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CENTRAL COALFIELDS LIMITED (CCL)

MINING PLAN FOR MAGADH OCP (INCLUDING EASTERN PART IN CHATRA DIST.)

Name of Block- Magadh, Tandwa, Umargarh & Karimati

Name of Coalfield-North Karanpura Coalfield

Location-Chatra Dist. & Latehar Dist, Jharkhand State

Targeted Capacity-20.0 MTY

Job No. 342110

NIRPENDRA NATH
Project Officer
Magadh Project

January 2021

REGIONAL INSTITUTE-III
CENTRAL MINE PLANNING & DESIGN INSTITUTE LIMITED
(A Subsidiary of Coal India Limited)
GONDWANA PLACE, KANKE ROAD, RANCHI – 834 031
JHARKHAND, INDIA

	Parameters	Details
1.1	**INTRODUCTION**	
1.1.1	Name of Coal / Lignite Block	Magadh OCP
1.1.2	Name of the Coalfield/ Lignite Field	North Karanpura Coal Field
1.1.3	Base date of Mining Plan/ Mine Closure Plan	**Jan 2021**
1.1.4	Linked End Use Plant	Tandwa STPS & Basket Linkage- Coal from Magadh OCP to Hindalco-Renukut,Jhasugida-Vedanta,NTPC-Hariyana,Punjab,UP,Bihar,NTPC-Delhi,Adhunic-T,tata Power-Tata Nagar,NPC-Dhanbad
1.1.5	Distance of End use plant from the pit head of the project in "km"	**Tandwa STPS:8 km**
1.1.6	Mode of Coal Transport	By Rail

1.2 LOCATION, TOPOGRAPHY AND & COMMUNICATION

1.2.1	Location of coal deposit (District and State)	District-Chatra, Latehar State-Jharkhand
1.2.2	Communication: PWD roads, railway lines, Air	The Magadh OCP is approachable by 12 Km long fare weather Kutcha road from Tandwa village which is connected to Khalari via Piparwar by a 20 Km long fare weather road in the south and to Hazaribagh by a 50 Km long Metalled road via Barkagaon. Another metalled road connects Tandwa village with Hazaribagh (80 Km) via Semariea. A fair weather kutcha road connecting Tandwa village with Balumath also runs close to this OCP, which in turn is connected to Khalari via Tori and Bijupara. The nearest railway station is the Ray, which is at a distance of about 35 Km from the block, on Barkakana Dehri-on-Sone loop line of the Eastern Railway. Tori Railway station is another nearby railhead, located south-west of the block, at a crowfly distance of about 45 Km.
1.2.3	Availability of power supply, water etc.	It is proposed to establish one no. 132/33KV, 2x50 MVA sub-station, which will be centrally located from the proposed Amrapali and Magadh mining projects and Proposed Regional 33KV switching station, at Magadh & Amrapali. A lump sump amount of Rs. 230.00 lakhs have been provided for development of source of water for potable and industrial use. There is no perennial source of water in that area except a small stream called Sadabaha. So a hydro-geological survey should be done to develop sources of water.
1.2.4	Prominent physiographic	The Magadh OCP is characterised by more or less flat terrain with

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	Parameters	Details
	features, drainage pattern, natural water courses, rainfall data, highest flood level	gentle undulations. In general, the ground slopes towards south in major part of the block. In the northern part, it slopes towards the east. The maximum elevation of 509m is noticed in the northern part of the block, where lower seams are incroping. The minimum elevation of 464m is noticed near the southern block boundary.The drainage of Magadh OCP is controlled by Pindar-Kalkal nala, flowing west to east in the northern side of the property. and Kuhubad nala flowing north to south along the Western block boundary. The Kuhubad nala meets the Garhi river in the south at a distance of about 10 Km. There is no parennial water body within the block.The average monthly rainfall during the monsoon period (June to October) is 200mm and during the non-monsoon period (Nov. to May) is 20mm.
1.2.5	Important surface features within the project area and major diversion or shifting involved	Total PAFs to be rehabilitated 998 (As estimated by Project) 303-In Magadh OCP(Eastern side)-Chatra Dist 695-In Magadh OCP(Western side)-Latehar Dist.

1.3 DETAILS OF THE ALLOTTMENT AGREEMENT

1.3.1	Name the Allottee	NA
1.3.2	Details of allotment/vesting order	
1.3.3	Name and address of the applicant	
1.3.4	Name of the Previous allottee of the Block	
1.3.5	Starting Date of the Mine as per CMDPA	
1.3.6	Rated Capacity as per CMDPA	
1.3.7	Production Schedule as per opening permission (meeting provisions of CMDPA if any)	
1.3.8	End Use of Coal/Lignite as per allotment order if any	
1.3.9	Cardinal Points co-ordinates of the Block boundary	

1.4 DETAILS OF THE PREVIOUS APPROVAL OF MINING PLAN

1.4.1	Date of Approval	NA
1.4.2	Conditions, if any	
1.4.3	Scheduled year of start of production	
1.4.4	Proposed year of achieving	

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	Parameters	Details
	the targeted production	
1.4.5	Date of actual commencement of mining operations, if operations already started	
1.4.6	Likely date of mining operations, if operations not yet started & reasons for non-commencement of operations	NA
1.4.7	**Planned production and actual levels achieved in last 3 years (Coal in Mte, OB in MM^3, SR in MM^3/te)**	
1.4.8	**Statutory obligations vis-à-vis compliance status in a tabular form**	
1.4.9	Reasons for difference between the planned and actual production levels	

1.5 PARAMETERS OF APPROVED MINING PLAN VIS-À-VIS PROPOSED MINING PLAN

		Approved Mining Plan/PR	Proposed Mining Plan
1.5.1	Block Area in "Ha"	3000	3000
1.5.2	Block Area Projectised "Ha"	1146	1146
1.5.3	Lease area "Ha"		
1.5.4	Project Area "Ha"	1769 Ha.	1593.73 (*Reduction due to boundary adjustment with Sanghmitra OCP)* *-Source CCL
1.5.5	Life of the Project "Yrs"	26	22
1.5.6	Minimum and Maximum Depth of working "m"	100 m-110 m	100 m-110 m
1.5.7	Net Geological Block "Ha"	3000	3000
1.5.8	Production Target "MTPA"	20.0	20.0
1.5.9	Seams Available "As per GR"	Top to bottom 1. IV 2. III (comb) 3. III (B) 4. II + III (B) 5. III + II (T) 6. II (T) + II (B)	Top to bottom 1. IV 2. III (comb) 3. III (B) 4. II + III (B) 5. III + II (T) 6. II (T) + II (B)

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	Parameters	Details	
		7. II (T) 8. II (B) 9. I (T) 10. I (M) 11. I (B+M+T) 12. I (B)	7. II (T) 8. II (B) 9. I (T) 10. I (M) 11. I (B+M+T) 12. I (B)
1.5.10	Seams not considered for Mining with Reasons	Seam V because Seam V with a thickness of 4 to 5 m lies with a parting of around 100 m has not been considered in Magadh OCP.	Seam V because Seam V with a thickness of 4 to 5 m lies with a parting of around 100 m has not been considered in Magadh OCP.
1.5.11	Gross Geological Reserve "Mt"	1069.53	1069.53
1.5.12	Net Geological Reserve "Mt"	962.58	962.58
1.5.13	Blocked Reserve "Mt"	106.95	106.95
1.5.14	Minable Reserve "Mt"	351 Mt	351 Mt
1.5.15	Extractable Reserves "Mt"	351 Mt	351 Mt
1.5.16	% of Extraction/ recovery	100%	100%
1.5.17	Reserve Depleted (till the base date) Reserves " Mt"	NA	13.75
1.5.18	Balance Extractable reserve "Mt"	351 Mt	337.25
1.5.19	Average Grade	F	F
1.5.20	OB in MM3	529.12	501.41
1.5.21	SR MM3/te	1.51	1.49
1.5.22	Mining Technology	Shovel-dumper mining system envisaged for working this OC mine.	Shovel-dumper combination with surface miner system envisaged in the mine.
1.5.23	Coal Beneficiation envisaged		NA
1.5.24	Handling of Rejects		NA
1.5.25	Land use pattern " Ha"(As per PR)		
1	Excavation Area	1146	1146
2	Top Soil Dump		
3	External Dump	194.71	166.91
4	Safety Zone/Green belt	307.15	159.68
5	Other Use	14.80	14.80
6	Infrastructure area	106.34	106.34
8	Undisturbed Area		
	Total	1769	1593.73
1.5.26	**Reasons for revision**	CCL decided to make separate forest application for Magadh OCP in Chatra Dist in the name of Magadh East OCP(192.36 Ha)	

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	Parameters	*Details*
2.1	**DETAILS OF THE BLOCK**	
2.1.1	Particulars of adjacent blocks: North, South, East, West	**North: Sanghmitra** **East: Koyad Kishanpur** **South: unblocked** **South** **West: Tetariakhar**
2.1.2	Location of the Block District / State	District-Chatra, State-Jharkhand
2.1.3	Area of the Block "Ha"	3000
2.1.4	Area of the geological block projectized "in Ha" (Area of the geological block considered for liquidation of coal reserve)	1146
2.1.5	Balance area yet to be projectized "Ha"	1854
2.1.6	Likely Reserve in the area yet to be projectized "Mte"	**NA**
2.1.7	Cardinal Point Co-ordinates of the non-coal/lignite bearing area/**existing mining lease** outside the allotted Geological Coal/Lignite block (Duly certified in line with para 1.9 of the Guideline, if fresh inning lease required)	
2.1.8	Certificate of **Qualified person/ Accredited Mining Plan preparing agency (MPPA)**if the project area is confined within the vested/allotted block boundary/**existing mining lease** and Where the project area extends beyond the block boundary, a certificate of **Qualified person/ Accredited Mining Plan preparing agency (MPPA)**should be supported with a certificate of State Government mines and Geology department must be attached, which should specify (a) intent of the state government for grant of lease beyond the vested geological boundary; (b) non-	**NA**

	Longitude	Latitude
Magadh Opencast Project	$84^0$53'40" to 84059'30"E	$23^0$47'40" to $23^0$51'30"N
Magadh	$84^0$57'40" to $84^0$59'30"E	$23^0$49'15" to $23^0$51'30"N
Tandwa	$84^0$55'35" to $84^0$57'40"E	$23^0$47'40" to $23^0$50'38"N
Dumargarh	$84^0$54'50" to $84^0$56'09"E	$23^0$48'30" to $23^0$50'56"N
Karimati	$84^0$53'40" to $84^0$54'54"E	$23^0$48'40" to $23^0$49'40"N

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	Parameters	Details
	existence of Coal/ Lignite in the area beyond the vested/allotted geological block boundary/**existing mining lease** to rule out the issue of encroachment and use of coal bearing area (beyond the vested/allotted block boundary/**existing mining lease**) in the mining plan The Project area, Lease area and geological block area in "Ha" shall also be envisaged.	
2.1.9	KML file of the Proposed lease area, Project Area and geological block.	**NA**
2.1.10	Whether the proposed project area is confined within the allotted block boundary/**existing mining lease**, if not, the reason for deviation from allotted block boundary, may be given.	**Yes**
2.1.11	If the project area extends outside the allotted block boundary/**existing mining lease**, confirmation about non-occurrence of coal/lignite in the area under reference needs to be furnished	**NA**
2.1.12	Type of the Project (Operating / under Implementation) and year of Starting.	Operating
2.2	**EXPLORATION, GEOLOGY AND ASSESSMENT OF RESERVE**	
2.2.1	Regional geological set up of the area, local geology, structure, stratigraphic sequence, characteristics of the litho-logical units (coal seams /partings/overburden).	The North Karanpura Coalfield forms a part of the east-west trending valley between Hazaribagh plateau in the north and Ranchi plateau in the south. The Aswa Pahar in the south separates the North Karanpura Coalfield and the South Karanpura Coalfield by an east-west elongated metamorphic patch. However, they are almost interconnected near Bachra and Hindgir village by a narrow tongue of Talchir outcrops. On the eastern side, the North Karanpura Coalfield is separated from the West Bokaro Coalfield by a narrow stretch of metamorphic rocks having several outliers of Talchir Formation. In the west, it is separated from the Auranga Coalfield by a stretch of about 20km wide metamorphic belt.

