CENTRAL COALFIELDS LIMITED (CCL)

EXPANSION PROJECT REPORT
(INCLUDING MINING PLAN & COST ESTIMATES)
OF
ASHOK OCP

Name of Block- Ashok Block

Name of Coalfield-North Karanpura Coalfield

Location-Chatra Dist., Jharkhand State

Targeted Capacity-20.0 MTY

Peak Capacity-30.0 MTY

(TEXT & APPENDICES)

Job No. -3420158

AUGUST 2020

REGIONAL INSTITUTE-III

CENTRAL MINE PLANNING & DESIGN INSTITUTE LIMITED

(A Subsidiary of Coal India Limited)

GONDWANA PLACE, KANKE ROAD, RANCHI – 834 031

JHARKHAND, INDIA

A. Index of Chapters of the Mining Plan (Including Mine Closure Plan) / Mine Closure Plan or Final Mine Closure Plan

LIST OF PLANS

Sl .No	Plan	Scale	Drawing No
1	Location Plan	NTS	RI-3/OCM/1681
2	KML file	1:5000	RI-3/OCM/1682
3	Cadastral Plan	1:10000	RI-3/OCM/1683
4	Geological Plan	1:10000	RI-3/OCM/1684
5	A.Borehole Litholog 01-10	1:100	RI-3/G/10247
	B.Borehole Litholog 11-20	1:100	RI-3/G/10248
	C.Borehole Litholog 21-30	1:100	RI-3/G/10249
	D.Borehole Litholog 31-40	1:100	RI-3/G/10250
	E.Borehole Litholog 41-50	1:100	RI-3/G/10251
	F.Borehole Litholog 51-54	1:100	RI-3/G/10252
	G.Lithology NNKA -7 BHS	1:100	RI-3/G/10253
6	Surface Plan	1:10000	RI-3/OCM/1685
7	Conceptual Plan	1:10000	RI-3/OCM/1686
8	Landuse Plan	1:10000	RI-3/OCM/1687
9	Floor contour,Isochore and Isograde Plan of Bottom Lower Dakra Seam	1:10000	RI-3/OCM/1688
10	Floor contour,Isochore and Isograde Plan of Middle Lower Dakra Seam	1:10000	RI-3/OCM/1689
11	Floor contour,Isochore and Isograde Plan of Top Lower Dakra Seam	1:10000	RI-3/OCM/1690
12	Floor contour,Isochore and Isograde Plan of Upper Dakra Seam	1:10000	RI-3/OCM/1691
13	Floor contour,Isochore and Isograde Plan of Bukbuka Lower Bottom Seam	1:10000	RI-3/OCM/1692
14	Floor contour,Isochore and Isograde Plan of Bukbuka Lower Top Seam	1:10000	RI-3/OCM/1693
15	Floor contour,Isochore and Isograde Plan of Upper Bukbuka Bottom Seam	1:10000	RI-3/OCM/1694
16	Floor contour,Isochore and Isograde Plan of Upper Bukbuka Top Seam	1:10000	RI-3/OCM/1695
17	Floor contour,Isochore and Isograde Plan of Bukbuka Top Seam	1:10000	RI-3/OCM/1696
18	Floor contour,Isochore and Isograde Plan of Lower Bisrampur Bottom Seam	1:10000	RI-3/OCM/1697
19	Floor contour,Isochore and Isograde Plan of Lower Bisrampur Top Seam	1:10000	RI-3/OCM/1698
20	Floor contour,Isochore and Isograde Plan of Upper Bisrampur Seam	1:10000	RI-3/OCM/1699
21	Floor contour,Isochore and Isograde Plan of Karkata Seam	1:10000	RI-3/OCM/1700
22	Floor contour,Isochore and Isograde Plan of K1 Seam	1:10000	RI-3/OCM/1701
23	Floor contour,Isochore and Isograde Plan of K2 Seam	1:10000	RI-3/OCM/1702
24	Cross section 1-1' showing mining system	1:2000	RI-3/OCM/1703
25	Cross section 2-2' showing mining system	1:2000	RI-3/OCM/1704
26	Cross section 3-3' showing mining system	1:2000	RI-3/OCM/1705
27	Cross section 4-4' showing mining system	1:2000	RI-3/OCM/1706
28	Cross section 5-5' showing mining system	1:2000	RI-3/OCM/1707
29	Existing and Proposed surface Plan	1:10000	RI-3/OCM/1708
30	Total Coal Plan	1:10000	RI-3/OCM/1709
31	Total OB Plan	1:10000	RI-3/OCM/1710
32	Final Stage Quarry Plan	1:10000	RI-3/OCM/1711
33	Post Mining Land use Plan	1:10000	RI-3/OCM/1712
34	1 st Year Reclamation Plan	1:10000	RI-3/OCM/1713
35	3 rd Year Reclamation Plan	1:10000	RI-3/OCM/1714
36	5 th Year Reclamation Plan	1:10000	RI-3/OCM/1715
37	10 th Year Reclamation Plan	1:10000	RI-3/OCM/1716
38	15 th Year Reclamation Plan	1:10000	RI-3/OCM/1717
39	19 th Year Reclamation Plan	1:10000	RI-3/OCM/1718

40	1 st Year stage Plan	1:10000	RI-3/OCM/1719
41	3 rd Year stage Plan	1:10000	RI-3/OCM/1720
42	5 th Year stage Plan	1:10000	RI-3/OCM/1721
43	10 th Year stage Plan	1:10000	RI-3/OCM/1722
44	15 th Year stage Plan	1:10000	RI-3/OCM/1723
45	Final Stage Dump plan	1:10000	RI-3/OCM/1724
46	Key Plan without Piparwar Belt	1:10000	RI-3/E&M/M3158
47	Key Plan with Piparwar Belt	1:10000	RI-3/E&M/M3159
48	Workshop var I	NTS	RI-3/E&M/M3150
49	Workshop var II	NTS	RI-3/E&M/M3151
50	Workshop var III	NTS	RI-3/E&M/M3152
51	Single line substation Var I	NTS	RI-3/E&M/3E3156
52	Single line substation Var II	NTS	RI-3/E&M/3E3157

List of Appendices

26	C.1, C.2 ,C.3 & C.4	Estimated yearwise opearying cost at 100 % & 85 % capacity utilisation	Var I-67X-68X	Var II-46X-47X	Var III-33X-34X
27	D-D.1	Cash flow statement for financial & economic analysis at 100%, and 85% of the capacity.	Var I-68XA	Var II-48X	Var III-35X
28	E	Estimated investment on Land Reclamation	Var I-69X		
	E1	Estimated investment on Replacement	Var I-70X	Var II-49X	Var III-36X
	E2	Estimated residual value	Var I-71X	Var II-50X	Var III-37X
29	F	Environmental Protection Measures	Var I-72X-73X	Var II-51X-52X	Var III-38X-39X

B. List of Abbreviations used.

Seam abbreviations used

BLD	:	Bottom Lower Dakra	UBT	:	Upper Bukbuka Top
MLD	:	Middle Lower Dakra	BT	:	Bukbuka Top
TLD	:	Top Lower Dakra	LBIB	:	Lower Bisrampur Bottom
UD	:	Upper Dakra	LBIT	:	Lower Bisrampur Top
BLB	:	Bottom Lower Bukbuka	UBI	:	Upper Bisrampur
BLT	:	Top Lower Bukbuka	KKT	:	Karkata
UBB	:	Upper Bukbuka Bottom	K1	:	K1
K2	:	K2			

2. SUMMARISED DATA

A. General:

1. Name of the Project	:	**Ashok Expansion Opencast**
2. Coalfield	:	North Karanpura Coalfield
3. Location	:	Chatra District, Jharkhand
4. Company	:	Central Coalfields Limited
5. Address of the Company	:	Darbhanga House, Ranchi, PIN- 834001
6. Nearest Railway Station	:	Ray on Gomoh- Dehri-on-Sone loop line of Eastern Railway
7. Roads	:	Ashok Expansion Project (Planned in Ashok block) is connected to Ranchi by a metaled road via Khalari and to Hazaribagh via Barkagaon. The distance of the Ashok Expansion Project from Ranchi is about 80 Kms.

B. Geological Information:

1. General Information:

1.	Name of blocks	*West of Ashok Block*
2.	Area (Sq.Km)	11.64
3.	Borehole Density (nos./Sq. Km)	12
4.	Balance Geological Reserves (Million Tes)	441.64
5.	Quarriable Reserves (Million Tonnes)	324.84

2. Sequence of Coal Seams, Parting and GCV/ASH in Ashok Block

Seam Name/ Parting	Thickness Range		GCV Range (kcal/kg)		Ash Range		Moisture Range	
	FROM	TO	Max	Min	Max	Min	Max	Min
K2	0.5	2.42	3439	4814	27	45.1	4.8	11.1
Parting	1.25	14.98						
K1	0.33	2.03	2964	4465	34	53.2	3.7	7.7
Parting	4.98	14.6						
Karkata	2.38	6.31	4056	5329	34	53.2	3.7	7.7
Parting	4.55	18.73						
Upper Bishrampur	0.25	4.44	2376	5550	22.4	60.8	3.2	11.3
Parting	0.8	16.4						
Lower Bishrampur	1.94	5.92	3307	5185	23.2	49.6	3.5	8.9
Parting	3.39	20.58						
Lower Bishrampur top	0.28	2.1	2727	5351	24.8	57.3	3	6
Parting	0.5	4.8						
Lower Bishrampur bottom	0.51	1	3488	5740	18.5	46.9	4.5	7.4
Parting	20.08	28.4						
Upper Bukbuka top	0.34	1.92	2625	4699	27.9	55.4	4.7	9
Parting	0.95	3.5						
Upper Bukbuka bottom	0.11	3.7	3313	4840	26.2	46.6	5.9	8.6
Parting	7.9	43.26						
Upper Bukbuka	1.16	7.44	3497	5691	18.4	46.5	4.1	8.6
Parting	0	16.98						
Lower Bukbuka top	0.81	5.41	2907	5148	26	50.4	4.2	6.5
Parting	0.65	29.31						
Lower Bukbuka bottom	0.7	3.15	2994	4623	32	52.3	3.6	8.2
Parting	1.5	20.25						
Lower Bukbuka	0.38	5.4	3143	4615	28.8	53.6	3.5	9.7
Parting	4.38	31.03						
Upper Dakra	0.5	4.54	2441	5461	227	60.5	2.9	6.6
Parting	0.48	16.65						
Lower Dakra	17.16	23.09	2855	4520	33.4	47.6	4.2	7.2

Lower Dakra top	0.6	4.3	3182	5233	26.1	51.7	3.5	7.4
Parting	0	16.95						
Lower Dakra middle	2.45	11.46	2684	4650	32.7	57.4	3.1	6.8
Parting	8.5	25.6						
Lower Dakra bottom	0.24	3.46	2164	5789	18.6	63.9	2.6	7.7

C. Technical Information:			
1	Area of the proposed Quarry	sq. km	10.92
2	Borehole density within mine area	BHs/sq. km	10
3	Mine parameters		
	Av. Strike length of the quarry	km	3.72
	Extent along dip (Avg.)	km	3.30
4	Description of coal seams proposed to be worked along with the parting details		

