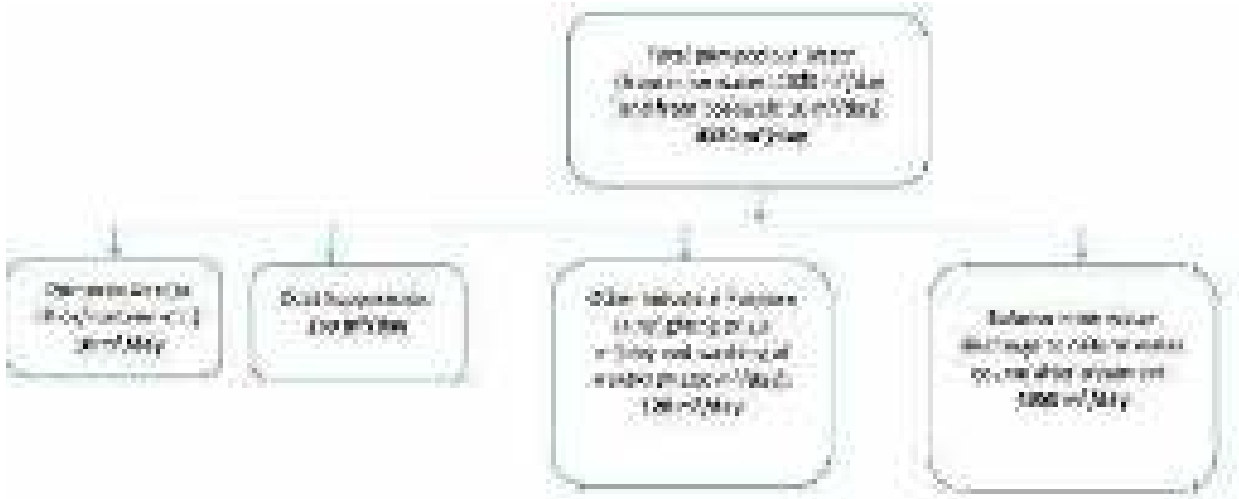


3.10 CONSIDERATION OF EXISTING MINE DISCHARGE INTO THE WARDHA RIVER

At Amalgamated Yekona I & II OC mine, Strata seepage water is first gets accumulated in the mine sump which will act as first stage / primary settling tank/ Sedimentation pond. The settled water is then be pumped out and fed into a surface sedimentation tank for secondary treatment. The treated water from the surface sedimentation tank is being utilized for internal usage like domestic use, dust suppression measures, washing of HEMM & fire-fighting purpose. The surplus water after internal usage is released onto natural water sources.

The quantity of mine discharge water (after treatment) is very less 4050 m3/day as compared to total amount of discharge in the Wardha river.

Flow Chart of Mine Water Utilization



The quality of mine discharge water (after treatment) also confirming the prescribed standards.

The Central Ground Water Authority has also issued NOC for Subject project i.e. Amalgamated Yekona I & II OC mine vide no. CGWA/NOC/MIN/ORIG/2019/6689
dated 19.11.2019 with a validity upto 18.11.2021 for maximum dewatering quantity of 4320 m3/day or 1580450.0 m3/year. Copy of the NOC letter is also placed below

3.11 Stage of Ground Water development :

The present stage of ground water extraction in and around the project area is 15.49% which can be categorized as safe area. As per CGWB, Central Region, Nagpur the 'Stage of ground water extraction' in Warora tehsil, in which mine is located is 16.57%.

Chapter 4

CONSTRUCTION OF EMBANKMENT AT AMALGAMATED YEKONA I & II OC MINE – CASE STUDY

Submission / Status of compliance :

4.1 Embankment Construction

The design criteria has been based on the Indian Standard Guidelines for planning and Design of river embankments from Compendium of Guidelines in the field of flood management by Ganga Flood Control Commission (G.F.C.C), Ministry of Water Resources, Govt. of India and Maharashtra Water & Irrigation Commission Report, 1999.