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	Parameters	Details
		REGIONAL STARATIGRAPHY: North Karanpura Coalfield is a large ovate basin covering an area of about 1230 sq km containing complete sequence of Gondwana sediments ranging up to a maximum thickness of 1750 m. All the formations viz., Talchir, Karharbari, Barakar, Barren Measure, Raniganj, Panchet of the Lower Gondwana Group as well as the Mahadeva formation of the Upper Gondwana Group are represented. If the full sequences of the different formations are added up, one would get as impression that the basin contains a maximum thickness of about 2 Km of Strata. Although it is unlikely that all the formations should attain their full thickness in any particular section, the fact remains that the basin contains a very thick pile of sediments. The different formations can be demarcated on Gross Lithological and Paleo-Botanical considerations tough most of the units have a Gradual and Gradational passage in to the overlying ones. **TECTONIC SET UP AND BASIN CONFIGURATION:** The North Karanpura Coalfield is a Basinal structure particularly in the area North and West of the Pre-Cambrian outcrop. The older formations are exposed along the periphery of the field, while the youngest Mahadeva beds occur in the axial regions. The overall dip amount of the entire coalfield varies from 10° to 12°. Dips in the Rikba Area are fairly high. Very steep dips are recorded locally close to the boundary faults. Precambrian Basement Metamorphic Highs of varying dimensions are seen with in the basin near Lurunga-Indratoli, East of Badam, Near Pahra, South of Misrol and Near Serendag-Honhe around Sidpa, Easwt of Pinderkom and East of Hesalong. A large number of Normal Gravity faults affect the Coalfield. At places, sub-horizontal slickensides suggesting Strike–Slip movement are noted. Almost the entire Northern boundary, part of the Southern Boundary is marked by the presence of high magnitude faults. The throw of the faults is maximum near Rikba and in the Rohne area, where the Panchet Formations are seen in juxtaposition with the Precambrian Rocks. The northern boundary with the Precambrian Basement is at places cut by Cross-faults causing off-sets of the Basin margin. All these faults have a General NW-SE to WNW-

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	Parameters	Details
		ESE trend with down throw towards North-East. Some of the outliers of Gondwana Sediments are associated with these faults. The Intra Basinal faults, have two preferred alignments. Majority of these faults show the NW-SE trend, while the others are East-West trending. These Intra basinal faults have affected all the formations. Many of the basin marginal cross faults and intra basinal faults are disposed in a step like manner. Statistical Analysis of the Fault trends indicates that about 35% of the faults have NW-SE trend and about 47% of the faults have East-West trend being sympathetic to the trend of the boundary faults. From the study of their relationship, it is evident that the NW-SE trending set is younger
2.2.2	**Local geology, Structure, Stratigraphic sequence, Characteristics of the litho-logical units (coal seams /partings/overburden):** **Geology:** The northern part of North Karanpura comprising Magadh and Amrapali blocks with an area of 30 sq. Km each were identified as potential blocks for detailed exploration. Accordingly, detailed drilling in Magadh geological block was taken up by CMPDI in March '83. The drilling data generated for the block by the end of the Dec.'1986 indicated the block is divisible into smaller sub -blocks viz. Magadh (9.04 Sq. Km) ,Tandwa (7.53 Sq. Km) ,Saradhu (8.05 Sq. Km) ,Dumargarh (5.0 Sq. Km) based on The northern part of North Karanpura comprising Magadh and Amrapali Blocks major faults and nalas. The drilling in the adjoining Dumargarh & Karimati blocks falling further west of Tandwa blocks were taken during 1984 -86 and in 1995. The Magadh block is located between longitude 84^0 57'40" and 84^0 59' 30" E and latitude 23^0 49' 15" and 23^0 51' 30" N and Tandwa Block is situated between longitude 84^0 55' 35" and 84^0 57' 40" E and Latitudes 23^0 47'40" and 23^0 50' 38"N. The Dumargarh block located between longitude 84^0 54'50" and 84^0 56' 09" E and latitude 23^0 48' 30" and 23^0 50' 56" N .The Karimati block is located between longitude 84^0 53'40" and 84^0 54' 54" E and latitude 23^0 48' 40" and 23^0 49' 40" N . The detailed exploration in Magadh and Tandwa block were under taken simultaneously by CMPDI during March '1983 to June 1988. The Geological report for Magadh block was submitted in March'89 and Geological report for Tandwa block was submitted in Aug.'89. The

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Parameters	Details

detailed exploration in Dumargarh was taken along with Magadh and Tandwa during 1984-1986 and some additional drilling was done in 1995 and Karimati block in which 2 boreholes were drilled by IBM in 1957 was further explored by CMPDI during Jan 1996 & June 1998.The geological report for Dumargarh block was submitted in Feb'1996. The geological report for Karimati block was submitted in Sept' 1998 As Magadh and Tandwa blocks are contiguous, the project report on Magadh (4.5 MTY) comprising area of Magadh and Tandwa geological blocks was prepared in Feb. '89 .The project envisages to mine the reserves to a depth limit of around 75-80 m in both Magadh and Tandwa blocks keeping seam I Bottom as the base seam .

Keeping the increasing demand of power grade coal and simple structure in both Magadh , Tandwa ,Dumargarh & Karimati blocks it has now been envisaged to exploit the available reserves in the above area in the proposed Magadh OCP with a rated capacity of 12 MTY up to a depth of around 100-110 m keeping seam-I Bottom as the base seam.

The Magadh block is contiguous to Tandwa block in the west and Saradu block in the north west . The boundary between Magadh and Tandwa block has been separated by Khubuad Nala . The quarry envisages in the Magadh block is designated as Quarry-1 East and quarry falling in the Tandwa block has been designated as Quarry-1 West .The quarry envisages in the Dumargarh block is designated as Quarry-2 East and quarry falling in the Karimati block has been designated as Quarry-2 West .The quarry boundaries are however ,do not correspond to geological block boundaries which have been delineated based on mining considerations.

Product Mix Quality

The product Mix quality of the Magadh OCP will be grade F (,Avg. UHV 2861 K Cal/Kg & Avg GrossCv 4068 KCal/Kg) with corresponding average ash of 38.22.

seam	Avg M%	Avg ash%	Avg VM	Avg Cv	Avg. UHV	Avg. Grade
Quarry-1E						
I Bottom	4.9	38.68	22.0	4,202	2,885	F
IMid	4.7	3.48	22.6	3,782	2,260	G
I Top	5.75	36.62	23.1	4,311	3,108	F
II Bot	5.7	37.7	24.2	4,166	2,901	F
II Top	6.0	35.99	23.78	4,280	3,023	F
III	6.4	35.9	23.9	4,243	3,058	F
IV	7.1	32.2	23.0	4,493	3,480	F
Product-Mix	5.4	38.6	22.7	4,108	2,836	F
Quarry-1W						

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Parameters		Details				
I Bottom	4.8	38.66	23.6	4,216	2,900	F
IMid	4.9	41.62	21.6	3,908	2,469	F
I Top	6.2	35.98	24.2	4,249	3,078	F
II Top	5.4	43.01	22.7	3,713	2,211	G
II B	7.8	36.0	25.0	4,050	2,855	F
II Com	5.7	42.97	22.7	3,678	2,178	G
IIIB +II Com	6.0	39.5	23.8	3,959	2,615	F
III+IIT	4.8	44.2		3,695	2,740	F

Quarry-2E						
I Bottom	6.7	38.4	22.9	3,953	2,703	F
IMid	6.8	39.3	23.7	3,871	2,545	F
I Top	6.8	36.5	23.7	4,125	2,919	F
II Top	6.8	33.8	22.4	4,010	2,745	F
II B	6.8	28.1		4,010	2,745	F
II Com	6.6	35.7	26.7	4,235	3,060	F
III Bot	7.0	28.1		4,890	4,055	E
III Top	7.4	33.6	23.2	4,306	3,232	F
IV	8.2	29.6	24.5	4,546	3,653	E
IVB	7.3	40.8		3,655	2,260	G
IVC	7.9	34.8		4,130	3,005	F
IVD	7.5	34.8		4,190	3,060	F
Product-Mix	6.7	37.36	25.9	4,014	2,809	F

Quarry-2W						
I Bottom	6.1	37.76	23.2	4,128	2,846	F
IMid	5.9	42.61	22.0	3,660	2,200	G
I Top	6.2	39.31	23.3	3,931	2,612	F
IT+IM+IB	6.0	41.07	22.5	3,693	3,226	F
IM+IB	6.0	41.07	22.5	3,693	3,226	F
III +II	6.3	37.63	23.5	4,073	2,825	F
IV	7.1	33.65	23.7	4,381	3,260	F
IVA	5.4	45.2	23.4	3,515	1,915	G
IVB	6.9	35.8		4,180	3,005	F
IVD	6.6	34.0		4,395	3,300	F
Product-Mix	6.2	38.45	22.2	4,021	2,941	F
Product-Mix (Magadh OCP)	6.0	38.22	23.5	4,068	2,861	F

Details of Dirt -Band :

Seams in Magadh OCP are highly interbanded in nature .These bands at places form as high as 38 to 40 % (I Middle)of total seam thickness. It is observed that by and large seams considered in the proposed opencast do not contain dirt bands >1m except for some isolated cases. The details of dirt bands in Quarry -1 &Quarry -2 have been summarised in the Table below:

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Parameters	Details

Details of Dirt Bands

Seam	Dirt Bands < 1 m			Non-combustible Dirt Bands			Avg Band %
	No.	Thickness	%	No.	Thickness	%	
1	2	3	4	5		6	7
Quarry -1East							
IV	1-3	0.12-0.38	3.12-9.36	Nil	Nil	Nil	4.97
III	1-6	0.20-0.72	3.68-4.88	Nil- 1	Nil -0.33	Nil-5.09	10.42
II Top	1-4	0.15-0.94	7.55-21.17	1-2	0.02--0.07	11.0-14.9	12.6
II BOT	1	0.05-0.18	3.57-12.95	Nil	Nil	Nil	5.2
I TOP	1-5	0.12-1.19	4.16-27.42	Nil-1	Nil-0.19	Nil-2.09	6.23
I MID	2-8	0.31-1.53	9.51-38.2	1	0.1-0.3	1.2-5.28	21.83
I BOT	1-15	0.15-2.85	3.3-34.01	Nil-1	Nil -0.58	Nil-6.79	14.86
Quarry- 1 West							
IV	1-4	0.1-0.68	3.67-28.81	Nil-1	Nil-	Nil	5.15
III TOP	Nil-2	Nil-0.28	Nil-11.57	Nil	Nil	Nil	11.57
III BOT	Nil--1	Nil-0.63	Nil-28.08	Nil	Nil	Nil	23.08
III Com	1-5	0.5-1.22	11.7-20.3	1	0.10-0.77	2.05-12.04	17.17
II Top	2-8	0.31-1.49	10.33-25.04	Nil-1	Nil-0.36	Nil -5.49	21.34
II Bot	1-3	0.07-0.24	6.86-10.34	Nil	Nil	Nil	6.44
III +II TOP	7-15	2.33-2.74	23.07-24.57	1-4	0.52-1.07	5.15-9.60	
III +II	10	3.69	27.15	3	0.66	4.86	38.63
IIIB+ II	3-6	1.25-[illegible]54	15.45-24.85	1-3	0.47-1.12	5.81-10.96	29.38
II	2-8	1.26-1.83	16.49-23.08	1	0.65--0.79	7.44-9.96	25.13
I TOP	1-5	0.05--0.72	1.29-22.78	Nil	Nil	Nil	11.61
I MID	2-8	0.54-2.15	10.82-36.36	1-2	0.06-0.20	1.21-6.45	26.17
I BOT	2-12	0.19-2.15	1-24	Nil	Nil	Nil	13.53
1	2	3	4	5		6	7
Quarry- 2 East							
IVD	2	0.28	9.3	2	0.2	7.3	16.0
IVC	NIL	NIL	NIL	NIL	NIL	NIL	NIL
IVB	NIL	NIL	NIL	NIL	NIL	NIL	NIL
IV	1-2	0.06-0.49	6.44-10.5	1	0.11	2.97	5.19
IIITOP	1-5	0.08-0.036	8.0-29.8	NIL	NIL	NIL	12.7
IIIBOT	NIL	NIL	NIL	NIL	NIL	NIL	NIL
IIBOT	NIL	NIL	NIL	NIL	NIL	NIL	NIL
II	4	0.97	15.3	1	0.35	5.52	20.8
III+II	1-11	0.16-2.05	8.65-11.41	1-3	0.20-1.21	2.27-10.47	16.8
I TOP	1-5	0.25-1.07	6.44-21.3	NIL	NIL	NIL	10.1
I MID	3-8	1.23-1.54	16.6-26.6	NIL	NIL	NIL	18.4
IM+IB	3-18	0.74-3.81	6.1-24.5	NIL-3	NIL-0.24	NIL-2.01	19.1
I BOT	1-11	0.11-2.04	1.18-21.1	1	0.1	1.12	13.4
IT+IM+IB	3-23	0.74-4.18	6.19-24.5	1-3	0.18-0.36	1-1.91	20.7
Quarry- 2 West							
IVD	3	0.46	20.54	NIL	NIL	NIL	20.54
IVC	1	0.2	10.1	NIL	NIL	NIL	10.1
IVB	NIL	NIL	NIL	NIL	NIL	NIL	NIL
IVA	1	0.2	20.9	NIL	NIL	NIL	20.87
IV	1-5	0.2-1.1	4.31-17.6	1	0.08	1.3	12.97
III +II	2-11	0.7-1.9	5.77-19.8	1-3	0.12-1.21	1.1-10.0	17.5
I TOP	1-5	0.2-1.4	6.44-33.3	NIL	NIL	NIL	16.46
I MID	3-9	0.7-2.8	11.5-38.0	1	0.03-0.1	0.4-1.7	27.83