Sl. No.	Particulars	THICKNESS RANGE		Average Value
		From	To	
I	Seam Thickness			
1	Bottom Lower Dakra	0.24	3.46	1.85
2	Middle Lower Dakra	2.45	11.46	6.96
3	Top Lower Dakra	0.6	4.3	2.45
4	Upper Dakra	0.5	4.54	2.52
5	Bukbuka Lower Bottom	0.7	3.15	1.93
6	Bukbuka Lower Top	0.81	5.41	3.11
7	Upper Bukbuka Bottom	0.11	3.7	1.91
8	Upper Bukbuka Top	0.34	1.92	1.13
9	Bukbuka Top	0.57	6.22	3.40
10	Lower Bishrampur Bottom	0.51	1	0.76
11	Lower Bishrampur Top	0.28	2.1	1.19
12	Upper Bishrampur	0.25	4.44	2.35
13	Karkata	2.38	6.31	4.35
14	K1	0.33	2.03	1.18
15	K2	0.5	2.42	1.46
II.	Seam Gradient			6-8 deg
III	Specific Gravity of the seams			1.55-1.70
IV	Excavation Category of coal			III
V	**Parting/Overburden Thickness**			

1	Bottom Lower Dakra-Middle Lower Dakra	8.5	25.6	17.05
2	Midle Lower Dakra-Top Lower Dakra	0.00	16.95	8.475
3	Top Lower Dakra - Upper Dakra	0.48	16.65	8.565
4	Upper Dakra - Bukbuka Lower Bottom	4.38	31.03	17.705
5	Bukbuka Lower Bottom - Bukbuka Lower Top	0.65	29.31	14.98
6	Bukbuka Lower Top - Upper Bukbuka Bottom	7.90	43.26	25.58
7	Upper Bukbuka Bottom - Upper Bukbuka Top	0.95	3.50	2.225
8	Upper Bukbuka Top - Bukbuka Top	3.95	17.38	10.665
9	Bukbuka Top-Lower Bishrampur Bottom	3.39	20.58	11.985
10	Lower Bishrampur Bottom-Lower Bishrampur Top	0.50	4.80	2.65
11	Lower Bishrampur Top-Upper Bishrampur	3.39	20.58	11.985
12	Upper Bishrampur-Karkata	4.55	18.73	11.64
13	Karkata -K1	4.98	2.03	3.505
14	K1-K2	1.25	14.98	8.115
15	Top OB			
VI	Excavation Category of OB			Cat.III+Cat IV
VII	OB Volume weight			2.40 (approx.)

D.TOTAL COAL AND TOTAL OB IN MINE:

OB (Mcum)	TOTAL	Coal (MT)	TOTAL
Top OB	78.96	K2	3.75
K2-K1	26.59	K1	4.96
K1-KKT	32.84	KKT	16.12
KKT-UBI	41.94	UBI	7.03
UBI-LBIT	17.13	LBIT	8.25
LBIT-LBIB	8.52	LBIB	10.27
LBIB-BT	92.68	BT	7.07
BT-UBT	53.14	UBT	11.54
UBT-UBB	8.20	UBB	30.04
UBB-BLT	60.00	BLT	24.77
BLT-BLB	18.67	BLB	11.38
BLB-UD	147.70	UD	15.10
UD-TLD	64.16	TLD	39.73
TLD-MLD	65.85	MLD	111.00
MLD-BLD	96.76	BLD	23.83
TOTAL	**813.13**	**TOTAL**	**324.84**

5. Av. Stripping Ratio — 2.50 cum/te

6. Method of Mining — Surface Miner and Shovel dumper

   Target Output — 20.0 MTY

7. Nominal production capacity (at 100%) — 20.0 MTY

   Peak production capacity (at 125%) — 30.0 MTY

   Production capacity (at 85%) — 10.20 MTY

8. Year of achieving Target Production (from zero date) — 5th year

9. Year of start of Internal Dumping 3rd Year

10. Production Phasing (from zero date upto target year) Mt

Year of Quarry operation	Coal output (M.tes)	Volume of OBR (MCUM)	Stripping Ratio (Cum/te)
1	3.30	10.33	3.13
2	7.00	19.89	2.84
3	12.00	34.07	2.84
4	17.00	48.26	2.84
5	20.00	55.31	2.77

11	Total Mine Life (at Nom. production capacity)	Years	19 yrs		
	Pre-construction period		-		
	Construction period		-		
	Production build-up period		5yrs		
	Production period		13 yrs		
	Tapering / mine closure period		2 yrs		
12	Major HEMM Deployed for Coal	Capacity	Variant I	Variant II	Variant III
	Surface Miner	SM 3800	7	5	Outsourced
	FE Loader	10-12 Cum	6	5	
	Rear Dumper	100 T	33	25	
	Dozer	410 HP	7	5	
	Diesel RBH Drill	160 mm	2	1	
	Diesel hyd backhoe	4.5-5.5 cum	2	1	
13	Major HEMM Deployed for OB	Capacity	Variant I	Variant II	Variant III
	Elect/Diesel Hyd Shovel	20-22 Cum	5		Outsourced

	Rear Dumper	190T	53		
	Elect/Diesel Hyd Shovel	10-12 Cum	10	8	
	Rear Dumper	100T	99	73	
	Electric RBH Drill	250 mm	5		
	Diesel RBH Drill	160 mm	10	8	
	Dozer	410 HP	15	8	
14	Total Manpower (Target Year)	Nos	1441	1016	426
15	Overall Output per manshift (OMS)				
16	Seam-wise weighted average grade of coal (non-coking/coking)		G11 (Av GCV 4000 - 4300 kcal/kg)		
17	Coal Transport within the mine		In-pit belt conveying system /Truck		
18	Surface Coal Transport to Siding/Despatch Point and Mode of Despatch		Conveyor		
19	Any Railway Siding and distance		Piparwar Railway Siding and proposed Railway siding in the West of Ashok Block.Proposed railway siding at Pit top towards west of quarry.		
20	Name of any Specific Customer/Industry		Basket linkage and e-booking		

D.	ENVIRONMENTAL & OTHERS		Variant I	Variant II	Variant III
1	Civil Construction Residential houses	Nos.	-	-	-
	Housing satisfaction	%			
2	Water Demand	MGPD			
	Colony		0.031	0.022	0.010
	Industrial		0.810	0.755	0.696
3	Total Land to be acquired	Ha	1111.92	1111.92	1111.92
	Government land	Ha	15.10	15.10	15.10
	Tenancy land	Ha	204.78	204.78	204.78
	Forest land (type of forest)	Ha	892.04	892.04	892.04
4	Land to be acquired within minetake area (excavation area)	Ha	1054.66	1054.66	1054.66
	Government land	Ha	14.72	14.72	14.72
	Tenancy land	Ha	196.11	196.11	196.11
	Forest land (type of forest)	Ha	843.83	843.83	843.83
5	Land to be acquired outside minetake area (Beyond Excavation Area, such as Approach Road, Infrastructure, Colony, etc.)	Ha	57.26	57.26	57.26
	Government land	Ha	038	038	038
	Tenancy land	Ha	8.67	8.67	8.67
	Forest land (type of forest)	Ha	48.21	48.21	48.21
6	Land to be acquired for external dumping	Ha	0.00	0.00	0.00
	Government land	Ha			
	Tenancy land	Ha	0.00	0.00	0.00
	Forest land (type of forest)	Ha	0.00	0.00	0.00
			0.00	0.00	0.00
7	Net Present Value of Forest Land	Rs.Lakhs/ Ha	18.32	18.32	18.32
	Total Area	Rs.Lakhs	892.04	892.04	892.04

D.	ENVIRONMENTAL & OTHERS		Variant I	Variant II	Variant III
	Total Value		16342.17	16342.17	16342.17
8	Habitation & Rehabilitation				
	No. of villages within mine boundary	Nos.	10	10	10
	No. of PAFs to be rehabilitated		5000	5000	5000
9	Cost of land & Rehabilitation				
	Total Cost	Rs. crores	630.15	630.15	630.15
	R&R only		554.30	554.30	554.30
10	Total EMP Capital	Rs. crores	872.65	853.93	849.44
	Social cost		630.25	630.25	630.25
	Environment cost		242.40	223.68	219.19
11	Average annual rainfall	mm	1488		
12	Make of Water (Maximum)	Cu.m/day	310280		
13	Total installed pumping capacity	lps	900		

E. FINANCIAL PARAMETERS

			VARIANT I		VARIANT II	VARIANT III
			WITHOUT PIPAR WAR CPP	WITH PIPARWAR CPP	WITHOUT PIPARWAR CPP	WITHOUT PIPARWAR CPP
Sl. No.	**Particulars**	**Unit**	**ROM**	**ROM**	**ROM**	**ROM**
1	Total Capital Investment	Rs. crores				
	Upto Target		4409.23	4558.84	2622.40	1687.46
	Beyond Traget		401.84	401.84	10.76	5.60
	Total		4811.07	4960.68	2633.16	1693.07
2	Total Capital Investment on P&M	Rs. crores				
	Upto Target		3034.56	3183.43	1373.11	543.88
	Beyond Traget		397.84	397.84	6.77	1.62
3	a) Capital for Sanction (Upto Target Year)	Rs. crores	4289.04	4438.65	2510.41	1610.26
	b) Capital for Sanction (Project Life)		4690.88	4840.49	2521.17	1615.86
4	Output per manshift (OMS) (Max Manpower)	Tonne	49.81	49.81	74.56	176.18
5	Earnings per manshift (EMS) (target year)	Rs.	3514.33	3514.33	3532.99	3584.31
6	Estimated Cost of Production	Rs. / tonne				
	At 100% production level		862.07	868.88	832.57	808.78
	At 85% production level		979.39	987.25	908.32	862.04
7	Estimated average selling price	Rs. / tonne	1063.25	1063.25	1063.25	1063.25
8	Estimated Profit	Rs. / tonne				
	At 100% production level		201.18	194.37	230.68	254.47
	At 85% production level		83.86	76.00	154.93	201.21
9	**Financial Internal rate of return (FIRR)**	%				
	At 100% production level		**27.87%**	**26.66%**	**41.29%**	**56.29%**
	At 85% production level		**18.83%**	**17.85%**	**31.23%**	**45.69%**
10	Break-even point					
	Production	Mty	15.35	15.50	12.99	10.83
	Production level	%	76.73%	77.50%	64.97%	54.14%
12	Final Mine Closure Cost / te.	Rs/tonne	6.27	6.27	6.27	6.27
13	Year of Achieving target Production		5th	5th	5th	5th

VARIANTS PROPOSED:

- **VARIANT I- COAL, OB AND RECLAMATION ALL DEPARTMENTAL**
- **VARIANT II- COAL AND OB UPTO LOWER UPPER DAKRA DEPARTMENTAL AND ABOVE UPPER DAKRA ALL COAL AND OB OUTSOURCED, RECLAMATION OUTSOURCED**
- **VARIANT III- COAL, OB AND RECLAMATION ALLL OUTSOURCED**