4.1.1 Spacing of Embankment

The spacing of embankments and their alignment needs careful consideration with respect to the vulnerability to the river and the rise of high flood levels on account of reduction in flow and also increase in peak discharge due to reduction in flood plain storage by construction of the factors embankment. Finalization of the alignment and the spacing with due consideration to the above factors and at the same time optimizing the benefits from the proposed embankment would need considerable experience of the river behavior and studies of the effects of the embankment along different alignments. In view of the widely varying nature of the rivers, no general recommendation about spacing of embankment can substitute the need for the above studies. The following general guidelines about the minimum spacing etc. are however, given mainly with an idea to check the tendency of excessive encroachment of the natural flood plain of the river.

In case of the embankment on both sides of the river, the spacing between the embankments should not be less than 3 times Lacey wetted perimeter for design flood discharge.

In case of the embankment on only one bank, the embankment should not be less than a distance equal to 1.5 times Lacey's wetted perimeter from the midstream of the river.

4.2 Calculation

Based on unlined channel / stream design on alluvial soil by Lacey's theory,

Lacey's wetted perimeter = $P_w = 4.75 \sqrt{Q}$

Where,

P_w = Lacey's wetted perimeter in meter;

Q = Discharge in cumecs (cubic meter per second)

1. Case Study Amalgamated Yekona I & II OC

Amalgamated Yekona I & II OC mine situated in located in Village Marda, District Chandrapur (Maharashtra). Wardha River flows along the south-western boundary of the Project.

The Wardha River is a major river in Vidarbha region of Maharashtra in India. The Wardha River joins the Wainganga River at Chaprala in Gadchiroli district and forms the Pranahita River which ultimately flows into Godavari.

Fig Wardha river

To find Lacey's wetted perimeter of Wardha river at Amalgamated Yekona I & II OC mine situated in Village Marda, Warora town, District Chandrapur (Maharashtra) based on following equation:

$P_w = 4.75 \sqrt{Q}$

Where,

P_w = Lacey's wetted perimeter in meter;

Q = Discharge in cumecs (cubic meter per second)

Q = 5633 * 10^6 Cu.m per year = 178.62 cu.m per sec = Average annual yield (Discharge) of water (based on Maharashtra Water & Irrigation Commission Report 1999)