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Parameters			Details				
I BOT	3-10	0.6-2.3	6.52-21.0	1	0.16	2.5	16.51

NB - There are no dirt bands > 1m in the proposed Magadh OCP.

Sequence of coal seam and parting

The sequence of coal seams and partings as established in Magadh OCP (Quarry 1 & Quarry 2) & Magadh , Tandwa ,Dumargarh, Karimati Geological blocks are summarised in Table No -10

Table No -10

Sequence of Coal Seams and Parting in Quarry-1

Particulars	Thickness Range(in Metre)				Thickness Range (Metre)			
		In the Block		Quarry - 1 East		In the Block		Quarry - 1West
Seams	Parting	In the Block	Avg Range		Seams Parting	In the Block	General range	
V Top		0.47-6.22	1.5-6.0					
	Parting	0.-11.35						
V Bot		0.40-2.0	0.5-1.75					
V		5.50-7.36	6-7			6.14-6.90	6-7	
	Parting	94.10-111.68			Parting	87.67-104.26		
IV		2.16-5.52	3-5	3.0-4.70	IV	0.58-3..95	1.75-2.75	1.37-2.36
-	Parting	3.60-27.22		4.30-27.22	Parting*	5.18-28.20		5.18-25.75
III		2.20-9.92	4-7	3.59-6.25	III	3.80-6.91	5-6	3.80-5.61
III+II T		10.46-14.65	11-13		IIIT	0.93-2.42	1.25-2.0	1.25-2.42
					Parting**	0-7.34		0.-7.34

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Parameters				Details				
					III BOT	1.40-2.73	1.5-2.5	1.40-2.73
	Parting	0-39.98		3.05-36.21	Parting***	0-10.82		0-10.82
II TOP		0.37-6.70	1-3	0.40-5.80	IITOP	3.97-7.18	5.5-6.5	3.97-6.56
	Parting	1.22-19.19		1.22-19.19	Parting	0-4.43		0-3.32
II BOT		0.22-2.87	0.6-1.5	0.22-1.14	II BOT	0.64-2.32	1-2	0.64-2.32
					III+IIT	10.10-11.15	10.5	10.1
					III+II	13.59-15.52	14-15	13.59
					III B+II	8.05-12.49	9-12	8.09--10.22
					II	7.64-8.74	7.5-8.5	7.64-8.74
	Parting	0.78-7.35		0.78-5.05	Parting #	1.68-5.66		1.74--5.66
I Top		1.98-8.32		1.98-8.32	I Top	1.70-4.76	3-4	1.70-3.83
	Parting			1.15-6.79	Parting	0.84-5.78		0.84-5.78
I Middle		1.54-10.29	3-6	1.54-5.80	I Middle	1.02-7.99	4-6	1.02-5.97
	Parting	0.50-17.41		0.50-8.96	Parting	0.62-4.27		0.62-4.27
I Bottom		3.85-11.79	5-9	3.85-11.79	I Bottom	5.98-11.60	7-9	6.93-11.60

Sequence of Coal Seams and Parting in Quarry-2

Thickness Range (Metre)		Thickness Range (Metre)	Avg Range

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Parameters				Details			
Seams	In the Block Dumargarh	Quarry-2 East	Avg Range	Seams	In the Block Krimati	Quarry-2 west	Avg Range
V Top	10.81-17.83		10-15	V Top	7.62-15.70		10-11
Parting	3.12-6.44			Parting	3.20 -16.40		
V Bot	1.05--2.96		1-2	V Bot	0.46-3.97		0.5-1.2
Parting	42.68-87.55			Parting	56.26-70.43		
IVD	0.60-5.20	2.53-3.0	1-3	IVD	0.79-3.91	2.24	2-3
Parting	1.16-6.75	2.41-3.16		Parting	1.97-6.0	3.4	
IVC	0.40-2.81	0.4-1.21	1-1.5	IVC	0.96-2.05	1.58	1-1.5
Parting	6.73-29.95	19.78-21.09		Parting	10.72-14.06	11.48	
IVB	0.27-2.54	0.27-1.23	0.5-1.5	IVB	0.79-2.27	0.8-2.27	0.5-1.5
Parting	3.60-32.71	8.6-17.07		Parting	2.61-15.58	20.47-26.95	
IVA	0-1.33	0.21-0.82	0.3-0.6	IVA	0.24-1.19	0.26-1.15	
Parting	1.06-12.86	1.06-10.6		Parting	4.85-9.38	4.85-9.38	
IV	1.71-4.69	2.52-4.69	2-4	IV	4.64-7.14	4.64-7.14	5-6
Parting*	3.77-25.42	3.77-23.5		Parting		2.61-10.84	
III T	0.19-2.91	0.31-2.42	1				
Parting	2.34-16.19	2.89-9.94					
III BOT	1.32-3.70	1.32-1.4	2-3				
***Parting	1-6.29	2.61					
II T	3.98-8.96	6.03	6-7				
Parting	1-3.55	2.61					

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Parameters			Details				
II BOT	0.99-2.94	1.21	1-2				
III'+II'	6.34-8.35	8.81-13.09	8	III +II	7.26-14.09	7.26-13.72	10-12
Parting #	1.86-8.55	2.24-5.66		Parting #	0.91-8.97	2.0-4.23	
I Top	2.88-7.16	2.88-5.02	3-5		2.56-6.13	2.56-4.65	3-5
Parting	1.0 -3.81	1.92-3.3			0.80-4.12	0.8-4.12	
I Middle	5.07-8.17	5.07-7.7	6-7	19.78-21.09	4.21-7.26	4.65-7.26	5-6
I T+I M	10.36-11.98	10.89-11.98	11-12				
Parting	1-2.95	1.11-2.39		Parting	0.53-4.38	1.21-4.38	
IMid+ IBot	8.30-19.33	11.95-18.84	15-18				
I Bottom	4.45-10.86	5.14-10.86	7-9	I Bottom	4.18-14.10	4.18-11.78	8-10
IT+IM+IB	14.29	14.29					

*Also includes parting between IV and III (comb)/III+II(com) /III + II Top.

**Also includes parting between III Top and III Bottom + II Com./ III and II (com) .

***Also includes parting between III (Com) and II (com) and III Bottom and II Top / II (com) .

.@ Also includes parting between II Bottom and III + II Top (com).

Strike and Dip:

The strike of the formations in the Magadh and Tandwa Blocks are roughly NE-SW which swings to ENE -WSW in the eastern part in the Magadh block.The srike in the Dumargarh WNW-ESE& in Karimati Blocks is E-W with local variations. The dip of the formation generally varies from 4^0 to 9^0 towards south in Magadh block and 3^0-7^0 in Tandwa Block. The dip in Dumargarh Block varies from 3^0-12^0 (avg 8 ^{0})in Karimti Block varies from 8^0-15^0 (avg 11 ^{0})The local variations in the dip and strike observed in the block is mainly due to rolls and increase and decrease in the intervening partings between the seams.

Faults :

Both Magadh and Tandwa blocks are characterised by a simple geological

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	Parameters	Details
	structure. Magadh block has been intersected by two faults (F1 & F2)and the Tandwa block is free from faults. The fault F1 forms the eastern boundary of the Magadh block is a major fault trending WNW -ESE having maximum throw of about 120 m The fault is responsible for bringing Barakar in juxtaposition with Barren Measures in the down dip side of Magadh block , the other fault F2 is a small oblique fault trending NNE-SSW having a throw of 7 m towards west . The fault is located in the north western part of the block. The Dumargarh block is also less disturbed from geological point of view. Altogether 3 faults have been interpreted. F1 located in the in the southern boundary trends E-W has a throw of 50 -60 m towards north The fault F2 located in the in the southern eastern corner having NW-SE trends has a throw up to 10 m towards north. The fault F3 located in the in the central part s has a throw of 7-25m The fault F1 & F2 continues in Karimati, However, the fault F2 of Dumargarh has been nomenclature as F3. The other additional fault F2 of Karimati is located in the central part having a throw of 25 m towards north.	
2.2.3	Geological Block Area " Ha"	3000
2.2.4	Status of Exploration of the block	Some additional boreholes shall be required for proving the incrops in Karimati. Provision of additional 3000 m has been made in the project report for proving of incrops and the additional 30 % for indicated reserve falling in dip side of the quarry in Karimati block which could not be taken up due to non-approachability in the forest area .
2.2.5	Area covered by 'detailed' exploration within the block (sq. km)	24.74
2.2.6	Whether entire lease area has been covered by 'detailed' exploration.	No
2.2.7	No. of boreholes drilled within the block	Total of 228 boreholes have been drilled in the blocks covered by geological blocks of Magadh OC - 109 in Magadh , 65 in Tandwa , 32 in Dumargarh and 22 in Karimati blocks.
2.2.8	Whether any further exploration/study is required or suggested and time frame in which it is to be completed	NA
2.2.10	Overall borehole density within the block (no./ sq. km) approx	9
2.2.11	No of Seams available as per GR (Geological Report)	Top to Bottom IV III (comb) III (B) II + III (B)

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	Parameters	Details
		III + II (T) II (T) + II (B) II (T) II (B) I (T) I (M) I (B+M+T) I (B)
2.2.12	Seams not considered for Mining with Reasons	Seam V because Seam V having thickness of 4 to 5 m lies with a parting of around 100 m has not been considered in Magadh OCP.
2.2.13	Dip of the Seam	7 degree to 12 degree
2.2.14	Seam wise thickness	

Sl. No.	Particulars	Unit	Quarry-I		Quarry-II	
			West	East	East	West
I.	Thickness of Coal Seams					
1	I (B)	m	9.0	7.0	7.5	7.5
2	I (B + M +T)	m			14	
3	I (M)	m	3.5	3.8	6.0	5.5
4	I (T)	m	3.0	5.0	4.0	3.5
5	II (B)	m	1.5	1.0	1.2	-
6	II (T)	m	5.0	3	6.0	-
7	II (T) + II (B)	m	8.0	-	-	-
8	III + II (T)	m	10.0	-	-	-
9	II + III (B)	m	9.0	-	9.0	10
10	III (B)	m	-	-	1.5	-
11	III (Comb.)	m	5.0	5.0-	3.0	
12	IV	m	2.0	4.0	3.5	5.5