	Parameters	*Details*
1.1	**INTRODUCTION**	
1.1.1	Name of Coal / Lignite Block	Ashok Geological Block
1.1.2	Name of the Coalfield/ Lignite Field	North Karanpura Coal Field
1.1.3	Base date of Mining Plan/ Mine Closure Plan	**August 2020**
1.1.4	Linked End Use Plant	Basket Linkage
1.1.5	Distance of End use plant from the pit head of the project in "km"	Basket Linkage
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, State-Jharkhand
1.2.2	Communication: PWD roads, railway lines, Air	It is connected to Ranchi by a metaled road via Khalari and to Hazaribagh via Barkagaon. The distance of the Project from Ranchi is about 80 Kms. The project is accessible by a pucca road after crossing Damodar River. This road is connected to Khalari-Dakra-Tandwa-Hazaribagh metalled road. The nearest Railway Station 'Ray', on Gomoh- Dehri-On-Sone loop line of Eastern Railway, is located about 10 km away from the project. The nearest airport is Ranchi at a distance of about 90km.
1.2.3	Availability of power supply, water etc.	Nearest source of power is existing Ashok OCP Sub-station of CCL which is receiving power through two nos. of independent 33 kV feeder from CCL central Switching station Piparwar and nearest source of water is from neighbouring mine like Existing Ashok and Piparwar OCP.
1.2.4	Prominent physiographic features, drainage pattern, natural water courses, rainfall data, highest flood level	The block is characterised by more or less flat terrain with gentle undulations. The general slope of the ground is towards south. The ground elevation above MSL varies between 420m and 480m. A prominent physiographic feature 'Satohari Hill' (height 636m) lies in the north of the block. Two nallas, namely Dambua & Benti, originating from the area and join Damodar River, which forms the main drainage channels of the area.
1.2.5	Important surface features within the project area and major diversion or shifting involved	Ten Villages along with some hutments are to be shifted 1.Saraiya 2. Lukaiya 3. Jhulundia 4. Hendza 5. Torhad 6. Kutki 7. Koilera 8. Thethangi 9. Chirlunga 10. Bali PAF -5000(As estimated by Project)It will change after detail survey and assessment.

	Parameters	*Details*

1.3 DETAILS OF CO -ORDINATES

1.3.1 Cardinal Points co-ordinates of the Block boundary

	National Coal Grid	
Name	Grid Northing (m)	Grid Easting (m)
1	1082373.841	3102645.762
2	1078829.591	3102710.765
3	1079214.033	3100479.585
4	1079482.284	3100099.034
5	1079510.603	3099013.069
6	1081515.449	3099018.608
7	1082152.586	3100303.728

	UTM Grid (Zone 45)	
Name	Grid Easting (m)	Grid Northing (m)
1	296694.624	2627610.477
2	296685.637	2624063.351
3	294461.508	2624494.545
4	294086.39	2624770.862
5	293000.531	2624821.874
6	293047.957	2626827.501
7	294346.958	2627438.064

1.4 DETAILS OF THE PREVIOUS APPROVAL OF MINING PLAN

NA

	Parameters	*Details*

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

		Approved Mining Plan	Proposed Mining Plan
1.5.1	Block Area in "Ha"	NA	1163.71
1.5.2	Block Area Projectised "Ha"		
1.5.3	Lease area "Ha"		1766.03
1.5.4	Project Area "Ha"		
1.5.5	Life of the Project "Yrs"		19
1.5.6	Minimum and Maximum Depth of working "m"		10 to 170
1.5.7	Net Geological Block "Ha"		1092.17
1.5.8	Production Target "MTPA"		20.0
1.5.9	Seams Available "As per GR"		Top to Bottom 1. K2 2. K1 3. KARKATA(KKT) 4. UPPER BISRAMPUR(UBI) 5. LOWER BISRAMPUR TOP(LBIT) 6. LOWER BISRAMPUR BOTTOM(LBIB) 7. BUKBUKA TOP(BT) 8. UPPER BUKBUKA TOP(UBT) 9. UPPER BUKBUKA BOTTOM(UBB) 10. BUKBUKA LOWER TOP(BLT) 11. BUKBUKA LOWER BOTTOM(BLB) 12. UPPER DAKRA(UD) 13. TOP LOWER DAKRA(TLD) 14. MIDDLE LOWER DAKRA(MLD) 15. BOTTOM LOWER DAKRA(BLD)
1.5.10	Seams not considered for Mining with Reasons		
1.5.11	Gross Geological Reserve "Mt"		441.64
1.5.12	Net Geological Reserve "Mt"	NA	397.47
1.5.13	Blocked Reserve "Mt"		55.41
1.5.14	Minable Reserve "Mt"		

	Parameters	*Details*	
1.5.15	Extractable Reserves "Mt"		324.84
1.5.16	% of Extraction/ recovery		85%
1.5.17	Reserve Depleted (till the base date) Reserves " Mt"		
1.5.18	Balance Extractable reserve "Mt"		324.84
1.5.19	Average Grade		G-11
1.5.20	OB in MM3		812.09
1.5.21	SR MM3/te		2.50
1.5.22	Mining Technology		Surface Miner in Coal and Shovel Dumper combination in OB
1.5.23	Coal Beneficiation envisaged		NA
1.5.24	Handling of Rejects		
1.5.25	Land use pattern " Ha"		
1	Excavation Area		1606.84 ha
2	Top Soil Dump		Included in Sl. No.1
3	External Dump		NA
4	Safety Zone		5.14 ha
5	Other Use (Road etc)		NA
6	Infrastructure area		48.46 ha
7	Green Belt		130.61 ha
8	Undisturbed Area		NA
	Total		1791.05 ha

	Parameters	*Details*	
2.1	**DETAILS OF THE BLOCK**		
2.1.1	Particulars of adjacent blocks: North, South, East, West	**North:** UNBLOCKED, BLOCKING IS TO BE DONE AFTER DETAIL EXPLORATION **South:** PURNADIH	**East:** ASHOK EAST (EXISTING ASHOK MINE) **West:** ASHOK KARKATA WEST AND ASHOK KARKATA CENTRAL
2.1.2	Location of the Block District / State	District-Chatra, State-Jharkhand	
2.1.3	Area of the Block "Ha"	1163.71	
2.1.4	Area of the geological block projectized "in Ha" (Area of the geological block considered for liquidation of coal reserve)	1092.17	
2.1.5	Balance area yet to be projectized "Ha"	71.59	
2.1.9	KML file of the Proposed lease area, Project Area and geological block.	Attached	
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	
2.1.12	Type of the Project (Operating / under Implementation) and year of Starting.	**EXPANSION PROJECT** **Year of starting-After all statutory clearances**	
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. **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	

	Parameters	Details
		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-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).	

	Parameters	Details

Description of Formations:

•Metamorphic:

The metamorphic rocks are not exposed in the block. However metamorphic rocks were encountered in 2 boreholes which were referred for correlation of seams.

•Karharbari:

The Karharbari Formation does not crop out in the block but the occurrence underneath Barakar Formation has been proved by drilled holes. General lithology of Karharbari Formation consists of Medium to Coarse to Very Coarse Grained Sandstone with Intercalation and shale in few places, Coal Seams.

•Barakar:

Predominant rock types of the Barakar Formation are fine to Coarse grained sandstone and Intercalation of sandstone and shale. Occasional occurrence of Grey Shale, Sandy Shale and Shaly Sandstone were also reported within the block during exploration work. The Coal bearing horizon of the block area is mainly represented by Barakar Formation. Different coal seams of the blocks show several splitting and merging throughout the block.

Seam Name/ Parting	Thickness Range		GCV Range (kcal/kg)		Ash Range		Moisture Range	
	FROM	TO	Max	Min	Max	Min	Max	Min
K2	0.5	2.42	3439	4814	27	45.1	4.8	11.1
Parting	1.25	14.98						
K1	0.33	2.03	2964	4465	34	53.2	3.7	7.7
Parting	4.98	14.6						
Karkata	2.38	6.31	4056	5329	34	53.2	3.7	7.7
Parting	4.55	18.73						
Upper Bishrampur	0.25	4.44	2376	5550	22.4	60.8	3.2	11.3
Parting	0.8	16.4						
Lower Bishrampur	1.94	5.92	3307	5185	23.2	49.6	3.5	8.9
Parting	3.39	20.58						
Lower Bishrampur top	0.28	2.1	2727	5351	24.8	57.3	3	6
Parting	0.5	4.8						
Lower Bishrampur bottom	0.51	1	3488	5740	18.5	46.9	4.5	7.4
Parting	20.08	28.4						
Upper Bukbuka top	0.34	1.92	2625	4699	27.9	55.4	4.7	9
Parting	0.95	3.5						

Parameters				Details				
Upper Bukbuka bottom	0.11	3.7	3313	4840	26.2	46.6	5.9	8.6
Parting	7.9	43.26						
Upper Bukbuka	1.16	7.44	3497	5691	18.4	46.5	4.1	8.6
Parting	0	16.98						
Lower Bukbuka top	0.81	5.41	2907	5148	26	50.4	4.2	6.5
Parting	0.65	29.31						
Lower Bukbuka bottom	0.7	3.15	2994	4623	32	52.3	3.6	8.2
Parting	1.5	20.25						
Lower Bukbuka	0.38	5.4	3143	4615	28.8	53.6	3.5	9.7
Parting	4.38	31.03						
Upper Dakra	0.5	4.54	2441	5461	227	60.5	2.9	6.6
Parting	0.48	16.65						
Lower Dakra	17.16	23.09	2855	4520	33.4	47.6	4.2	7.2
Lower Dakra top	0.6	4.3	3182	5233	26.1	51.7	3.5	7.4
Parting	0	16.95						
Lower Dakra middle	2.45	11.46	2684	4650	32.7	57.4	3.1	6.8
Parting	8.5	25.6						
Lower Dakra bottom	0.24	3.46	2164	5789	18.6	63.9	2.6	7.7

Strike and Dip

The General strikes are varying thorough out the project area. It varies from E-W to NE - SW with in the project area. The nature of the swing is consistent thorough out the area as well as in line with the eastern adjacent eastern part of existing Ashok Project and Southern adjacent Purnadih Coal block. Dips varying between 6° and 8° North-Westerly to northerly.