$P_w = 4.75 \sqrt{178.62}$

= 4.75 * 13.36

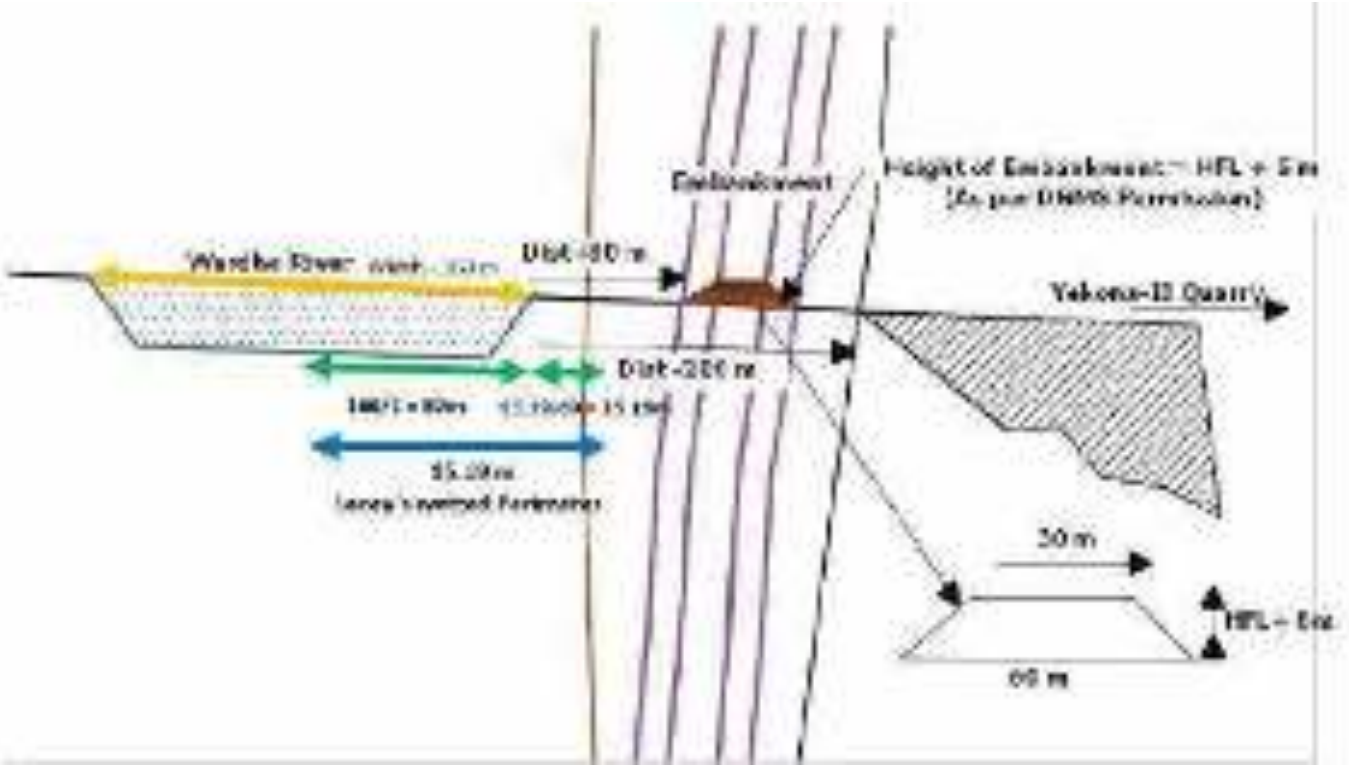
= 63.46 m

As embankment is on only one bank, the embankment should not be less than a distance equal to 1.5 times Lacey's wetted perimeter from the