2.2.15	Methodology of reserves estimation (also mention if any software package has been used).	Total Excavation method – Total volume of a mine within defined boundary is calculated by total iso-excavation lines as mentioned in total excavation plan of project report. Volume of coal is calculated from isochore plans of coal seams considered for mining. The difference between volume of total excavation and volume of coal gives volume of OB. Sector wise and seam wise/parting wise volumes within mine boundary of both coal & OB are calculated from isochore plan for coal seam & iso-parting

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	Parameters	Details
		plans of overburden/inter-burden. The results of these calculations are compared with the result of total excavation method. Further, these results are also compared with results of sector-wise volume calculated by cross-sectional method. The reserves have been cross checked, later using MINEX software.
2.2.16	Average GCV "KCal/kg"	4064
2.2.17	Gross Geological Reserve of the block "Mte"	1069.53
2.2.18	Net Geological Reserve of the block "Mte"	962.58
2.2.19	Minable Reserve of the block "Mte"	351
2.2.20	Blocked Reserve "Mte	106.95
2.2.21	Corresponding extractable reserve of the block "Mte"	351
2.2.22	Percentage of Extraction	36%
2.2.23	Reserve already depleted (Base date of Mining Plan)	13.75
2.2.24	Balance Reserve (as on Base Date)	337.25(April 2020)

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	Parameters	*Details*
3.1	**MINING METHOD**	
3.1.1	Existing method of mining if the mine is under operation	
3.1.2	Proposed method of mining with justification on suitability of method of mining	**Rated Capacity** The Expansion Project Report for Magadh OCP has been prepared for a rated capacity of 20.0 MTY(12MTY to 20MTY-incremental 8 MTY). of ROM coal. The rated capacity of 20.0 MTY of coal has been found technically feasible from this mine because of its favourable geo-mining parameters like long strike length (about 9.0 Km.) of the quarry, flat gradient of the seams (about 1 in 10),deployment of higher size equipment, free from major geological disturbances, sufficient mineable reserves etc. **Design Criteria** The following design criteria have been adopted for the mining operations: No. of annual working days - 330 No. of daily shifts - 3 Duration of each shift - 8 hours The opencast mine would be worked on 3 shifts/ day and seven days/week round the year. **Boundaries of the Mining Block** In this, four geological blocks namely Magadh, Tandwa, Dumargarh, Karimati have been considered for exploitation in the name of Magadh OCP.The total strike length of all the four blocks together will be about 9.0 Km. The entire property along the strike direction has been envisaged to be divided into two quarries i.e. Quarry-1 and Quarry-2. Quarry –1, will include Magadh block and Tandwa block and this quarry will be worked first followed by Quarry-2, which includes Dumargarh and Karimati blocks.

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	Parameters	Details
		Quarry-1 with a total strike length of 5.10 Km will be worked into two sections i.e. west (2.1 Km) and east (3.0 Km) section. Both the sections will be worked simultaneously with west section working ahead of east section working. Quarry-2, with a total strike length of 3.90 Km will also be worked in two sections i.e. east (1.9 Km) and west (2.0 Km) section. Both the sections will be worked simultaneously with east section working ahead of west section working. The **northern floor boundary** of the proposed quarry has been fixed along the incrop of seam-I bottom in both quarry-1 and quarry-2 except in the western section of quarry-1 where **northern surface boundary** has been fixed leaving a surface barrier of 100m from the Ara village in order to avoid the rehabilitation of this village.The **eastern floor boundary** has been fixed along fault F1 (Saradhu fault) having a throw of about 150m. The **western floor boundary** has been fixed leaving a surface barrier of 100m from Bhityahi nalla .The **Southern floor boundary** has been fixed along the FRL of 370-385m (on Seam -IB floor), corresponding to a maximum depth of 100-110m. More reserves are available in further dip side of the southern boundary and these reserves may be exploited in Phase-II. No external dumping/surface infrastructure will be formed/constructed in the dip side. In this PR, it has been considered that the Ara village, located beyond the northern surface boundary of quarry no.1, will not be rehabilitated because CCL is facing a lot of difficulties in village rehabilitation process. This village will be surrounded by quarry and other mine infrastructure. So all out effort should be made to rehabilitate this village and the rehabilitation will result in the release of about 2.6M.tes of incrop coal at a stripping ratio of 2.26m^3/te. This coal may be exploited at a later date after rehabilitation. However, this reserve has not been considered in the Project Report. The mineable reserves, volume of OBR and S.R (as per PR). are

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Parameters	Details

as follows :

Depth (m)	Strike Length (Km)	Coal (M.tes)	OBR (Mm^3)	S.R.. (M^3/te.)
100-110	9.0	351.00	529.12	1.51

More reserves are available in further dip side of the southern boundary. The dip side mine boundaries can be extended to exploit the dip side reserves as phase-II. No external dumping/surface infrastructure will be formed/constructed in the dip side.

Geological and Mining Characteristics

The geological & mining characteristics of the proposed Magadh opencast (20.0 MTY) mine are given. A total no. of 11 coal seams is occurring within the above quarriable area. Out of these, Seam-I bottom, seam-II(T) + II (B) Combined, seam-III + II (T) combined and seam-II + III (B) combined are the thickest and most prominent seams The coal seams are dipping at a gradient of 1 in 8 to 1 in 10 towards the south.

MINING AND GEOLOGICAL CHARACTERISTICS

Sl. No.	Particulars	Unit	Quarry-I		Quarry-II	
			West	East	East	West
I.	**Thickness of Coal Seams**					
1	I (B)	m	9.0	7.0	7.5	7.5
2	I (B + M +T)	m			14	
3	I (M)	m	3.5	3.8	6.0	5.5
4	I (T)	m	3.0	5.0	4.0	3.5
5	II (B)	m	1.5	1.0	1.2	-
6	II (T)	m	5.0	3	6.0	-
7	II (T) + II (B)	m	8.0	-	-	-
8	III + II (T)	m	10.0	-	-	-
9	II + III (B)	m	9.0	-	9.0	10
10	III (B)	m	-	-	1.5	-
11	III (Comb.)	m	5.0	5.0-	3.0	
12	IV	m	2.0	4.0	3.5	5.5
II,	**Thickness of OB & Parting**					

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Parameters	Details					
1	Top OB	m	10.0-50.0	10.0-55.0	10-40	10-40
2	Part. bet.I (B) & I(M)	m	1-4	1-9	1-2	1-4
3	Part. bet.I (M) & I (T)	m	1-6	1-7	2-3	1-4
4	Part. bet.I (T) & II (B)	m	2-6	1-5	2-5	2-4
5	Part. bet. II (B) & II (T)	m	2.0	2-19	2.6	
6	Part. bet. II (T) & III (Comb.)	m	6.0	3-36	3.0	
7	Part. bet. III (Comb.) & IV	m	5-25	4-27	3-23	3-11
III	**Quarry Parameters**					
1	Dip of the seams		7^0	7^0	8^0	12^0
2	Strike length	Km	2.1	3.0	1.9	2.0
3	Width	Km	1.4	1.0	1.3	1.2
4	Maximum depth	m	110	110	100	100
5	Area of Excavation	Ha.	274	360	310	236

The strike length of the proposed Magadh OCP is about 9 Km. and the quarry is envisaged to work in two quarries i.e. quarry-1 and quarry-2. Quarry-1 will be worked first followed by Quarry-2. The Mining and Geological characteristics and the mineable reserves as mentioned earlier have been shown quarry wise and section wise.

Quarry-1 is envisaged to open first inspite of the SR being higher than that of quarry-2

It is proposed to make and initial box cut in the western section of quarry-1 because of the following reasons :

(a) The stripping ratio of western section (1.50 m^3/te.) is less as compared to that of eastern section (1.82m^3/te.).

(b) About 5 Km length of Pindarkalkal nala is to be diverted initially in the eastern section before making any excavation.

(c) No requirement of forest land during the initial period.

Mining System

The mining and geological conditions of the mine are as follows :

(a) Multiple seams to be worked.

(b) Moderately flat gradient of 7° - 8° of the coal seams.

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	Parameters	Details
		(c) Variable thickness of OB/partings.

Considering the above mining and geological conditions, shovel-dumper mining system has been envisaged for working this OC mine. The following variants of shovel- dumper combination has been considered to work this mine.

OB Removal

Over burden & inter-burden have been proposed to be outsourced and hence HEMM for OB removal have not been provided in this PR.

The coal and intervening parting benches would be formed parallel to the coal seams and will be mined by inclined slicing method. The top O.B. benches will be formed horizontally along particular horizons of 15m thick and will be mined by horizontal slicing method. However the O.B. benches immediately above the roof of the top most seams will be formed parallel to the coal seam roof to avoid the formation of triangular rib of O.B. which is likely to mix up with the coal after blasting. The maximum top OB bench height will be maintained at 15m and coal and intervening parting bench height at 10-15m.

Coal Winning

Loading and transportation of coal using machines, blast hole drilling in coal and face preparation have been proposed to be outsourced and hence HEMM for coal winning have not been provided in this PR. However, common equipment such as grader, water sprinkler, crane etc. are considered in this project. Further it is proposed to carry out a detail exercise to decide the mode of coal winning compatible with the calendar programme of OB removal

Some major system parameters are given below :-

1.	Maximum Bench Height For
	O.B - 15m.

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Parameters	Details
	Coal and intervening parting - 10-15 m.
	2. Width of the permanent haul road - 30 m.
	3. Width of the temporary transport ramp - 20 m.
	4. Usual height of the spoil dump bench - 30 m.
	5. The width of the active dump bench - 60 m.
	6. Bench Slope (working)
	O.B. bench - 70^0 Coal bench - 70^0
	Dump bench - 37^0
	7. Overall pit slope (for 150-160m depth) - 42^0
	Application of Dragline
	The deposit is characterized by thin multiple coal seams/sections dipping at a gradient of 4 -9^0. These coal seams are I Bottom (7-9m), I Middle (3.5-5m), I Top (3.5-4m), II Bottom (1m), II Top (2.5m), III (5-5.5m) and IV (2-4m). The intervening partings between these coal seams are also thin. Parting between IB & IM ranges in thickness between 2-3 m, parting between IM & IT average 3m, parting between IT & IIB ranges in thickness from 3-4m, parting between IIB & IIT varies from 2-10m. The dragline application has been studied and it appears feasible to deploy 1 no. of 24M^3 /96m dragline in the eastern section (Magadh sector) of quarry-I. It wiil be possible to deploye the same in the parting between seam-II(T) & III and also parting between seam-III & IV. However, dragline can not be deployed in the entire strike length of 9.0 Km of the Magadh OCP. It can handle about 2.7 Mm^3 of OBR out of the total volume of OBR of 19.82 Mm^3.Hence, the deployment of dragline has not been considered.
	Calendar Programme of Excavation
	The summarised Calendar Programme of Excavation(for Balance Coal and OB as on April 2020) is given below which has been formulated based on the adopted sequence of opencast mine field development at optimum conditions of mining operations for the

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	Parameters	Details

entire life of Magadh opencast mine.

The total mineable reserves has been estimated as 337.25 M.tes corresponding to a volume of OBR of 501.41 Mm^3 at an average stripping ratio of 1.49 m^3/te. The rated output of 20.0 MTY would be achieved in 4th year of the quarry operation.

The calendar programme of excavation has been formulated based on the requirement of the linked power plant of NK STPP of NTPC & projections by Working group Xth Plan document that had indicated the demand of non-coking coal for the XI Plan as 580 Mt and indigenous supply of non-coking coal from CIL as 445 Mt.