	Parameters	Details

Fault Details:

Fault No.	Trend	Throw Details	
		Fault Plane Direction	Throw Amount (in m)
F1 - F1	E-W	Southerly	17 - 22
F2 - F2	E-W	Northerly	20
F3 - F3	E-W in the west swings to NE -SW in the east.	Southerly	5 - 25
F4 - F4	NW -SE	South -Westerly	14 - 20
F4' - F4'	E - W to NW - SE	Northerly	10 - 95
F4A - F4A	NEN - SWS	Southerly	0 - 10
F4B - F4B	NE - SW	North - Westerly	0 - 20
F5 - F5	E-W	Northerly	0 - 25
F5' - F5'	NE - SW to ENE - WSE	Southerly	05 - 20
F6 - F6	NE-SW to E - W	Southerly	0 - 29
F7 - F7	E-W in the west swings to NE -SW in the east.	Southerly to South -Westerly	0 - 25
F8 - F8	E-W	Southerly	0 - 10
F8' - F8'	SW - NE	Southerly	12
F9 - F9	NW - SE in east to E-W in the center swings to NE -SW in the west.	Southerly in western part and south westerly in in eastern part.	7 - 31
F10 - F10	E - W in east to NE - SW in west.	Southerly	0 - 10
F11 - F11	E-W in east to NE-SW in west.	Northerly	20
F12 - F12	NE - SW	Southerly	8 - 20
F13 - F13	ESE - WNW	Southerly	0 - 67
F14 - F14	E - W		
F18 - F18	NE -SW	South -easterly	20 -40
F39 - F39	E-W	Northerly	About 100 m

2.2.3	Geological Block Area " Ha"	**1163.71**
2.2.4	Status of Exploration of the block	Fully Explored
2.2.5	Area covered by 'detailed' exploration within the block (sq. km)	Full Area

	Parameters	Details
2.2.6	Whether entire lease area has been covered by 'detailed' exploration.	Yes
2.2.7	No. of boreholes drilled within the block	139
2.2.8	Whether any further exploration/study is required or suggested and time frame in which it is to be completed	
2.2.9	Year wise future programme of exploration	Not required
2.2.10	Overall borehole density within the block (no./ sq. km) approx	12
2.2.11	No of Seams available as per GR (Geological Report)	Top to Bottom and abbreviations used in this report 1. K2 2. K1 3. KARKATA (KKT) 4. UPPER BISRAMPUR (UBI) 5. LOWER BISRAMPUR TOP (LBIT) 6. LOWER BISRAMPUR BOTTOM (LBIB) 7. BUKBUKA TOP (BT) 8. UPPER BUKBUKA TOP (UBT) 9. UPPER BUKBUKA BOTTOM (UBB) 10. BUKBUKA LOWER TOP (BLT) 11. BUKBUKA LOWERBOTTOM (BLB) 12. UPPER DAKRA (UD) 13. TOP LOWER DAKRA (TLD) 14. MIDDLE LOWER DAKRA (MLD) 15. BOTTOM LOWER DAKRA (BLD)
2.2.12	Seams not considered for Mining with Reasons	
2.2.13	Dip of the Seam	6 degree to 8 degree
2.2.14	Seam wise thickness, depth and reserve	

Sl. No.	Particulars	THICKNESS RANGE		Average Value	Geological reserve (MT)
		From	To		
I	Seam Thickness				
1	Bottom Lower Dakra	0.24	3.46	1.85	34.58
2	Middle Lower Dakra	2.45	11.46	6.96	149.24
3	Top Lower Dakra	0.6	4.3	2.45	54.31
4	Upper Dakra	0.5	4.54	2.52	20.54
5	Bukbuka Lower Bottom	0.7	3.15	1.93	15.34
6	Bukbuka Lower Top	0.81	5.41	3.11	33.80
7	Upper Bukbuka Bottom	0.11	3.7	1.91	39.30
8	Upper Bukbuka Top	0.34	1.92	1.13	15.32

	Parameters		Details			
	9	Bukbuka Top	0.57	6.22	3.40	8.83
	10	Lower Bishrampur Bottom	0.51	1	0.76	14.32
	11	Lower Bishrampur Top	0.28	2.1	1.19	11.47
	12	Upper Bishrampur	0.25	4.44	2.35	9.33
	13	Karkata	2.38	6.31	4.35	22.42
	14	K1	0.33	2.03	1.18	6.90
	15	K2	0.5	2.42	1.46	5.94
	II.	Seam Gradient			6-8 deg	
	III	Specific Gravity of the seams			1.51-1.71	
	IV	Excavation Category of coal			III	
	V	**Parting/Overburden Thickness**				
	1	Bottom Lower Dakra-Middle Lower Dakra	8.5	25.6	17.05	119.70
	2	Midle Lower Dakra-Top Lower Dakra	0.00	16.95	8.475	62.30
	3	Top Lower Dakra - Upper Dakra	0.48	16.65	8.565	66.38
	4	Upper Dakra - Bukbuka Lower Bottom	4.38	31.03	17.705	168.24
	5	Bukbuka Lower Bottom - Bukbuka Lower Top	0.65	29.31	14.98	19.14
	6	Bukbuka Lower Top - Upper Bukbuka Bottom	7.90	43.26	25.58	71.94
	7	Upper Bukbuka Bottom - Upper Bukbuka Top	0.95	3.50	2.225	4.98
	8	Upper Bukbuka Top - Bukbuka Top	3.95	17.38	10.665	58.36
	9	Bukbuka Top-Lower Bishrampur Bottom	3.39	20.58	11.985	102.75
	10	Lower Bishrampur Bottom-Lower Bishrampur Top	0.50	4.80	2.65	8.48
	11	Lower Bishrampur Top-Upper Bishrampur	3.39	20.58	11.985	18.02
	12	Upper Bishrampur-Karkata	4.55	18.73	11.64	47.43
	13	Karkata -K1	4.98	2.03	3.505	37.99
	14	K1-K2	1.25	14.98	8.115	30.27
	15	Top OB				114.20
	VI	Excavation Category of OB			Cat.III+Cat IV	
	VII	OB Volume weight			2.40 (approx.)	

<table>
<tr><th></th><th>Parameters</th><th>Details</th></tr>
<tr><td></td><td colspan="2">Seam wise Average GCV

<table><tr><th>Seam Name</th><th>Average GCV</th></tr><tr><td>K2</td><td>3959</td></tr><tr><td>K1</td><td>3679</td></tr><tr><td>KKT</td><td>4800</td></tr><tr><td>UBI</td><td>5108</td></tr><tr><td>LBIT</td><td>5352</td></tr><tr><td>LBIB</td><td>4680</td></tr><tr><td>BT</td><td>3925</td></tr><tr><td>UBT</td><td>4699</td></tr><tr><td>UBB</td><td>3797</td></tr><tr><td>BLT</td><td>4215</td></tr><tr><td>BLB</td><td>3879</td></tr><tr><td>UD</td><td>4027</td></tr><tr><td>TLD</td><td>4413</td></tr><tr><td>MLD</td><td>3933</td></tr><tr><td>BLD</td><td>3901</td></tr></table></td></tr>
<tr><td>2.2.15</td><td>Methodology of reserves estimation (also mention if any software package has been used).</td><td>The present Project Report i.e Ashok Expansion OCP (20.0 MTY) has been designed combining the part of the Existing Geological Report of the Ashok and Purnadih Coal block and newly explored West of Ashok Coal Block. Since all the Geological Report of the different coal blocks have been prepared in different time frame, all the coal seams of the 3 coal blocks have been correlated again and accordingly the weighted average Grade (GCV) of the different coal seams have been reached for further processing.

MINEX software is being used for reserve estimation. Grade Wise, seam wise and Depth wise Tonnage of coal is calculated using the Detailed Resource Reporting method of MINEX software.

The iso-excavation plan has been prepared by the MINEX software, considering grid values on the floor of Seam Bottom Lower Dakra and those of the surface grid and contouring them at an interval of 10m, using MINEX software. The Total Coal plan has been prepared by using the effective thickness grids of individual coal seams. Total Overburden plan has been</td></tr>
</table>

	Parameters	Details
		prepared by subtracting total seam coal thickness grid from iso-excavation grid and contouring at an interval of 10m. A deduction of 10% is made from gross reserves to account for geological variations due to unforeseen factors to arrive at net coal reserves.
2.2.16	Average GCV "KCal/kg"	4203
2.2.17	Gross Geological Reserve of the block "Mte"	441.64
2.2.18	Net Geological Reserve of the block "Mte"	397.47
2.2.19	Minable Reserve of the block "Mte"	380.26
2.2.20	Blocked Reserve "Mte	55.41
2.2.21	Corresponding extractable reserve of the block "Mte"	324.84
2.2.22	Percentage of Extraction	85%

	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	Fifteen seams are to worked along with splits from top to bottom as mentioned below: K2, K1, Karkata(KKT), Upper Bisrampur(UBI), Lower Bisrampur Top(LBIT), Lower Bisrampur Bottom(LBIB),Bukbuka Top(BT),Upper Bukbuka Top(UBT),Upper Bukbuka Bottom(UBB), Bukbuka Lower Top(BLT), Bukbuka Lower Bottom(BLB) Upper Dakra(UD),Top Lower Dakra(TLD),Middle Lower Dakra(MLD) and Bottom Lower Dakra(BLD) Choice of Mining Method Considering • Multiple seams with splits to be worked • Flat gradient of 4-5 degree of the coal seams. • Variable thickness of OB/Partings. Shovel-dumper mining system has been envisaged for OB removal in this proposed Open Cast mine. Coal winning is proposed to be carried out using surface miner, FE loader and dumper combination and partly using shovel dumper combination. It is also proposed to respond to improvements in technology and equipment, which would result in improved profitability and productivity parameters taking into account of safety and environmental parameters. As both outsourcing and departmental mode of operation is running in this area hence three variants viz., complete departmental, partial outsourcing and complete outsourcing mode have been envisaged in this report. Justification for Optimization of targeted capacity Considering • The strike length of the quarry (3.86 km) • Total thickness of coal seams available at different stages of mine • Average yearly advance rate of nearly 125m • Flat gradient of nearly 6-8 degree The mine has been planned for a rated capacity of 20.0Mtpa.

	Parameters	Details
		Sequence of mining **BOX CUT** For the proposed quarry, box-cut will be made near the borehole NNKA-210. It is proposed to touch the floor of Bottom Lower Dakra seam at a floor RL of 410 m. From initial box cut, the mine is proposed to be extended towards east and west up to full strike length. **ANNUAL ADVANCE RATE** Ashok OC Mine was started in Dec' 1994 against a sanctioned PR of Ashok OCP for a rated capacity of 1.50 MTY. The Expansion PR for a rated capacity of 10MTY was sanctioned in Dec' 2017. About 148.34 M.tes of coal has been produced from this mine until Dec '19, corresponding to a volume of OBR of 159.32 Mm3 at an average stripping ratio of 1.07 m3/te. This mine is near exhaustion. An annual coal output of 20.0 MTY is being proposed keeping in mind the sustained production level for a period of 13 years (total life 19 yrs.) to justify the investment of mine infrastructure like CHP, Railway Siding, Workshop and other civil structures. With the proposed annual coal output the average advance rate for the quarry works out to be about 125m. **COAL EVACUATION** Western flank roads in the quarry (at 30m interval) are proposed to be used for movement of coal to the extent possible. All coal from the quarry are proposed to conveyed to Silo by conveyor systems. The coal production has proposed through surface miner as well as shovel dumper also. A Coal handling plant has been proposed inside quarry/surface near quarry mouth to cater entire production either through surface miner or shovel dumper and accordingly facilities of receiving, crushing, storage & loading /conveying arrangement has been envisaged. Two options have been worked out- **Option I**-Entire 20 MTY coal to be dispatched through 2 silos located at proposed siding in Mc Luskiganj-Piparwar line to the west of the quarry. **Option II**- 13.5 MTY coal to be dispatched through 2 silos located at proposed siding in Mc Luskiganj-Piparwar line to the west of the quarry and remaining 6.5MTY to be fed to Piparwar washery through belt conveyors.