midstream of the river i.e. 1.5 * 63.46m = 95.19 m

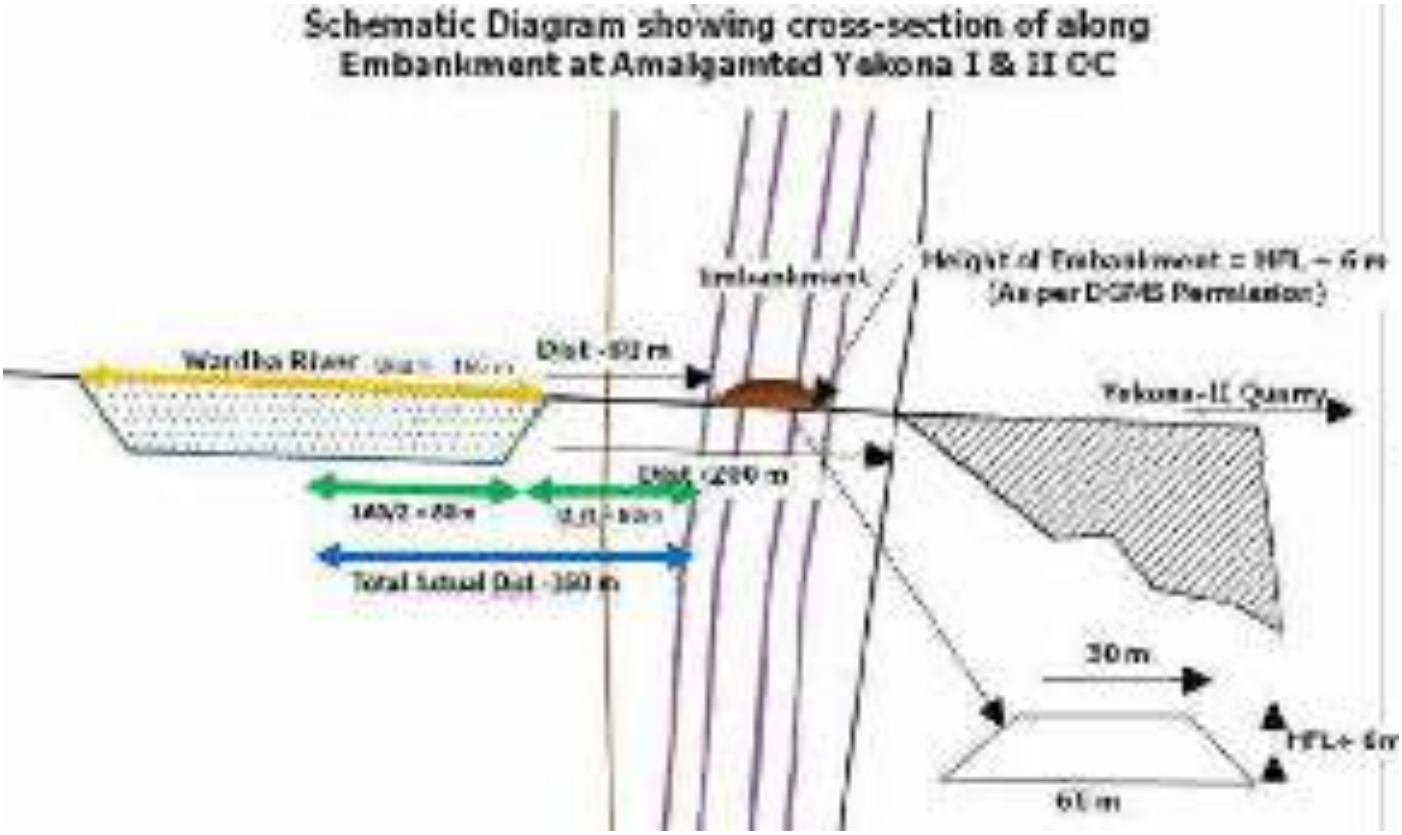
As per Lacey's theory, Design criteria for flood protection Embankment, for only one bank should not be less than 95.19 m from midstream of river.