Summarized calendar Programme of Excavation(As on April 2020)

YEAR	OBR (Mm^3)	COAL (M.tes)	SR (m^3/te)\
1	8.72	4.50	1.94
2	12.85	9.00	1.43
3	20.57	17.00	1.21
4	28.57	20.00	1.43
5	31.55	20.00	1.58
6	31.94	20.00	1.60
7	33.75	20.00	1.69
8	32.74	20.00	1.64
9	33.39	20.00	1.67
10	31.29	20.00	1.56
11	30.92	20.00	1.55
12	27.49	20.00	1.37
13	28.92	20.00	1.45
14	30.97	20.00	1.55
15	27.41	20.00	1.37
16	28.26	20.00	1.41
17	29.07	20.00	1.45
18	15.96	11.00	1.45
19	4.76	4.94	1.47
20	4.76	4.94	1.47
21	4.76	4.94	1.47
22	2.76	0.94	1.47

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	Parameters	Details
		TOTAL 501.41 337.25 1.49 The stage-wise volumes adopted in the calendar programme is for maximum bench height of 15m in coal bench and 15 m in OB bench. It is very essential that sequence of mining and dumping of overburden shall be executed as per Calendar programme of excavation and dumping plan respectively. Since both OB removal & coal winning has been proposed for outsourcing, bench height & width in coal can be adjusted as per specifications of hired HEMM/equipment and stipulations of DGMS permissions **Drilling & Blasting** Drilling and blasting would be required both in OB and coal benches before excavation by shovels. The ground vibration due to blasting can be controlled by :- i) reducing the amount of explosives charged per delay ii) reducing spacing and burden of blast holes, iii) reducing the amount of explosives charged per blast, iv) proper strata movement during blast by using suitable initiating sequence. Since above parameters are site specific, the exact blasting pattern will be designed after conducting field trials. **Proposed HEMM** Departmental HEMM have been provided as for reclamation work only. **O.B. Dumps** The total volume of OBR is estimated as 501.41 M cum.
3.1.3	Coal production capacity proposed "Mtpa"	20.0 Mtpa
3.1.4	Justification for optimization Coal production capacity	The rated capacity of 20.0 MTY of coal has been found technically feasible from this mine because of its favourable geo-mining

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	Parameters	Details
		parameters like long strike length (about 9.0 Km.) of the quarry, flat gradient of the seams (about 1 in 10), deployment of higher size equipment, free from major geological disturbances, sufficient mineable reserves etc.
3.1.5	Calendar year from which the production will start	Already started
3.1.6	Year of Achieving rated production	Fourth Year
3.1.7	Tentative Coal Production Plan "MT"	

YEAR	OBR (M.cu)	COAL (M.tes)	SR (m^3/te)
1	8.72	4.50	1.94
2	12.85	9.00	1.43
3	20.57	17.00	1.21
4	28.57	20.00	1.43
5	31.55	20.00	1.58
6	31.94	20.00	1.60
7	33.75	20.00	1.69
8	32.74	20.00	1.64
9	33.39	20.00	1.67
10	31.29	20.00	1.56
11	30.92	20.00	1.55
12	27.49	20.00	1.37
13	28.92	20.00	1.45
14	30.97	20.00	1.55
15	27.41	20.00	1.37
16	28.26	20.00	1.41
17	29.07	20.00	1.45
18	15.96	11.00	1.45
19	4.76	4.94	1.47
20	4.76	4.94	1.47
21	4.76	4.94	1.47
22	2.76	0.94	1.47
TOTAL	501.41	337.25	1.49

3.1.8	**Rated Capacity "Mtpa"**		
	-	By OC	20 Mtpa
	-	By UG	-
	-	Overall	20 Mtpa
3.1.9	**Life of the mine: "Years"**		
	-	By OC	22

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	Parameters	Details
	- By UG	-
	- Overall	22
3.1.10	Whether the proposed external OB dump site is coal/ lignite bearing: If so, whether coal/lignite below waste disposal area is extractable.	NA
3.1.11	Whether negative proving for coal / lignite in the proposed site for OB dump/ infrastructure has been done.	NA
3.1.12	Results of any investigation carried out for scientific mining, conservation of minerals and protection of environment; future proposals.	NA

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	Parameters	Details
4.1	**Safety Management**	
4.1.1	**Important safety aspects:** Major Risks and uncertainties to the project viz. Proximity to river, adjacent working, geo-mining disturbances, slope stability and remedial measures suggested. It should also include proposed overall slope of the quarry and OB dump, dump height, strata control, fire and spontaneous heating, gas monitoring, disaster management, danger from inrush of water etc.	Safety of men and machine deployed in the mining area should be properly taken care of irrespective of whether the mining activities are performed by departmental or by outsourcing option. All the regulations & schedules of Coal Mines Regulations 2017 relating to mining in general and opencast mining in particular have to be adhered to and implemented in order to maintain day to day safety as per stature. **SAFETY ASPECTS FOR OF HEMM / EQUIPMENT** Special precaution should be taken while deploying workers in the mine. Before employing any person to the mine proper vocation training should be imparted and recommendations of various Safety Conferences should be strictly followed. Some of the major aspects are as follows:- A) For persons: i) No persons shall be deployed unless he is trained at VTC and holds VTC Certificates. A record of the same shall be maintained. ii) Records in Form-B and Form-D shall be maintained. iii) Records of driving license of operators shall be kept by competent authority and shall be made readily available for inspection by management. iv) Adequate supervision shall be maintained by competent persons, including officials and technicians. B) For Machineries: Provisions of Regulation 109, 110, 216 & 217 of CMR 2017 and DGMS Cir. (Tech.) 1 of 1999 should be strictly adhered to along with the following: i) All machinery and plant used in connection with working of a mine shall be of good design, sound construction, and suitable material, adequate strength, free from patent defect and properly maintained. ii) The owner, agent and manager shall provide adequate

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Parameters	Details
	training facilities and ensure proper training of persons employed for operation and maintenance of machinery and plant. iii) No person except an engineer or other competent person under his supervision shall undertake any work on machinery and plant in which technical knowledge or experience is required. iv) All the machineries to be deployed in mines shall be so designed as to afford the operator clear and uninterrupted vision all around. v) Every heavy earth moving machineries, including trucks and tippers, used in mine shall be fitted with adequate safety features or devices as specified by DGMS. All equipment shall be provided with audiovisual alarms, proper light for use at night and fitted with suitable type of the fire extinguishers. vi) Truck mounted drill machines designed for tube well drilling for sources of water shall not be used and only proper type of blast hole drill machine, especially designed for mining purpose, shall be used in the mine. vii) Every heavy earth moving machinery shall be under the charge of a competent person (Operator or Driver), authorized in writing by the Manager. viii) All persons employed or to be employed to operate heavy earth moving machinery shall be trained and their competency shall be evaluated by a Board constituted by the management, who shall be persons who are not connected with imparting of training. ix) A proper record of repair and maintenance along with inspection done by competent authority and defect pointed out shall be maintained and signed by authorized person. x) Only such fitters or mechanics possessing driver's or operator's license, shall be allowed to carry out test-run of heavy earth moving machineries. xi) No person other than the operator or the driver or any person so authorised in writing by the manager shall be allowed to ride on a heavy earth moving machinery

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	Parameters	Details
		C) General: i) Every person shall strictly adhere to the provisions of the Act and of the rules and regulations and to any order or direction issued by the manager or an official with a view to the safety or convenience of persons not being inconsistent with the Act, rules and these regulations; nor shall he neglect or refuse to obey such orders or directions. ii) Every person shall, immediately before proceeding to work and immediately after terminating work at the end of his shift have his name recorded in the appropriate register. iii) Risk Management Plan of tipper/pay loader shall be made and implemented. iv) All operators/drivers so authorised by the Manager shall observe the Regulation 62 and 63 of CMR 2017 and obey the systematic traffics rules prepared by management v) Before deploying workers, they must be trained and briefed about safety aspects in opencast mine. However, during course of execution of the work, if any accident occurs whether major or minor, the matter shall have to be immediately informed to mine management i.e. Colliery Manager/Agent/GM of Area so that Notices of accidents in a accordance of (Reg. 8 of CMR 2017) and Section 23 of The Mines Act 1952 may be given and other necessary steps may be taken in accordance with the Mines Act 1952. vi) Mine authority shall operate transport system in such a way so as to minimize pollution in the mine. **STABILITY OF BENCHES, QUARRY HIGHWALLS AND SPOIL DUMPS** During quarry operations, it is necessary to adopt required mining parameters for the stability of benches, highwalls and spoil dumps. It is also mandatory to examine systematically the fencing of mine workings, landslides and cracks between benches. It is required to maintain well-graded and wide roads on benches keeping the width of working areas sufficient for spreading of blasted rock and movement of the mining and transport equipment.

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Parameters	Details
	During actual mining operation, systematic observations of the condition of benches, high wall slopes and spoil dumps should be carried out and the dimensions be modified if necessary to suit the local conditions. To ascertain the optimum slope angles for stability of quarry benches, highwalls and spoil dumps, scientific study of slope stability along with hydro-geological study of the area needs to under taken.During actual mining operation, systematic observations of the condition of benches, high wall slopes and spoil dumps should be carried out and the dimensions be modified if necessary to suit the local conditions. Provisions laid down in Reg. 106 and 108 of the Coal Mines regulation 2017 shall be strictly adhered to for the safety of quarry and OB/ spoil dumps. In addition to this, the following precaution should be considered: i) The spoil dump height should not exceed 90m from immediate surface level with an overall slope of 28^0 or less. In the event of encountering steep floor gradient, floor blasting should be done and the area properly levelled by dozer before spoil dumping. ii) No working or construction should be allowed within the 60m toe of the OB dump. iii) Before dumping the OB on the floor of seam, at least 10m length all along the strike length should be made horizontal at every 50 meter by floor dinting/blasting. iv) Dump should be created in such a way that there is no chance of accumulation of water in and around the base of dump as it will adversely affect the shear strength of the base material of dump. It must be ensured that there is no stagnant water at the toe of dump and the top of the dump. v) The toe and face of the dump should not be eroded or cut at any point of time to avoid slope failure. A suitable toe wall should be created along the dump periphery. vi) Formation of dumping should be done in square or circular or any regular shape as far as possible. vii) Proper drainage system should be provided to bring down rain water by construction of inclined drain on dump face

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	Parameters	Details
		and catch drain on all benches. viii) During active period of dump, all rain water should be diverted away from mining site as far as possible. ix) Sump and pumping capacity should be sufficient to accommodate peak surface run-off and seepage of water. x) Gabion wall and garland drain should be constructed and maintained to trap the surface run-off and sludge coming from dump. xi) Plantation and grassing should be done on top and slope of the dump respectively. xii) Regular monitoring is required for development of tension crack, gullies, movement of soil mass, stagnation of water and any other unusual occurrence. In case of dump movement, rate of movement of dump should be monitored. Special attention should be given at curve area/turning area of the dump. **PRECAUTIONS AGAINST DANGER OF INUNDATION FROM SURFACE WATER** 1) Adequate protection against any danger of inrush of surface water into the mine or part shall be provided and maintained to the satisfaction of DGMS, whose decision shall be final. 2) The entrance into the mine shall be so designed, constructed and maintained that its lowest point (which means the point at which a body of rising water on surface can enter the mine) shall be not less than 3.0 meters above the highest flood level at that point. 3) Every year, during the rains constant watch shall be kept on the flood levels on the surface of the mine and if at any time the levels cross the highest levels earlier recorded, such levels shall be marked by permanent posts along the edges of water and the new highest levels thus observed shall be recorded with the date as the highest flood level on the plans by an actual survey. 4) If water dams or reservoirs are built across rivers and water courses on the upstream side of the mine, arrangements

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Parameters	Details
	shall be made for communication between appropriate authorities for the purpose of ascertaining the quantity and timing of water released from the dams which is likely to endanger safety of the mine and arrangement for similar communication shall be made when water level rises on the upstream side which is likely to endanger the mine. 5) The highest flood levels and danger levels at least 1.2 meters below the highest flood level, shall be permanently marked at appropriate places on the surface and whenever water rises towards the danger level at any place, all persons shall be withdrawn from the mine sufficiently in advance and for this purpose adequate arrangements of quick communication to all parts of the mine by effective systems shall be provided and maintained. 6) No working shall be made in the mine at any spot lying within a horizontal distance of 15 meters from either bank of a river or nala. 7) A competent person shall, once at least in every fourteen days during the rainy season and once at least in every thirty days during other periods of the year, examine every protective measure provided under regulations 149, whether in use or not, for their stability, and a report of every such examination shall be recorded. The protective measures and workings shall also be inspected, once at least in every quarter by the Manager personally. 8) A careful assessment is to be made against the danger from surface water before the onset of rainy season. The necessary precautions should be clearly laid down and implemented. A garland drain needs to be provided to drain away the surface rainwater from coming into the mine. 9) An embankment, 3.0m above the HFL along the River and nala should be made. Inspections for any accumulation of rainwater, obstruction in normal drainage and weakening in the embankment should be made. 10) Standing order for withdrawal of working persons in case of apprehended danger. During heavy rain inspection of vulnerable points is essential. In case of any danger

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	Parameters	Details
		persons are to be withdrawn to safer places.