	Parameters	Details
		OVERBURDEN TRANSPORT Due to high annual mine advance rate large fleet of overburden transport equipment are required. However, as all the overburden removed from the quarry will be accommodated within the internal dumps of existing Ashok OCP dump and Internal dump of Proposed quarry only, there will be no need for the OB loaded dumpers to come out of the quarry. OB dumpers will utilize the nearest dump benches to reach the internal dump so as to minimize dumper movement thereby reducing overall fleet size. Initial OB dumping is proposed in the quarry leaving a gap of nearly 200 m to accommodate the conveyor belts of coal transportation. **APPLICATION OF SURFACE MINER** Surface miners are a specialized mining machines that eliminates drilling, blasting and subsequent crushing as the cutting drums break and size rock. These machines can discharge onto conveyor belts or directly load trucks or work in windrowing mode, in which machines cut the material and leave the material on the floor/ cut face as it is, to be loaded by FE loader on dumpers for transport from mines to loading conveyors. **APPLICABILITY OF SURFACE MINER AT ASHOK EXPANSION OPENCAST (20.0 MTY)** Surface Miners are in use for coal winning in neighbouring Ashok and Piparwar mines since long with outsourcing mode. Departmental operation of surface miner in coal benches at Ashok Opencast are proposed in response of improvement in technology and proposed coal evacuation arrangements. The advantages of surface miners include: • Continuous mining method subject to the availability of face. • Low environmental impact from vibration and dust due to elimination of blasting. • Selective mining possible in stratified deposits such as coal. • No drill and blast costs. • Primary crushing and fragmentation of product, i.e., Product is of right size range with no additional costs for crushing required. • Less stress on trucks due to minimum impact of the excavated material during loading.

	Parameters	Details
		DRILLING AND BLASTING OPERATIONS RBH drill of 250 mm/160mm dia. are envisaged for drilling in OB and coal seam. Elements of drilling and blasting of OB and coal would be decided during actual course of mining. Specific consumption of explosives in OB and coal is envisaged as 0.30 kg/cum and 0.20 kg/cum respectively. • Production scheduling Years | 1 | 2 | 3 | 4 | 5 Coal | 3.30 | 7.00 | 12.00 | 17.00 | 20.00 OB | 10.33 | 19.89 | 34.07 | 48.26 | 55.31 The mine is proposed to achieve its target production in fifth year. The Calendar Programme of Excavation is given for all the three variants considering adopted sequence of opencast mine field development at optimum conditions of mining operations for the entire life of Ashok Opencast Mine. The total mineable reserves have been estimated as 324.84 M.tes corresponding to a volume of OBR of 813.13 Mcum at an average stripping ratio of 2.5 cum/te. The rated output of 20.0 MTY would be achieved in 5th year. • Equipment configuration The OB benches are proposed to be excavated by Electric Hyd. Shovel 20-22 cum +190 T RD and Electric/Diesel hyd. Shovel of 10-12 cum + 100T RD. For the estimation of the dumper population, the lead for OB transportation has been considered for each year and for each bench. For coal production, Surface Miner (950 HP) with 10-12 cum FE loader and 100T RD have been envisaged. Diesel hydraulic backhoe (4.5-5.5 cum) in coal and additional capacity of diesel hydraulic shovel (10-12 cum) in OB removal may be used for coal winning operation. For the estimation of the dumper population, the lead for coal transportation has been considered for each year and for each seam. Productivity of the dozers, FE loader and backhoe provided in common category has not been considered while calculating the capacity requirement of HEMM for the mine.

	Parameters	Details
		MINE BOUNDARIES **Southern Boundary:** The quarry surface boundary in the south has been fixed leaving a barrier of 20 m from the northern leasehold boundary of Purnadih OCP (3.0 MTY). **Northern Boundary:** The northern quarry surface boundary has been fixed leaving a barrier of 100 m from the Piparwar Mcluskiegunj railway line. **Eastern Boundary:** The eastern boundary has been fixed along the western limit of existing Ashok OCP (10MTY) including batter of existing Ashok OCP to eliminate inter quarry barrier. It merges with the existing Ashok OCP(10.0MTY) working. **Western Boundary:** The western quarry surface boundary has been fixed leaving a barrier of 100 m from the Piparwar Mcluskiegunj railway line. This proposal of Ashok Expansion OCP (20.0 MTY) envisages three variants of mine operation & capital investment for consideration and to take investment decision. **Variant –I** The option envisages total coal production, OB removal and Reclamation to be carried out departmentally. **Variant- II** Coal and OB removal up to the roof of Upper Dakra Seam by Departmental means and Coal & OB above Upper Dakra outsourced. Reclamation too is outsourced in this variant. **Variant- III** Total Coal, OB and Reclamation outsourced Coal transportation is proposed to be carried out through western flank of the quarry. Batter roads are designed at an interval of 30m height and all coal faces are proposed to be merged with the batter roads as per working horizon.

	Parameters	Details
		Apart from this a haul road on floor is also provided in the western edge of the quarry on the floor of Bottom Lower Dakra seam with a gradient of 1 in 16. Coal from lower benches may be transported to higher batter roads using ramps (1 in 10). It is proposed to transport all coal from the quarry to loading silo by means of conveyor arrangements. It is proposed that no dumper with loaded coal should come out of the mine hence truck less transportation of the coal transportation is envisaged. OB is proposed to be removed by Shovel Dumper method using drilling and blasting. OB from this mine is proposed to be transported by eastern flank only. Considering the existing dump of adjoining Ashok OCP(10.0MTY) it is proposed to increase the height of the existing internal dump of Ashok OCP(+460m) to +520m RL. Each dump deck/horizon is 30m height and road width taken as 40m. Internal dumping in proposed mine begin from third year onwards. The entire mine has been divided into six sectors for ascertaining the seam encountered at different stages along with quarry surface and OB volume. Considering the yearly rate of advance, total strike length and total coal thickness, the mine has planned for a rated capacity of 20.0Mtpa. **Summarised Calendar Programme is given below:**

Years		Coal (MT)	OB(Mcum)	SR(Cum/T)
Y1	Production built-up	3.30	10.33	3.13
Y2		7.00	19.89	2.84
Y3		12.00	34.07	2.84
Y4		17.00	48.26	2.84
Y5	Target Production	20.00	55.31	2.77
Y6		20.00	49.55	2.48
Y7		20.00	49.55	2.48
Y8		20.00	49.55	2.48
Y9		20.00	49.81	2.49
Y10		20.00	49.97	2.50
Y11		20.00	58.26	2.91
Y12		20.00	58.77	2.94
Y13		20.00	45.26	2.26
Y14		20.00	45.63	2.28
Y15		20.00	44.17	2.21
Y16		20.00	44.17	2.21
Y17		20.00	44.17	2.21
Y18	Tapering Period	15.00	33.12	2.21
Y19		10.54	23.28	2.21
TOTAL		324.84	813.13	2.50

	Parameters	Details
		• **Location of Mine Opening:** Mine is proposed to open near the Bore Hole NNKA-163 (surface RL-462.99m). It's the point where base seam, Bottom lower Dakra incrops and it's the highest elevation in the rise side of the quarry boundary. **Mining system (geometry and bench parameters and its sequence of development) :**

Sl. No.	Particular	Unit	Value
1	OB Bench Height working for 20-22 cum shovels	m	15-18
2	OB Bench Height working for 10-12 cum shovels	m	10-12
3	Coal Bench Height working for Surface Miner	m	8-10
4	Working bench width for Shovel	m	60
5	Working bench width for Surface Miner	M	60
6	Non - Working bench width	m	40
7	Bench Slope for OB and coal	Deg	70
8	Haul Road width	m	30-35
9	Maximum Dump height of individual deck/layer	m	30
10	Blast Hole dia. for OB and coal	mm	160/250
11	Powder Factor in OB and coal	Kg/cum	0.3-0.4 & 0.2

Proposed mining system at different stage of mine operation are marked in the seam cross section plan. The mine is proposed to be worked by inclined slicing method.

	Parameters	Details

Quarry parameters:

1	Max strike length along surface	km	3.86
2	Max strike length along floor	km	3.59
3	Max dip rise length along surface	km	3.43
4	Max dip rise length along floor	km	3.17
5	Maximum depth of the quarry	m	170
6	Surface quarry area	Ha.	1092.17
7	Quarry Floor area	Ha	9416.68
8	Average specific gravity of coal	t/cum	1.64
9	Average grade of coal (GCV)	Kcal/kg	4203

Thickness of Seams and parting:

Sl. No.	Particulars	THICKNESS RANGE		Average Value
		From	To	
I	Seam Thickness			
1	Bottom Lower Dakra	0.24	3.46	1.85
2	Middle Lower Dakra	2.45	11.46	6.96
3	Top Lower Dakra	0.6	4.3	2.45
4	Upper Dakra	0.5	4.54	2.52
5	Bukbuka Lower Bottom	0.7	3.15	1.93
6	Bukbuka Lower Top	0.81	5.41	3.11
7	Upper Bukbuka Bottom	0.11	3.7	1.91
8	Upper Bukbuka Top	0.34	1.92	1.13
9	Bukbuka Top	0.57	6.22	3.40
10	Lower Bishrampur Bottom	0.51	1	0.76
11	Lower Bishrampur Top	0.28	2.1	1.19
12	Upper Bishrampur	0.25	4.44	2.35
13	Karkata	2.38	6.31	4.35
14	K1	0.33	2.03	1.18
15	K2	0.5	2.42	1.46
II.	Seam Gradient			6-8 deg
III	Specific Gravity of the seams			1.55-1.70
IV	Excavation Category of coal			III
V	**Parting/Overburden Thickness**			
1	Bottom Lower Dakra-Middle Lower Dakra	8.5	25.6	17.05

	Parameters	Details				
		2	Midle Lower Dakra-Top Lower Dakra	0.00	16.95	8.475
		3	Top Lower Dakra - Upper Dakra	0.48	16.65	8.565
		4	Upper Dakra - Bukbuka Lower Bottom	4.38	31.03	17.705
		5	Bukbuka Lower Bottom - Bukbuka Lower Top	0.65	29.31	14.98
		6	Bukbuka Lower Top - Upper Bukbuka Bottom	7.90	43.26	25.58
		7	Upper Bukbuka Bottom - Upper Bukbuka Top	0.95	3.50	2.225
		8	Upper Bukbuka Top - Bukbuka Top	3.95	17.38	10.665
		9	Bukbuka Top-Lower Bishrampur Bottom	3.39	20.58	11.985
		10	Lower Bishrampur Bottom-Lower Bishrampur Top	0.50	4.80	2.65
		11	Lower Bishrampur Top-Upper Bishrampur	3.39	20.58	11.985
		12	Upper Bishrampur-Karkata	4.55	18.73	11.64
		13	Karkata -K1	4.98	2.03	3.505
		14	K1-K2	1.25	14.98	8.115
		15	Top OB			
		VI	Excavation Category of OB			Cat.III+Cat IV
		VII	OB Volume weight			2.40 (approx.)

Stage wise dump Schedule:

Year of Dumping	1	3	5	10	15	Final
Coal(MT) Progressive	3.30	22.30	59.3	159.3	259.3	324.84
OB(Mcum)-Progressive	10.54	64.30	167.87	416.31	668.40	812.09
Area of Excavation(Ha)	76.19	401.16	5783.58	7923.28	1031.73	1092.17
Internal(Mcum)	8.26	64.30	167.87	416.31	668.40	812.09
External	NIL					
Dump Area(Ha)	36.46	2621.594	4321.55	6641.11	9452.46	1058.64
Dump Height	30m	30-90	30-130	60-110	60-140	60-170

Internal Dumping starts from 3rd year itself.