As the physical width of river at considered cross- section is 160 m.

As per theoretical Design Criteria:



As per Actual construction:



Conclusion:

As per Lacey's theory, Design criteria for flood protection Embankment, for only one bank should not be less than 95.19 m from midstream of river.

As per the actual construction, the embankment at Amalgamated Yekona I & II OC is at a distance of 160 m from the midstream of Wardha river on the one bank side.

As such, there is a free space of 64.81 m available for between the physical bank / edge of river and toe of the embankment which will allow water to spread without any constraint thereby minimizing adverse impact in the surrounding significantly.

In other way, the construction of embankment at Amalgamated Yekona I & II OC site for protection of mine from the danger of surface inrush of Water as per the requirement of Coal Mines Regulation, 2017 and relevant permission from DGMS does not pose any danger to the river and the surrounding habitation.

Chapter 5

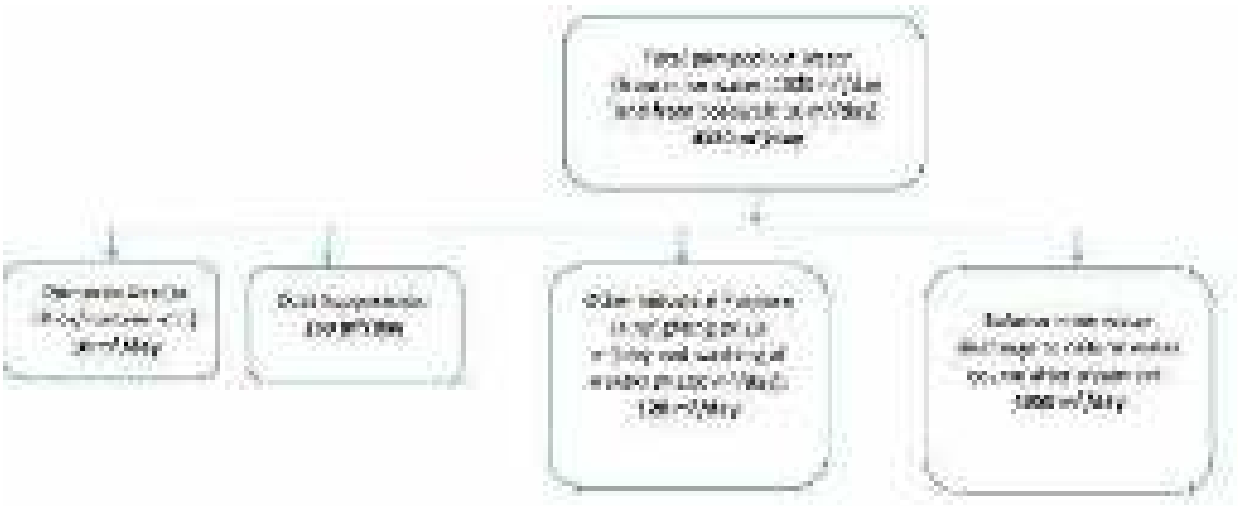
DISCUSSION

5.1 Mine Discharge :

As deliberated in the above paragraphs, strata seepage water first is gets accumulated in the mine sump which will act as first stage / primary settling tank/ Sedimentation pond. The settled water is then be pumped out and fed into a surface sedimentation tank for secondary treatment. The treated water from the surface sedimentation tank is being utilized for internal usage like domestic use, dust suppression measures, washing of HEMM & fire-fighting purpose. The surplus water after internal usage is released onto natural water sources.

The quantity of mine discharge water (after treatment) is very less 4050 m3/day as compared to total amount of discharge in the Wardha river.

Flow Chart of Mine Water Utilization



The quality of mine discharge water (after treatment) also confirming the prescribed standards. The Central Ground Water Authority has also issued NOC for Subject project i.e. Amalgamated Yekona I & II OC mine vide no. CGWA/NOC/MIN/ORIG/2019/6689

dated 19.11.2019 with a validity upto 18.11.2021 for maximum dewatering quantity of 4320 m3/day or 1580450.0 m3/year. Copy of the NOC letter enclosed.

Suggestion/ Recommendations :

- Mine water may be discharged in the Wardha river only after proper treatment.
- The water being discharged into the Wardha river should confirm the prescribed water quality standard.
- Any increase or decrease in the quantity of mine water discharge resulting from dewatering may be reported to Central Ground Water Authority and necessary permission from CGWA may be obtained.

5.2 Embankment

As per Lacey's theory, Design criteria for flood protection Embankment, for only one bank should not be less than 95.19 m from midstream of river.

As per the actual construction, the embankment at Amalgamated Yekona I & II OC is at a distance of 160 m from the midstream of Wardha river on the one bank side.

As such, there is a free space of 64.81 m available for between the physical bank / edge of river and toe of the embankment which will allow water to spread without any constraint thereby minimizing adverse impact in the surrounding significantly.

In other way, the construction of embankment at Amalgamated Yekona I & II OC site for protection of mine from the danger of surface inrush of Water as per the requirement of Coal Mines Regulation, 2017 and relevant permission from DGMS does not pose any danger to the river and the surrounding habitation.

Suggestion/ Recommendations :

- Actual construction of the embankment should be carried out as per the design prescribed.
- Necessary permission may be obtained from DGMS to protect the mine from danger of surface inrush of water.
- Plantation / grass seeding may be carried out in vacant space between embankment and river bank.

5.3 Plantation / Green Belt Development

In the EIA-EMP, it is proposed that, Green belt of 7000 m long & 30 m width along the periphery of mine boundary. Details shown in figure below:

Suggestion / Recommendations:

- Plantation / grass seeding may be carried out in vacant space between embankment and river bank.
- Green belt may be developed all along the periphery of the mine boundary as proposed.

Chapter 6

CONCLUSION

The strata seepage water is being abstracted from the mine sump for safe operation of the mine. This pumped out mine water meets the entire internal usage (Dust suppression purpose, washing of HEMM, firefighting needs, etc.). The balance quantity is let off the natural water courses after treatment. The CGWA NOC has also been secured accordingly for maximum dewatering quantity of 4320 m3/day or 1580450.0 m3/year.

The mine discharge from Amalgamated Yekona I & II OC into Wardha river is very less as compared to total discharge in the Wardha river. As such, this quantity of water will contribute as small aid to Wardha river volume and is not likely the affect the quality of water in Wardha river adversely. As such, there is no danger to the aquatic flora and fauna in the riverine eco system.

Construction of embankment at Amalgamated Yekona I & II OC site for protection of mine from the danger of surface inrush of Water as per the requirement of Coal Mines Regulation, 2017 and relevant permission from DGMS does not pose any danger to the river and the surrounding habitation.

Plantation / grass seeding in vacant space between embankment and river bank will reduce the soil erosion in the stretch.

The study reveals that, the riverine ecosystem in the study area (core zone & 10 km buffer zone) is having enough carrying capacity, both in terms of supportive and assimilative capacity, to support the development of the ecosystem of the area.

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