PROTECTION OF EQUIPMENT DEPLOYED AT BOTTOM HORIZONS FROM FLOODING:

During the heavy monsoon period, the mining operation in the lower-most bench may have to be stopped. Therefore, it is proposed to drown the lower-most bench, which would work as a sump. The water will be pumped out and discharged into the nearby nala/ river after proper sedimentation.

For ensuring safety of the equipment while working out bottom horizons with no access to surface profile, the following measures should be taken:

1) Drivage of initial trenches if any and coal cutting on bottom benches should be done during the dry period of the year.
2) Ramps should be made for quick shifting of equipment from bottom horizons, liable to be flooded during monsoon period, to the top horizons.

PREVENTION OF ELECTRIC SHOCKS:

During mining operations, all the statutory provisions of the Indian Electricity Rules 1956, and Indian Standards for installation and maintenance of electrical equipment etc. should be observed.

1) For protection from electric shocks to persons, all electrical equipment with voltage up to 1000V should be provided with Earth Leakage Relay, which will automatically disconnect electrical circuits.
2) Closed mobile substations and switchgears should be mechanically interlocked which exclude the possibility of opening the door when oil switch and air circuit breakers are in operation.
3) All metal parts of electrical equipment should be properly earthed to avoid failure of insulation.
4) All H.T lines and cables located within the blasting zones should be disconnected during charging & blasting

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	Parameters	Details
		operations.
		DUST SUPPRESSION & DILUTION OF EXHAUST FUMES:
		For precaution against dust, Regulation 143, 144 and 145 of CMR 2017 should be observed. Beside this the following measures should be adopted for dust suppression at all quarry working places, dumps, haul roads, CHP and near other auxiliary mining operations.
		1) Spraying with water on all working faces & haul roads, by special spraying machines or water-sprinkler.
		2) While drilling holes, it is necessary to use dust extraction devices.
		3) Installation of local dust suppression and air conditioning devices in cabins of excavators and drilling rigs may be considered.
		4) Leveling of spoil dump surface.
		5) Separate dust suppression arrangement should be provided for CHP.
		To prevent collection of harmful mixtures in the atmosphere, from the different sections of quarry workings, it is recommended: -
		To spread out the sources of dust formation and omission of harmful gases throughout the working area of the quarry, the following precautions should be taken:
		1) Drilling & blasting operations should be timed for periods of maximum wind activity during the day.
		2) Dumpers may be provided with purifiers for exhaust gases.
		MEASURES TO BE TAKEN FOR FIRE FIGHTING AND FIRE PREVENTION:
		In addition to statutory provisions as laid down in Reg 135, 139 and 140 of CMR 2017, the measures for firefighting and prevention of fires are as follows:
		1) Organisation of special cell for systematic observations to examine and prevent fire.

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	Parameters	Details
		2) Removal of spillage of coal on benches and cleaning of coal horizons to prevent cases of coal heating. 3) Storage of lubricants and cotton waste in enclosed fireproof containers in working places. 4) Provision of fire extinguishers. **MEASURES TO BE TAKEN WHILE WORKING ABOVE UNDERGROUND GALLERIES:** In addition to provisions laid down in DGMS Circulars (Tech. 2 & 3 of 1980, Tech. 11/1979), the additional measures for extracting pillars by opencast method are as follows: a) Quarry shall be worked by Heavy Earth Moving Machinery only. No manual operation in the quarry will be done. b) HEMMs, except drilling machines shall not be deployed on the bench where thickness of coal or overburden above the UG galleries, as proved by advance boreholes or other suitable methods, is less than 6m. c) Exposed coal faces (including UG galleries shall be kept covered with fine grained incombustible OB material to prevent breathing of air and control fire to dip side working. This cover shall be removed only at the time of coal extraction. d) Overburden containing carbonaceous material shall not be dumped within 30m of the exposed side of the coal benches. Hot overburden shall be quenched and cooled at dump sites. e) No person shall be allowed at any place in the opencast working where the thickness of overburden and/or coal over any gallery is less than 1.5m. f) Except for the purpose of inspection and support work no person shall be allowed in the underground mine beneath and within 200m of the opencast excavation. The person visiting UG will take all safety precautions for safe working. g) Blasting in fire area

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Parameters	Details
	i) No explosive other than slurry and emulsion explosive shall be used. ii) Blasting shall be done with detonating fuse down the hole. Fresh drill holes should be tightly plugged at the mouth. iii) Temperature inside the hole shall be measured by bi-metallic thermocouple heat sensor (before filling with water) and if the temperature exceeds 80oC in any hole, the hole will not be charged. iv) All blast holes shall be kept filled with water. When any hole is traversed by cracks or fissures the hole shall not be charged unless it is lined with an asbestos pipe and the hole filled with water. In addition, bentonite should be used for sealing any cracks at the bottom of the hole. v) Detonating fuse shall not be laid on hot ground without taking suitable precautions. vi) Charging and firing of holes in any one round shall be expeditiously completed and in any case within 2 hours. vii) A parting of at least 2m between the bottom of a short hole and roof of underground gallery shall be left intact. viii) Effective muffling of hot shot holes with old wire rope screens shall be done for prevention of flying hot fragments. ix) No blasting shall be done in crushed or broken ground. x) No person shall be employed within 150m when blasting the heated material. xi) The spacing of hole in the coal/OB benches lying immediately above the galleries shall be so adjusted that the holes do not lie immediately above the galleries in order to ensure that blast holes do not directly fire into the underground working. xii) All holes in the coal/OB benches lying immediately above the galleries shall be charged with water impulses or with moist sand of at least 0.6m in length at the bottom of the hole. xiii) No person including a shot firer shall take shelter within 100m of the quarry opening. Such shelter shall be

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	Parameters	Details
		of an approved design **MEASURES TO BE TAKEN WHILE DRILLING BLASTING:** Following measures should be taken during drilling and blasting operation in the quarry beside the statutory requirements: 1) Drilling and Blasting in quarry should be done in accordance with the provisions of Mines Act, rules and regulations and based on the Standing Orders for the safe use of explosives. 2) Adequate safety measures have to be taken during blasting operation in the quarry so that men/machine are not affected. **CONSERVATION** Suitable measures should be taken to minimize coal loss during mining operations. Selective mining of in-seam dirt bands has been proposed. It is proposed not to dump any spoil material over coal bearing area, amenable for mining, at present or even at a future date. **SCIENTIFIC STUDIES** The slopes of the quarry and dumps have been proposed on the basis of experience in the adjoining areas. However, to ascertain optimum slope angles for stability of quarry batter and dumps a scientific study need be carried out. Similarly, hydro-geological study of the area is to under taken as none is available at present. Studies should also be carried out to ascertain the pattern of surface drainage, the manner of diversion of water courses to other water courses away from the mining area and the dimension of diversion dams, garland drains and other protective structures to be constructed.
4.1.2	A Commitment from the Company Board that entire mining operation will be carried out as per the Statutory provision given under Mines Act 1952, Coal Mine	(To be furnished as a Part of Annexure)

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	Parameters	Details
	Regulation 2017 and & wherever specific permission will be required the company will approach the concerned authorities.	

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	Parameters	*Details*
5.1	Mine infrastructure required e.g. Equipment maintenance planning, Office buildings, Workshop, Power supply arrangement, Water supply etc.	**Buildings** Residential Buildings The manpower requirement for this project is estimated as 467 and 257 houses would be required at 55% housing satisfaction. The total capital expenditure on residential buildings amounts to Rs.905.77 lakhs. It is proposed to construct these houses at the township located at the proposed site in Sheregarha village to the north of the proposed opencast project. Service Buildings Provision has been made in this report for the construction of a GM/P.O. Office, Store, Electrical Sub-station, Magazine and Excavation Workshop suitable for the repair and maintenance of 170T/85T Dumper and other HEMMs deployed in this Project. Other welfare buildings like first aid centre, rest shelter, dispensary, Primary, school, officers' club bank building, post office, shopping centre etc. have also been provided. The total capital expenditure on service buildings amounts to Rs.661.19 lakhs. Roads & Culverts Approach Road to Project There is an existing Kutcha road from Tandwa to Saradhu, which needs to be strengthened and widened. Cost for 17 Km road from Tandwa to Magadh block has been provided. The estimated capital investment for approach road amounting to Rs.901.45 lakhs. Colony Road The length of the colony road inside the township has been estimated as 5.0 Km. Estimated capital investment of Rs.61.80 lakhs for colony roads along with culverts. Haul Road The length of haul road has been estimated as 10 Km. The total estimated capital expenditure on haul road amounts to Rs.2920.17 lakhs.

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Approach Road to Magazine

The estimated capital investment for 3.0 KM long Approach road to Magazine is Rs. 75.66 lakhs.

Approach Road to Colony

The approach road to colony has been estimated as 5Km and the estimated capital expenditure is Rs.264.22 lakhs.

Strengthening and Widening of Piparwar-Tandwa Road

The existing PWD road connecting Piparwar to Tandwa needs strengthening and widening. A lump sum amount has been provided for this. Half of this amount has been charged to Magadh OCP and remaining half has been charged to Amrapali OCP.

Bridges

A lump sum amount of Rs.402 lakhs has been provided for the construction of bridges over river.

No of villages for Rehabilitation					
Sl No	**villages**	**House**	**House-hold**	**% age assumed for rehabilitation**	**Total**
1	Saradhu	569	569	50	285
2	Devalgarha	18	18	100	18
Sub Total-Magadh East OCP;Chatra Dist.*					**303**
3	Chamatu	140	157	50	70
4	Phurbasia	202	206	50	103
5	Ganeshpur	319	333	100	333
6	Ara	189	190	100	189
Sub Total-Magadh West OCP;Latehar Dist.*					**695**
Total PAF		**1437**	**1473**		**998**

***-As informed by CCL**

5.2	Power supply & illumination	The proposed Magadh OCP is located in a green field area. Another new project, Amrapali, will also be located near this block. The maximum power demand for these two opencast projects will be about 40MVA. For meeting this, huge power demand, no immediate source of power supply is available nearby these mining projects. The nearest source of power is DVC's 132/33KV, 2x50 MVA sub-station, which is situated at Piparwar at a distance of about 25 Km from these two projects. But there is also no scope of availability of drawing power to meet

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the integrated demand of 50 MVA (approx.) for these two proposed projects and also other infrastructure.

For over-coming the above stated power supply constraint, it is proposed to establish one no. 132/33KV, 2x50 MVA sub-station, which will be centrally located from the proposed Amrapali and Magadh mining projects and Proposed Regional 33KV switching station , at Magadh & Amrapali . Provision of initial power supply has been made from existing Piparwar 33KV switching station of CCL as there is no other alternative. Hence, the switching station at Piparwar shall have to be extended by two numbers of feeders for drawing power at 33KV by erecting one number of 33KV double circuit overhead transmission line upto Amrapali and Magadh Projects. Power will be received at 33KV by individual through an independent feeder.

The cost involved for construction of the proposed 132/33KV sub- station, Regional 33KV switching station, incoming 132 KV OH line and 33KV overhead transmission line from Piparwar 33KV switching station of CCL and extension of 33KV switching station at Piparwar, will be equally shared by the surrounding projects.