	Parameters	Details
3.1.3	Coal production capacity proposed "Mtpa"	20.0 Mtpa
3.1.4	Justification for optimization Coal production capacity	Considering 1. Strike length of the quarry 2. Dip rise length of the Quarry 3. Total thickness of coal seams at various stages 4. Annual rate of advance of nearly 125m The capacity of the mine has been fixed at 20.0MTY
3.1.5	Calendar year from which the production will start	First year
3.1.6	Year of Achieving rated production	Fifth year
3.1.7	Tentative Coal Production Plan "MT"	

Detail calendar Programme of the mine

Seam abbreviations used the tables.

BLD	:	Bottom Lower Dakra	UBT	:	Upper Bukbuka Top
MLD	:	Middle Lower Dakra	BT	:	Bukbuka Top
TLD	:	Top Lower Dakra	LBIB	:	Lower Bisrampur Bottom
UD	:	Upper Dakra	LBIT	:	Lower Bisrampur Top
BLB	:	Bottom Lower Bukbuka	UBI	:	Upper Bisrampur
BLT	:	Top Lower Bukbuka	KKT	:	Karkata
UBB	:	Upper Bukbuka Bottom	K1	:	K1
K2	:	K2			

	Parameters	Details

	Seams							
Years	K2	K1	KKT	UBI	LBIT	LBIB	BT	UBT
	1	2	3	4	5	6	7	8
1								
2				0.00	0.01	0.02	0.07	0.15
3				0.00	0.02	0.04	0.13	0.26
4				0.00	0.03	0.06	0.18	0.37
5		0.00	0.04	0.04	0.11	0.16	0.26	0.55
6		0.02	0.19	0.21	0.40	0.51	0.45	1.01
7		0.02	0.19	0.21	0.40	0.51	0.45	1.01
8	0.02	0.07	0.47	0.26	0.48	0.60	0.60	0.89
9	0.04	0.10	0.64	0.29	0.53	0.66	0.69	0.81
10	0.04	0.10	0.64	0.29	0.53	0.66	0.69	0.81
11	0.23	0.45	1.70	0.59	0.79	0.96	0.44	0.81
12	0.24	0.47	1.76	0.61	0.81	0.98	0.42	0.81
13	0.49	0.59	1.68	0.71	0.67	0.82	0.43	0.65
14	0.49	0.59	1.68	0.71	0.67	0.82	0.43	0.65
15	0.51	0.60	1.67	0.72	0.66	0.81	0.43	0.64
16	0.51	0.60	1.67	0.72	0.66	0.81	0.43	0.64
17	0.51	0.60	1.67	0.72	0.66	0.81	0.43	0.64
18	0.39	0.45	1.25	0.54	0.49	0.61	0.32	0.48
19	0.27	0.32	0.88	0.38	0.35	0.43	0.23	0.34
Total,	3.75	4.96	16.12	7.03	8.25	10.27	7.07	11.54

Seams							
UBB	BLT	BLB	UD	TLD	MLD	BLD	Total Coal Production(Mtpa)
9	10	11	12	13	15	15	Total (1 to 15)
				0.06	2.40	0.84	3.30
0.46	0.66	0.17	0.39	1.29	3.20	0.57	7.00
0.79	1.14	0.30	0.68	2.23	5.46	0.95	12.00
1.12	1.62	0.42	0.96	3.16	7.74	1.35	17.00
1.57	1.90	0.55	1.10	3.51	8.70	1.51	20.00
2.56	1.87	0.75	0.97	2.71	7.13	1.22	20.00
2.56	1.87	0.75	0.97	2.71	7.13	1.22	20.00
2.31	1.77	0.76	0.90	2.63	6.97	1.27	20.00
2.15	1.71	0.77	0.86	2.58	6.88	1.31	20.00
2.15	1.71	0.77	0.86	2.58	6.88	1.31	20.00
2.06	1.58	0.93	0.76	1.79	5.49	1.44	20.00
2.05	1.57	0.94	0.76	1.74	5.41	1.44	20.00
1.66	1.20	0.70	0.93	2.02	5.96	1.49	20.00
1.66	1.20	0.70	0.93	2.02	5.96	1.49	20.00
1.62	1.17	0.68	0.94	2.04	6.01	1.50	20.00
1.62	1.17	0.68	0.94	2.04	6.01	1.50	20.00

Parameters	Details

1.62	1.17	0.68	0.94	2.04	6.01	1.50	20.00
1.22	0.87	0.51	0.71	1.53	4.51	1.12	15.00
0.86	0.61	0.36	0.50	1.08	3.17	0.79	10.54
30.04	24.77	11.38	15.10	39.73	111.00	23.83	324.84

Top OB and partings

Years	Top OB	K2-K1	K1-KKT	KKT-UBI	UBI-LBIT	LBIT-LBIB	LBIB-BT	BT-UBT
	1	2	3	4	5	6	7	8
1								
2				0.01	0.09	0.07	1.01	1.14
3				0.02	0.15	0.12	1.74	1.97
4				0.03	0.21	0.17	2.47	2.79
5	0.01	0.03	0.20	0.43	0.45	0.37	4.07	3.44
6	0.03	0.13	0.96	1.99	1.25	1.05	8.63	4.06
7	0.03	0.13	0.96	1.99	1.25	1.05	8.63	4.06
8	0.03	0.13	0.96	1.99	1.25	1.05	8.63	4.06
9	0.79	0.88	2.18	2.84	1.44	0.94	7.74	3.64
10	1.26	1.35	2.94	3.37	1.55	0.87	7.19	3.38
11	5.37	3.06	4.98	5.00	1.76	0.71	7.82	3.78
12	5.62	3.17	5.11	5.10	1.77	0.70	7.86	3.81
13	10.18	2.84	2.46	3.16	0.99	0.25	4.47	2.77
14	10.55	2.84	2.46	3.16	0.99	0.25	4.47	2.77
15	10.55	2.82	2.25	3.00	0.93	0.22	4.20	2.68
16	10.55	2.82	2.25	3.00	0.93	0.22	4.20	2.68
17	10.55	2.82	2.25	3.00	0.93	0.22	4.20	2.68
18	7.91	2.11	1.69	2.25	0.70	0.16	3.15	2.01
19	5.56	1.48	1.18	1.58	0.49	0.11	2.21	1.41
Total	78.96	26.59	32.84	41.94	17.13	8.52	92.68	53.14

Top OB and parting

UBT-UBB	UBB-BLT	BLT-BLB	BLB-UD	UD-TLD	TLD-MLD	MLD-BLD	Total OB (Mcum)
9	10	11	12	13	14	15	Total (1 to 15)
				0.73	5.51	4.09	10.33
0.43	2.04	1.04	5.77	2.78	2.72	2.81	19.89
0.74	3.52	1.80	9.99	4.78	4.51	4.72	34.07
1.05	4.99	2.56	14.15	6.77	6.39	6.69	48.26
1.13	5.58	2.70	15.12	7.22	6.84	7.72	55.31
0.73	4.45	1.51	9.16	4.30	4.19	7.12	49.55
0.73	4.45	1.51	9.16	4.30	4.19	7.12	49.55
0.73	4.45	1.51	9.16	4.30	4.19	7.12	49.55
0.55	4.82	1.10	9.09	4.03	3.69	6.09	49.81
0.43	5.05	0.84	9.04	3.86	3.38	5.45	49.97
0.30	4.31	0.76	8.65	3.14	3.38	5.25	58.26
0.29	4.26	0.75	8.62	3.09	3.38	5.23	58.77
0.18	2.05	0.43	6.46	2.41	2.21	4.40	45.26

0.18	2.05	0.43	6.46	2.41	2.21	4.40	45.63
0.17	1.87	0.40	6.28	2.35	2.11	4.33	44.17
0.17	1.87	0.40	6.28	2.35	2.11	4.33	44.17
0.17	1.87	0.40	6.28	2.35	2.11	4.33	44.17
0.13	1.40	0.30	4.71	1.76	1.59	3.25	33.12
0.09	0.98	0.21	3.31	1.24	1.11	2.28	23.28
8.20	60.00	18.67	147.70	64.16	65.85	96.76	813.13

Summarised calendar Programme for entire mine life

Years	Total Coal	Total OB	SR(cum/T)
1	3.30	10.33	3.13
2	7.00	19.89	2.84
3	12.00	34.07	2.84
4	17.00	48.26	2.84
5	20.00	55.31	2.77
6	20.00	49.55	2.48
7	20.00	49.55	2.48
8	20.00	49.55	2.48
9	20.00	49.81	2.49
10	20.00	49.97	2.50
11	20.00	58.26	2.91
12	20.00	58.77	2.94
13	20.00	45.26	2.26
14	20.00	45.63	2.28
15	20.00	44.17	2.21
16	20.00	44.17	2.21
17	20.00	44.17	2.21
18	15.00	33.12	2.21
19	10.54	23.28	2.21
Total	**324.84**	**813.13**	**2.50**

3.1.8	**Rated Capacity "Mtpa"**	
	- By OC	20.0Mtpa
	- By UG	-
	- Overall	20.0Mtpa
3.1.9	**Life of the mine: "Years"**	
	- By OC	19
	- By UG	-
	- Overall	19
3.1.10	Whether the proposed external OB dump site is coal/ lignite	Proposed OB dump site is within the decoaled area of Existing Ashok OCP(10.0(MTY) and Decoaled Proposed Ashok OCP(20.0MTY)

	Parameters	Details
	bearing: If so, whether coal/lignite below waste disposal area is extractable.	
3.1.11	Whether negative proving for coal / lignite in the proposed site for OB dump/ infrastructure has been done.	Not required

3.1.12 Type of Equipment/ HEMM proposed

Variant I-Coal, OB and Reclamation all departmental

HEMM	Capacity	Max	Capacity build-up				Target
			1	2	3	4	5
OB							
Elect/Diesel Hyd Shovel	20-22 Cum	5	1	2	4	5	5
Rear Dumper	190 T	53	2	14	25	36	42
Electric RBH Drill	250 mm	5	1	2	4	5	5
Elect/Diesel Hyd Shovel	10-12 Cum	10	4	4	6	8	9
Rear Dumper	100 T	99	24	27	47	70	85
Diesel RBH Drill	160 mm	10	4	4	6	8	9
Dozer	410 HP	15	1	2	4	5	5
Coal							
Surface Miner	950 HP	7	1	3	5	6	7
FE Loader	10-12 Cum	6	1	2	4	5	6
Rear Dumper	100 T	33	5	10	18	23	33
Dozer	410 HP	7	1	3	5	6	7
Diesel Hyd Backhoe	4.5-5.5 Cum	2	1	2	2	2	2
Diesel RBH Drill	160 mm	2	1	2	2	2	2
Common							
Diesel Hyd Backhoe	2-3 Cum	2	2	2	2	2	2
FE Loader	5-6 Cum	2	2	2	2	2	2
Dump Truck	10 T	2	2	2	2	2	2
Drill	110-120 mm	2	1	1	1	1	2
Grader	250-280 HP	3	1	2	2	2	3
Wheel Dozer	460 HP	3	1	2	2	2	3
R T Crane	40T	1	1	1	1	1	1
R T Crane	20T	2	1	1	1	2	2
Mobile Crane	8-14T	2	1	1	1	2	2
Dozer with Ripper Attachment	750-850 HP	2	1	1	1	1	2
Cable Handler		1	1	1	1	1	1
Tyre Handler	35 kN	2	1	1	2	2	2
Water Sprinkler	70KL	3	1	2	3	3	3
Reclamation							
Water Sprinkler	70 kL	2	1	1	2	2	2
FE Loader	5-6 Cum	3	1	1	2	2	3
Dumper	60 T	6	3	3	4	4	6
Dozer	410 HP	3	1	1	2	2	3