Maximum Demand & Energy Consumption:

The estimated maximum demand and annual energy consumption at optimum production level in OCP after considering power factor improvement by static capacitors and thus :

- Load in operation : 12.03 MW
- Maximum power demand: 7.869 MVA
- Initial power factor : 0.72
- Improved power factor : 0.96

To meet the requirement of power demand of Magadh opencast project, there would be 3 nos. of 33/6.6KV Sub-stations namely Sub-station no.1, Sub-station no.2 & Sub-station no.3. The installed transformer capacity of Sub-station No.1 would be 2x16MVA , The capacity of Sub-station 2 & 3 would be 2x16 MVA and 2x10 MVA respectively .

Power Cost

Based on current DVC tariff, annual power bill would be of the order of Rs. 13.997 Crores for the 10th Year of quarry operation as detailed in table

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Annual Power Bill

Tariff : Rs. 3.20/KWh

Power Consumers	Annual Power Consumption ($KWh \times 10^6$)	KWh per tonne of coal production KWh/te	Power charges per tonne of coal production (Rs.)
Coal	39.88	1.994	6.38
OB			
Common	3.86	0.193	0.62
Total	**43.74**	**2.187**	**7.00**

Power Factor

To maintain a high system power factor of around 0.96 even during maximum demand hours, two sets of 6.6KV capacitors each having a capacity of 2526 KVAR are to be installed in the 6.6KV switch board of sub-station no.1. The capacitor banks shall have the facility to connect and disconnect required number of units depending upon the loading pattern of sub-stations. The capacitor bank shall be provided with automatic control facility.

Illumination

For general illumination high pressure sodium vapour lamps 400W shall be mounted on suitable supports fixed along quarry periphery. The permanent type of illumination in haul road, and inside quarry shall also be done by 400W/250W HPSV lamps. These lights are to be supplied from 230V (L-L) system.

Haul roads from quarry to workshop etc. will also be illuminated by 400/250W HPSV light fittings.

Provision for mobile lighting towers have also been made for illumination in the working of quarry. The tower consists of 4x1000W metal helide fittings with 6KVA DG set mounted on a trolley and a mast of 18m height. The lighting tower can also take power from normal power supply system.

5.3	Drainage & Pumping: Assessment of Volume of Water for Pumping,	The following data has been taken into consideration for arriving at the size of the pumps:- (a) Maximum annual rainfall : 1926.16 mm (b) Maximum rainfall in a day : [illegible]40 mm (c) Expected Life of the mine : 26 years (d) Percentage probability (approx.) : 3.74

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	Pumping Capacity and Pump Selection	(e) Depth of the mine : 110 m (f) Maximum probable rainfall in a day in monsoon period from the probability curve for 3.57% probability : 160 mm (g) Run-off Co-efficient considered: (i) For mined out area = 0.9 (ii) For area beyond excavation = 0.7 (iii) For internal dumped area = 0.4 (h) Inflow of water to the mine due to natural seepage and underground precipitation. 10%of water accumulate-ed in mine. (i) The rainfall data has been adopted as recorded at : : Bachra in N.K Area & I M D , Hazaribagh.

PUMPING CALCULATIONS

Eastern sector :

The calculation has been done taking into consideration the entire area of the mine:-

(a)	Area of Excavation	:	3.370 Sq.Km.(approx)
(b)	Internal dumped area	:	2.314 Sq.Km.(approx)
(c)	Area beyond excavation	:	0.125 Sq.Km.(approx)
(d)	Probable water accumulation on the day of maximum rainfall	:	326032 Cu.m.(approx)
(e)	Adding 10% for seepage and precipitation on total make of water	:	32603 Cu.m.
(f)	Assuming 20 hours, pumping per day pumping capacity required to pump out the total make of water in six days.	:	2989 Cum./hour

SELECTION OF PUMPS :

On the basis of the calculation and providing 50% standby pumping capacity, the following pumps have been provided:-

Eight nos. of 540 Cum./hr.x150m head pumps and four nos. of 300 Cum./hr. x150m head pumps have been selected.

Western Sector :

The calculation has been done taking into consideration the entire area of the mine:-

(a) Area of Excavation : 2.480 Sq.Km.(approx)
(b) Internal dumped area : 1.464 Sq.Km.(approx)
(c) Area beyond excavation: 0.104 Sq.Km.(approx)
(e) Probable water accumulation on the day of maximum rainfall: 251744 Cu.m.(approx)
(f) Adding 10% for seepage and precipitation on total make of water: 25174 Cu.m.
(g) Assuming 20 hours, pumping per day pumping capacity required to pump out the total make of water in six days.
: 2308 Cum./hour

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		SELECTION OF PUMPS On the basis of the calculation and providing 50% standby pumping capacity, the following pumps have been provided: - Six nos. of 540 Cum./hr.x150m head pumps and four nos. of 300 Cum./hr. X 150m head pumps have been selected. Main Pump Eight nos. of 540 Cum./hr.x150m head pumps and four nos. of 300 Cum./hr. x 150m head pumps have been selected for eastern sector and six nos. of 540 Cum./hr.x150m four nos. of 300 Cum./ hr.X 150m head pumps have been provided for western sector to dewater the mine. For initial years of mine operations when the depth of the mine will be low, eight nos. of 300 cum/hr x 100m head and six nos.150cum/hr x 60 m head pumps have also been provided. Diesel Pumps Five 300 cum/hr x 100 m and four nos. of 150 Cum./hr x 60 m head diesel pumps have been provided for emergency requirement. Face Pumps Ten nos. of face Pumps of 50 Cum./ hr.x 45m head have been provided to pump out the water accumulated near the working faces. Slurry Pumps Six nos. of Slurry Pumps of 250 Cum./hr. x 45 m head have been provided to pump out the slurry accumulated near the working faces. Priming Pumps Twelve nos. of 50 cum x 16 m head face pumps have been provided to prime the higher capacity main pumps. SELECTION OF DELIVERY RANGES: The delivery ranges have been selected on the basis of the pumping capacity during probable maximum rainfall and velocity of flow within the reasonable limit. The delivery ranges for different capacity of pumps have been selected as 300 mm, 250mm, 200mm and 150mm, 125mm diameter and for priming and face pumps 100 mm of internal diameters of pipes as per manufacturer's standard.
5.4	Coal	The proposed coal handling system has been envisaged on the surface to handle 20.0

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	Handling Arrangement: Brief detail of the CHP/ Mode of Dispatch, Coal quality and Coal staking and handling arrangement	MTY of ROM Coal. The quality of the coal is of power grade and it will be taken by Tandwa STPS but a substantial quantity will be despatched to other places through railway wagon. The ROM coal shall be crushed down to (-) 50 mm size before it is despatched. **System Capacity :** The system capacity of the coal handling plant has been designed in such a way so that it can cater fluctuations in the coal production within an overall rated production of 20.0 MTY from the mine. Circuit consisting of Primary & Secondary sizers and allied equipment of output capacity of 2500 TPH and collecting conveyor system of 2250 TPH have been envisaged. A set of conveyor have been provided to carry crushed coal. Four such circuits comprising of crushing & conveying of coal have been envisaged so that three circuits will be in operation and one circuit may be kept as stand-by. Storage capacity of the bunker has been kept as 2 x 30,000 Te .Each of these two bunkers will be linked with two sets of conveyors having capacity of 2500 TPH each . The capacity of silo for wagon loading has been kept as 2x4000 Te. System description of CHP as per Project Report : The CHP will have the following functional units as shown in Key Plan Drg. No: RI-III / Mech / 002314. • Receiving • Primary Crushing up to (-) 200 mm • Secondary Crushing up to (-) 50 mm • Storage & reclamation • Rapid loading with SILO • Dust suppression, Extraction, fire-fighting etc. & other Auxiliary facilities. • Belt weighing. **Plant Description:** The necessary control over fragmentation of coal will be exercised in the quarry itself by designing suitable blasting parameters. Heavy duty sizers of 2500 TPH capacity have been envisaged to crush ROM coal from (-) 1200 mm to (-) 50 mm size. For this four numbers of primary Sizers and four numbers of secondary sizers of similar acpacity have been provided. The ROM coal will be unloaded into the receiving hoppers of primary sizers to crush coal up to (-) 200 mm and it is fed to Secondary sizers through

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belt conveyor to reduce size of coal up to (-) 50 mm for despatch. The coal will be reclaimed by apron feeder and fed to primary sizers for crushing to specified size of (-) 200 mm. Crushed coal of (-) 200 mm will be collected by the conveyor installed underneath the primary sizers and to carry for secondary sizing (-) 50 mm by the secondary sizers.

Suitable measures for coal transportation have been considered, accordingly width of belt conveyor have been selected as 1600 mm. The crushed coal collected by underneath conveyor will feed it to the elevating conveyor for onward transportation. The elevating conveyor will have two circuits in which coal from any Sizer can be fed. The elevating conveyors will carry coal to ground bunker. The capacity and size of reclaim and loading conveyors have been selected to match the desired loading rate of Rapid loading System in combination with Silo.

Provision has been made for two numbers of self-flowing ground bunker having capacity of 30,000 Tonnes each. Each ground bunker has two nos. of tripper conveyor installed over it. The elevating conveyor carries the crushed coal (-) 50 mm size and discharge on tripper conveyor installed over the bunkers for spreading of coal in bunker. The tripper conveyor will uniformly spread the crushed coal in the bunkers. Arrangement of tripper conveyor will be such that it can move from one end to other to discharge the coal into the bunker in the form of layers, so that proper blending of coal takes place. Since the height of fall of coal mass is very high, so a suitable cascading arrangement at any terminal point of the bunker will be provided to avoid the impact of free fall of coal mass on the bowl face of the bunker. Continuous bin level indicators will be provided to gauge the level of coal in the bunkers. Suitable measures will be taken for the smooth flow of (-) 50 mm coal at bunkers / chutes / hopprers. The bunker opening is fitted with plough feeders with a capacity of 2500 TPH for reclaiming crushed coal for onward transportation to reclaim conveyor. Three number of plough feeders have been provided in each ground bunkers. Out of three, two will be working and one will be kept as stand by. Sufficient space will be provided for repair, maintenance of the plough feeders. A motorized hoist will be used for handling feeders and its components.

RAILWAY SIDING

The proposed Magadh OCP is located in a green field area and at present there is no arrangement for coal evacuation from this OCP. The coal production of 20.0 MTY from Magadh OCP is proposed, out of which 10.0 MTY of coal to be linked to Tandwa STPS of NTPC, located at a distance of about 10 Km from the mine site and rest coal (about10.0 MTY) will be linked for other consumer. Hence, for the transportation of coal from this mine have been envisaged with two MGR off-take of coal with rapid

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loadout system alongwith coal handling plant.

One off-take system is proposed by Tandwa STPS having a railway siding with MGR loop which is to be constructed and commissioned by NTPC, will be a dedicated and cost will be borne by NTPC.

Other siding will also be MGR loading which will cater the need of other consumers of central coalfields limited and such cost of only this siding has been considered.

The siding would take-off from Bukuru station of the Proposed Arterial (Tori-Shivpur-Hazaribagh) Railway Siding at a distance of about 26 Km from Tori Station. The length of the proposed alignment taking off from Bukuru station of main Arterial railway siding line to the Magadh OCP is about 12 Km. which includes link portion and yard portion with MGR bulb from proposed Bukuru Railway station to Magadh.

An emergency provision will be made to inter-link both MGR system so that loading of rakes will be made by both silos & RLS to any consumer wagons for loading and despatching of coal from this project.

Daily requirement of Box/N wagons and no. of trains are as below for other consumer:

Daily volume of loading in tonne	Daily requirement of No. of Box/N wagons	Daily No. of trains to be run	
		In single unit of 58 Box/N rake	In long unit of 116 Box/N rake
34000	580	10	5

5.5	Coal washing and the proposed handling/ disposal of rejects	**NA**

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	Parameters	Details
6.1	**LAND REQUIREMENT**	

Total Land Use

Particulars	Area in Ha.
Quarry Area	1146
External Dump	166.91
Safety Zone	159.68
Other use	14.8
Infrastructure Area	106.34
Total Area in Ha	**1593.73**

The project area falls into two districts, Chatra and Latehar. 495.92 Ha of project area falls in Chatra Dist. and 1097.81 Ha. in Latehar Dist of Jharkhand.