Parameters	Details

Var II-Coal & OB upto upper Dakra includind lower Dakra & parting, departmental and coal and OB above upper Dakra outsourced, Reclamation outsourced

HEMM	Capacity	Max	Capacity build-up				Target
			1	2	3	4	5
OB							
Elect/Diesel Hyd Shovel	20-22 Cum						
Rear Dumper	190 T						
Electric RBH Drill	250 mm						
Elect/Diesel Hyd Shovel	10-12 Cum	8	4	4	6	8	8
Rear Dumper	100 T	73	28	24	43	63	73
Diesel RBH Drill	160 mm	8	4	4	6	8	8
Dozer	410 HP	8	4	4	6	8	8
Coal							
Surface Miner	3800MM	5	1	2	4	5	5
FE Loader	10-12 Cum	5	1	2	3	4	5
Rear Dumper	100 T	25	5	8	14	21	25
Dozer	410 HP	5	1	2	4	5	5
Diesel Hyd Backhoe	4.5-5.5 Cum	1	1	1	1	1	1
Diesel RBH Drill	160 mm	1	1	1	1	1	1
Common							
Diesel Hyd Backhoe	2-3 Cum	1	1	1	1	1	1
FE Loader	5-6 Cum	1	1	1	1	1	1
Dump Truck	10 T	1	1	1	1	1	1
Drill	110-120 mm	1	1	1	1	1	1
Grader	250-280 HP	1	1	1	1	1	1
Wheel Dozer	460 HP	1	1	1	1	1	1
R T Crane	40T	1	1	1	1	1	1
R T Crane	20T	1	1	1	1	1	1
Mobile Crane	8-14T	1	1	1	1	1	1
Dozer with Ripper Attachment	750-850 HP	1	1	1	1	1	1
Cable Handler		1	1	1	1	1	1
Tyre Handler	35 kN	1	1	1	1	1	1
Water Sprinkler	70KL	1	1	1	1	1	1
Reclamation-Outsourced							

	Parameters	Details

Variant III-Coal, OB and Reclamation all outsourced

HEMM	Capacity	Max	Capacity build-up				Target
			1	2	3	4	5
OB-Outsourced							
Coal-Outsourced							
Common							
Diesel Hyd Backhoe	2-3 Cum	1	1	1	1	1	1
FE Loader	5-6 Cum	1	1	1	1	1	1
Dump Truck	10 T	1	1	1	1	1	1
Drill	110-120 mm	1	1	1	1	1	1
Grader	250-280 HP	1	1	1	1	1	1
Wheel Dozer	460 HP	1	1	1	1	1	1
Mobile Crane	8-14T	1	1	1	1	1	1
Dozer with Ripper Attachment	750-850 HP	1	1	1	1	1	1
Tyre Handler	35 kN	1	1	1	1	1	1
Water Sprinkler	70KL	1	1	1	1	1	1
Reclamation-Outsourced							

	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.

	Parameters	Details
		ii) The owner, agent and manager shall provide adequate 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.

	Parameters	Details
		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 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.

	Parameters	Details
		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. 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

	Parameters	Details
		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 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

	Parameters	Details
		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 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

	Parameters	Details
		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 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.

	Parameters	Details
		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 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.

	Parameters	Details
		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. 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

	Parameters	Details
		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. Blasting in fire area 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.

	Parameters	Details
		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. xii)No person including a shot firer shall take shelter within 100m of the quarry opening. Such shelter shall be 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.

	Parameters	*Details*
		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.

<table>
<tr><th></th><th>Parameters</th><th>Details</th></tr>
<tr><td>5.1</td><td>Mine infrastructure required e.g. Equipment maintenance planning, Office buildings, Workshop, Power supply arrangement, Water supply etc.</td><td>
Planning of project workshop and store has been done based on a comprehensive maintenance and repair program to achieve the high level of equipment availability, reliability and longer life. Maintenance and repair load of project workshop has been assessed on the basis of annual operating time, inter repair period, life of the equipment/ assemblies/ sub-assemblies, weight and size of the equipment/ assemblies/ sub-assemblies, man-hours required per repair/ maintenance, etc.

Main Workshop Var I
<table>
<tr><th>Major Shops</th><th>Shop Size</th><th>Equipment name</th><th>No of bays</th><th>Bay Size</th><th>Bracket height</th><th>EOT Crane capacity</th></tr>
<tr><td>Dumper Repair & Maintenance Shop</td><td>204m x 60m</td><td>190T/100T dumper</td><td>34</td><td>12m x 18m</td><td>13 m</td><td>2no. (45/5) te. & 1 no. (10/2) te</td></tr>
<tr><td>Dozer Repair Shop</td><td>24mx 48m</td><td>Dozer</td><td>4</td><td>12mx 14m</td><td>8.5m</td><td>1 no. 15/2 te</td></tr>
<tr><td>Face Eqpt Repair Shop</td><td>24m x 50m</td><td>Shovel</td><td>5</td><td>10m x 12m</td><td>10m</td><td>1 no. 10/2 te</td></tr>
</table>
Main Workshop Var II
<table>
<tr><th>Major Shops</th><th>Shop Size</th><th>Equipment name</th><th>No of bays</th><th>Bay Size</th><th>Bracket height</th><th>EOT Crane capacity</th></tr>
<tr><td>Dumper Repair & Maintenance Shop</td><td>90m x 60m</td><td>100T dumper</td><td>18</td><td>10m x 18 m</td><td>11.5 m</td><td>1no. (25/5) te. & 1 no. (10/2) te.</td></tr>
<tr><td>Dozer Repair Shop</td><td>24mx 36m</td><td>Dozer</td><td>3</td><td>12mx 14m</td><td>8.5m</td><td>1 no. 15/2 te</td></tr>
<tr><td>Face Eqpt Repair Shop</td><td>24m x 36m</td><td>Shovel</td><td>3</td><td>12m x 12m</td><td>10m</td><td>1 no. 10/2 te</td></tr>
</table>
E&M workshop
<table>
<tr><th>Major Shops</th><th>Shop size</th><th>Bracket height</th></tr>
<tr><td>E&M Repair Complex (Variant -I)
E&M Repair Complex (Variant -II)</td><td>172 m x 60m
133m x 57m</td><td>6m
6m</td></tr>
<tr><td>E&M Repair Complex (Variant -III)</td><td>-</td><td>6m</td></tr>
</table>
</td></tr>
</table>

The life of expansion of Ashok OCP has been estimated as 19 years. For service and welfare buildings, temporary type of construction has been proposed. Details of service buildings and welfare buildings are given below.

	VARIANT-I	VARIANT-II	VARIANT-III
	Plinth Area (m^2)	Plinth Area (m^2)	Plinth Area (m^2)
OFFICE			
P.O. OFFICE	1430	1190	880
SITE OFFICE	100	100	100
TOWN ADMINISTRATION OFFICE	50	50	50
STATUTORY BUILDINGS			
FIRST AID CENTRE	17	17	17
REST SHELTER	39	39	39
TOILET	30	30	30
CANTEEN	266	245	106
FIRE FIGHTING STATION	200	200	200
COMMUNITY BUILDINGS			
COMMUNITY HALL	450	450	450
OFFICERS' CLUB	380	380	158
SHOPPING CENTRE	1380	900	390
GARAGE	502	468	408
CYCLE STAND	837	580	275
DISPENSARY	280	280	160
BUS SHEDS	92	92	92
WORKERS' INSTITUTE	341	341	341
POST OFFICE	56	56	56
BANK	202	202	202
SCHOOL	484	484	277
OFFICERS' REST HOUSE	276	276	224
STAFF REST HOUSE	284	284	189
TRAINING CENTER	246	246	74

5.2	Power Supply and illumination	**POWER SUPPLY AND ILLUMINATION** Ashok OCP, having substantial coal reserve, is under the administrative control of Piparwar Area of CCL. Coal mining operation will require deployment of a number of large coal mining equipment and other auxiliary installations like dewatering pumps, coal handling plant, workshops etc. It is estimated that total power demand for Ashok OCP, for a planned production capacity of 20 MTY mining, will be around 15 MVA. Considering the load of HEMMs, CHP, Pumping, Illumination and other common loads envisaged for the project, two nos. of 2X10 MVA 33/6.6kV substation has been envisaged for fulfilling the power requirement of the project. The sub-Station-I shall receive power at 33 kV by taping to the incomers of the existing feeders of Ashok OCP and sub-station-II shall receive power from two nos. of independent 33 kV feeder from CCL central Switching station at Piparwar located at around 8 km. It is envisaged that the proposed 33/6.6 kV, 2X10 MVA substations to be installed for mining operation will have provision for 2 nos. incoming 33 kV feeders and 10/08 nos. outgoing 6.6 kV feeders as per requirement and 02/02 nos. of capacitor banks. The transformers for the substation have been selected considering maximum demand of the project at overall power factor of 0.98, and 100 % stand-by transformation capacity. The transformers of the substation shall be provided with NGR to limit the neutral current as required by statutory provisions. 33 kV VCBs shall be used for primary control of the 33/6.6 kV transformers and incoming 33 kV feeders. Necessary CTs and PTs shall also be provided. Outdoor type 6.6 kV VCBs will be used for secondary control of transformers, control of 6.6 kV outgoing feeders, bus-coupler and capacitor bank control. Necessary protections against over current, short circuit and earth fault for all incoming and outgoing circuit breakers and transformers has also been envisaged. To maintain power factor at 0.98, capacitor bank of suitable capacity with automatic power factor correction relay shall be provided. Necessary provision of automatic fire protection of transformers along with portable fire extinguishers has been envisaged for fire protection in the substations. These substations shall be installed near the quarry at suitable location for supply of power to different equipment of the project.

Illumination of the mine shall be done with LED luminaries, fixed on pole, fixed towers and mobile towers. Indoor illumination also will be done with LED fixtures.

For illumination of service/permanent haul roads, pole mounted LED luminaires of suitable wattage have been envisaged. Illumination of quarry general area/dump area will be done by LED lamp in flood light fixtures mounted on lighting towers. Sufficient no. of 25/10 kVA, 6.6 kV / 0.23 kV (L - L) transformers have been envisaged for mine lighting.

5.3 Drainage & Pumping : Assessment of Volume of Water for Pumping, Pumping Capacity and Pump Selection

Drainage& pumping

The pumping system of Ashok OCP of CCL has been designed for Var-I&II to dewater the inflow of water due to precipitation within the active pit limit during the monsoon and non-monsoon season and the ground water discharged from aquifers to enable the mining activity to continue round the year. In Variant-III, both coal winning and OB removal are outsourced; hence, no pumping provision has been made.