6.1.1 Total Land requirement for the mine in "Ha"

Chatra District (MAGADH EAST OCP)

	Land in Ha	Notified Forest	GMJJ	Non Forest
Quarry	345.89	55.57	150.52	139.8
OB Dump	27.8	0	4.99	22.81
Conveyor Corridor	3.56	0	0.58	2.98
Road	2.71	0	0.65	2.06
safety	5.04	5.04	0	0
Green belt	110.92	9.14#	49.55	52.23
Total	495.92	69.75	206.29	219.88

Sl No	Type of Land	Total Land	Magadh East OCP- Dist. Chatra	Magadh West OCP- Dist. Latehar
1	Notified Forest	381.22	69.75	311.47
2	GMJJ	280.5	206.29	74.21
3	Sub Total (Forest)	661.72	276.04	385.68
4	Non Forest	932.01	219.88	712.13
5	Total Land	1593.73	495.92	1097.81

Source-Plan supplied by Project.

6.1.2 During mining Land use details:

Type	Land use (Proposed)	Land Use (End of Life)	Land Use (Post Closure)						
			Agricultural land	Plantation	Water Body	Public/ Company Use	Forest Land (Returned)	Undisturbed	Total
Excavation Area	1146								0
Backfilled Area		634		634					634
Excavated Void		512				512			512

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	Parameters	Details								
	Without plantation									0
	Top Soil Dump									0
	External Dump	166.91	166.91		166.91					166.91
	Safety Zone	159.68	159.68		159.68					159.68
	Haul Road between quarries									0
	Road diversion									0
	Diversion/ below River/Nala/canal	14.8	14.8				14.8			14.8
	Settling pond									0
	Road & Infrastructure area	106.34	106.34				106.34			106.34
	Other Use									0
	Garland drains									0
	Embankment									0
	Green Belt									0
	Water Reservoir near pit									0
	UG entry									0
	Undisturbed/ Mining right for UG									0
	Resettment									0
	Pit head power plant									0
	Water harvesting									0
	Agricultural land									0
	Total	**1593.73**	**1593.73**	**0**	**960.59**	**0**	**633.14**	**0**	**0**	**1593.73**

6.1.3	Surface features over the block area	
6.1.4	No. of villages/Houses to be shifted	998 PAF(Approx.)
6.1.5	Population to be affected by the project	
6.1.6	Proposed Rehabilitation programme	It is proposed to Rehabilitate all the PAF on the land identified by project.
6.2	**DETAILS OF LEASE**	
6.2.1	Status of Lease	
6.2.2	Existing Lease Area "Ha"	
6.2.3	Period for which Mining Lease has been granted/is to be renewed/ is to be applied for.	NA
6.2.4	Date of expiry of earlier Mining Lease, if any	
6.2.5	Whether the lease boundary/ required boundary is same as	

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	Parameters	Details
	mentioned in the allotment order	
6.2.6	Lease Area (applied/ required) as per the Mining Plan under consideration (Ha)	
6.2.7	Whether the applied lease area falls within the allotted block	
6.2.8	Area (Ha) of lease which falls outside the delineated Block Boundary/Existing Mining Lease	
6.2.9	**Details of outside area:**	
	Whether forms part of any other coal block	
	Whether it contains any coal/lignite reserves	
	Purpose for which it is required, e.g. roads/ OB dumps/ service buildings/ colony/ safety zone/ others (specify)	NA
6.2.10	**Whether some part(s) of the allotted block has not been applied for mining lease.**	
	- Total area in Ha of such part(s).	
	- Total reserves in such part(s). (Mt)	
	- Brief reasoning for leaving such part(s)	

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7.1	**Commitment from the project proponent that the company will comply Environment and Forest Condition stipulated in the respective clearances**	In order to carry out the proposed mining activity in an environmentally sustainable manner, suitable environmental protection measures shall be taken up at different stages of project operation and post closure. A brief detail of activities to be covered in environmental management along with capital provision has been enclosed. In addition to this, few environmental protection measures have been suggested as a part of mine closure activities. **CAPITAL EXPENDITURE ON ENVIRONMENTAL PROTECTION MEASURES** (Amount in Rs.Lakhs)

1 Cost of rehabilitation	523.95
2 Cost of compensatory afforestation	3840.85
3 Cost of restoration	1726.77
4 Cost of Anti-pollution measures in mine & Industrial area	485.69
5 Cost of Anti-pollution measures in township	351.87
6 Other provisions	121.39
7 Compensation for Tenancy Land	2174.65
8 TOTAL CAPITAL	9225.17

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	Parameters	Details
8.1	**Abandonment Cost and Financial Assurance**	
8.1.1	**Abandonment Cost: Cost of Activities to be taken up for closure of the mine**	

S. No.	Activity	Weighted % of Mine Closure Cost		
		Progressive	Final	Average
A	Dismantling of Structure	0	8.5	4.25
	Service building			
	Residential Building			
	Industrial Structure			
B	Safety & Security	6.5	3.2	4.85
	Random rubble masonry/concrete wall			
	Toe wall around dump/Gabion wall			
	Barbared wire fencing			
	Fencing/boundary wall, fencing around water body			
	Garland drains			
C	OB Dump Reclamation			
C A	Technical Reclamation	60.5	60.5	60.5
	Re-handling of OB			
	Levelling by Dozer			
	Grading			
	Levelling and grading of high wall slopes & OB Dump			
C B	Biological Reclamation & Plantation	15	11.7	13.35
	Top soil Management			
	Grassing of OB dump			
	Plantation around virgin Area , safety zone , green belt, over external Dump and internal			
	Plantation post care (including manpower)			
	Plantation over cleared area obtained after dismantling			
D	Land scaping of the open space in leasehold area for improving its esthetic. Drain, Pipe lines, Peripheral road,gates, View points, cemented steps on bank Development of Agriculture land	4	5.5	4.75
E	Environment mitigation & management	12	1.5	6.75
	Air Quality (Water tanker , Sprinkler & other Control measures)			
	Water Quality (ETP & STP etc operating cost)			
	Manpower Cost and supervision			

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	Parameters	Details		
	F Post Closure Monitoring	0	3.2	1.6
	Air Quality			
	Water Quality			
	Power Cost			
	Manpower Cost and supervision			
	G Entrepreneurship Development (Vocational/skill development training for sustainable income of affected people)	1	0.5	0.75
	H Miscellaneous & Other measures like Golden Handshake, one time financial grant, alternative jobs, other services etc.	1	5.4	3.2
	Total	100	10	100

8.1.3 Financial Assurance: Amount to be deposited in Escrow account as a security against the mine activities to be carried out for the closure of the mine.

The mine closure plan of Magadh OCP (20 MTPA) was approved by CCL Board in 2013 with an estimated mine life of 26 Years (As on April 2012). Till date, 4787.31 Lakhs has already been deposited in the escrow account of Magadh OCP (20 MTPA).

This Mining Plan only involves truncation of the project area as per approved PR. There is no deviation from the approved calendar plan PR is proposed in this mining Plan. Hence, the balance life of mine is considered as 22 Years

ESCROW ACCOUNT	
Magadh OCP	
Project Area (Ha)	1593.73
Escrow Amount per Ha. For OC Project as on April, 2019 (lakhs/ Ha)	9
WPI as on April 2019	121.1
WPI as on April 2020	119.2
Escrow Amount per Ha. For OC Project as on April 2020 (lakhs/ Ha)	8.86
Current value of corpus as on April 2020	14118.53
Amount deposited in the Escrow Account (As on 30.03.2020)	**4787.31**
Balance Corpus for which provision is to be made	9331.22
Balance Life of mine	22
Annual corpus (Balance corpus / Balance life, in Rs. Lakh)	424.15
Year	**Amount in Lakh (Rs.)**
1	424.15
2	445.36
3	467.63
4	491.01
5	515.56
6	541.33
7	568.40

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Parameters	Details
8	596.82
9	626.66
10	658.00
11	690.90
12	725.44
13	761.71
14	799.80
15	839.79
16	881.78
17	925.87
18	972.16
19	1020.77
20	1071.81
21	1125.40
22	1181.67
Total	**16331.99**
Total Mine closure cost (in Rs Lakhs)	**21119.30**

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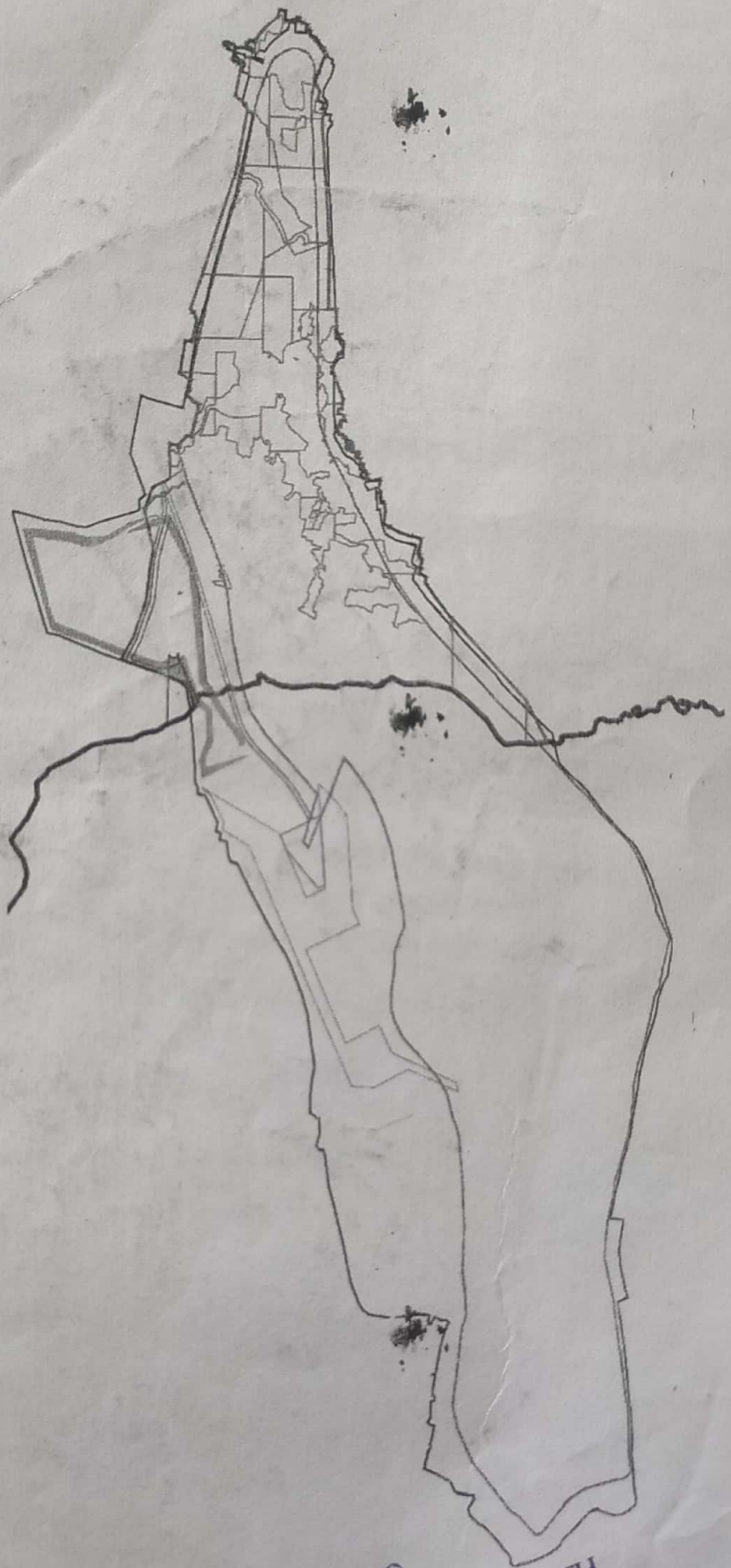

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