Assessment of volume of water for pumping

Maximum daily rainfall from probability curve is 0.148 m

Sl. No.	Particulars	Unit	1st year	5th year	10th year	15th Year	Final year
1	Total make of water	m^3	62477	244713	319780	483293	473614

Pumping capacity

(considering water to be pumped out in 100 hrs / 5 days)

Sl. No.	Particulars	Unit	1st year	5th year	10th year	15th Year	Final year
1	Pumping Capacity required	Cum/hr	625	2447	3198	4833	4736
		Litres/sec	174	680	888	1342	1316
2	Selected Pumping Capacity	Cum/hr	540	540	540	540	540
		Litres/sec	150	150	150	150	150
3	CALCULATED HEAD	m	41	119	173	155	178
4	Pump specification (lpsxhead)		150x200	150x200	150x200	150x200	150x200
5	Number of pumps required (working)		1	5	6	9	9
	- Stand by	No.	1	1	2	2	2
	Total Main Pumps required	No.	2	6	8	11	11

Pump Selection

SL.NO.	ITEMS	QUANTITY
1	Main Pump , 540 m^3/hr (150 lps), 200 m head, 500kW	11 Nos. (9 working + 2 standby)
2	137 m^3/hr (38 lps), 60 m head, 37 kW	03 Nos. As and when required.
3	Face Pump, 54 m^3/hr (15 lps), 60m head, 22.5 kW	06 Nos.(4working + 2 standby)
4	Slurry pump, 101 m^3/hr (28 lps), 28m head, 37 kW	06 Nos.(4working + 2 standby)
5	Diesel Pumps, 274 m^3/hr (76 lps), 200m head	02 Nos.
6	Pipefittings, bends, armoured suction, delivery hoses etc. Pipes are of 350,300,200,150 &100 mm nominal diameter.	LS

5.4	Coal Handling Arrangement: Brief detail of the CHP/ Mode of Dispatch, Coal quality and Coal staking and handling arrangement	The coal production has proposed through surface miner as well as shovel dumper also. A Coal handling plant has been proposed inside quarry/surface near quarry mouth to cater entire production either through surface miner or shovel dumper and accordingly facilities of receiving, crushing, storage & loading /conveying arrangement has been envisaged. Two options have been worked out **Option I**- Entire 20 MTY coal to be dispatched through 2 silos located at proposed siding in McLuskiganj-Piparwar line to the west of the quarry. **Option II**- 13.5 MTY coal to be dispatched through 2 silos located at proposed siding in McLuskiganj-Piparwar line to the west of the quarry and remaining 6.5MTY to be fed to Piparwar washery through belt conveyors.

SYSTEM DESCRIPTION

The CHP will have the following functional units as shown in the key plan of CHP.

- Semi mobile crushing plant for ROM shovel dumpers & secondary crushing plant
- Four no. of reclaim feeders of 1600tph each
- Ground storage bunkers of 35000 te capacity & Reclamation
- Loading of coal through two no of 4000 te capacity Silo & RLS.
- Loading of sized /Crushed coal (-100mm) through Silo &RLS
- Dust control system
- Dust suppression system
- Noise control system
- Fire Protection system
- Plant cleaning system
- Plant preventive maintenance
- Weighment

PLANT DESCRIPTION

Coal produced through blasting will be about 4.0 MTY. as such one no. of semi mobile Sizing plant having nominal capacity of 1200 TPH have been envisaged in the quarry for receiving, crushing, after primary crushing coal shall be fed to secondary crushing plant and finally coal will come to surface bunker through belt conveyors. The coal will be crushed up to (-) 100 mm size in two stages by primary and secondary sizers.

For coal produced through surface miner (-100 mm size), four nos. of reclaim feeders have been envisaged in the quarry floor to receive coal produced through surface miners. Two nos. of conveyors each having nominal capacity 3200 tph and 1800 mm width have been provided. The surface miner coal and -100 mm crushed coal will be fed to tripper conveyors. This coal from tripper conveyors will spread and stored in ground bunker of 35,000 te Capacity.

Below the bunker slits opening reclaim conveyors are provided to collect coal reclaimed through plough feeders. The nominal capacity of the each reclaim conveyors and plough feeders shall be of 3000 tph and widh 1800 mm. Bunker have been provided with six nos. of plough feeders.

Reclaim conveyors shall feed coal to silo loading belt conveyors which shall finally feed to 4000te 2 no silos.

		For the purpose of Weighment of coal handling and dispatched in the CHP, sufficient no of belt weighers of suitable capacity have been provided in each receiving and despatch circuit of the CHP conveyors. **RAILWAY SIDING** The proposed railway siding has been proposed in the existing McLuskiganj-Piparwar line to the west of the quarry. Necessary rail lines approx. five lines in the link/yard has been envisaged to accommodate two nos. Silo for loading of coal into railway wagons through RLS.
5.5	Coal washing and the proposed handling/ disposal of rejects.	**NA**

	Parameters	*Details*
6.1	**LAND REQUIREMENT**	
6.1.1	Total Land requirement for the mine in "Ha"	***Break up of pre-mining land type*** (indicative) ***and source of data.***

Land Type		Area (Ha.)
Tenancy	Agricultural	456.80
	Township	
	Grazing	
	Barren	
	Water Bodies	
	Road	
	Community/other use	
Govt Non Forest	Agricultural	66.80
	Township	
	Grazing	
	Barren/other use	
Forest	Reserve	1267.45
	Protected	
	GMJJ	
FreeHold		
Total		**1791.05**
Land in physical possession	Running Ashok OCP	654.11

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	1605.84								0
Backfilled Area		1142.10		1049.46		92.63			1142.098
Excavated Void		463.74			401.69	62.05			463.74
Without plantation									0
Top Soil Dump									0
External Dump									0
Safety Zone/Green Belt	119.37	119.37		119.37					119.37
Haul Road between quarries									0
Road diversion									0
Diversion/ below River/Nala/canal									0

	Parameters	Details								
	Settling pond									0
	Road & Infrastructure area	32.32	32.32		32.32					32.32
	Rationalization area	8.5	8.5		8.5					8.5
	Garland drains									0
	Embankment									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	**1766.03**	**1766.03**	**0.00**	**1209.65**	**401.69**	**154.68**	**0.00**	**0.00**	**1766.03**
6.1.3	Surface features over the block area	Existing Piparwar Macluskigung Railway Line and Villages								
6.1.4	No. of villages/Houses to be shifted	Ten villages and some hutments 1.Saraiya,2. Lukaiya,3. Jhulundia,4. Henjda, 5.Torhad, 6. Kutki,7. Koilera,8. Thethangi,9. Chirlunga and 10. Bali								
6.1.5	Population to be affected by the project	5000 PAF(Approx.)								
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	NA								
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.									
6.2.4	Date of expiry of earlier Mining Lease, if any									
6.2.5	Whether the lease boundary/ required boundary is same as 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									

	Parameters	***Details***
	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)	
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)	

	Parameters	*Details*
7	**ENVIRONMENTAL MANANGEMENT**	
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 as a part of environmental management along with capital provision has been incorporated in Appendix F of this report. In addition to this, a few additional environmental protection measures have been suggested as a part of mine closure activities, as detailed in the section 8.10 in this report.

	Parameters	Details
8.1	***Land Degradation and restoration Schedule***	

8.1.1 Tentative Land Degradation and Technical Reclamation (Commutative Area "Ha")

Year/Stage	Land Degraded Area in Ha					Technically Reclaimed Area				
	Excav	Dump (Extn + Top Soil)	Infra/ others	Total	Remarks	Backfill	Dump (Extn + Top Soil)	Others	Total	Remarks
Up to Base year *	551.18	0	16.35	567.53	1. Total Excavation is in Ashok OCP. Ashok Extension OCP is a virgin patch.	377.08	0.00	0.00	377.08	1. internal dumping in the mine void upto a top R.L. of +460m
Y-1	627.37	0	32.32	659.69		377.08	0.00	0.00	377.08	
Y-3	938	0	32.32	970.32		511.02	0.00	0.00	511.02	
Y-5	1110.824	0	32.32	1143.14		646.10	0.00	0.00	646.10	
Y-10	1326.153	0	32.32	1358.47		798.64	0.00	0.00	798.64	
Y-15	1569.267	0	32.32	1601.59		1035.81	0.00	0.00	1035.81	
Y-19	1605.836	0	32.32	1638.16		1142.10	0.00	0.00	1142.10	
Post Closure										
Y-22	1605.84	0	32.32	1638.16		1142.10	0	32.32	1174.42	

8.1.2 Tentative Biological Reclamation (Cumulative in "Ha")

Year/Stage (Life of the mine plus post closure period)	Biologically Reclaimed Area					Forest land (Return)	Un Disturbed/ To be left for Public/com Use	Total
	Agriculture	Plantation	Water Body	Company Use	Total			
Up to Base year *	0	183.58	54.73	1527.72	**1766.03**	0	0	**1766.03**
Y-1	0	203.93	54.73	1507.37	**1766.03**	0	0	**1766.03**
Y-3	0	206.16	54.73	1505.14	**1766.03**	0	0	**1766.03**
Y-5	0	257.19	54.73	1454.11	**1766.03**	0	0	**1766.03**
Y-10	0	393.41	54.73	1317.89	**1766.03**	0	0	**1766.03**
Y-15	0	796.45	54.73	914.85	**1766.03**	0	0	**1766.03**
Y-19	0	1001.36	54.73	709.94	**1766.03**	0	0	**1766.03**
Post Closure								
Y-22	0	1209.65	401.69		**1611.34**	0	154.69	**1766.03**

<table>
<tr><th></th><th>Parameters</th><th>Details</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>8.2</td><td>Post Closure Water Quality management:</td><td>There are no natural water bodies present within the project boundary. Two artificially created voids filled with water will be created at the stage of post closure. It is proposed to convert 401.79 Ha of Mine void into void filled with water with an ultimate depth of 180 m BGL.
These water bodies will play a key role in the eco-restoration of degraded area.
Water quality monitoring will be carried out quarterly during the post closure stage, as per the CPCB Norms and will be compared with the IS 10500:2012 & 2015. The actual end use and treatment measures, if any required will be decided at the post closure stage depending upon the quality of water.</td></tr>
<tr><td>8.3</td><td>Post Closure Air Quality management</td><td>Air quality monitoring will be carried out throughout the life of mine and at post closure stage to assess the impact of proposed activity on the surroundings.
No. of location of stations shall be fixed as per the MoEFCC norms and prevailing local factors.
Air pollution control measures like development of greenbelt and avenue plantation, mobile water sprinkling along haul roads, fixed water sprinklers at stock yard, Crushers, CHP will be deployed to minimize the impact on surroundings.</td></tr>
<tr><td>8.4</td><td colspan="2">Waste Management (Figures in MM^3) (Tentative)
<table>
<tr><th rowspan="2">Year/Stage
(Life of the mine plus post closure period)</th><th rowspan="2">OB Removal in Mm3
(Cumulative)</th><th colspan="2">External Dump
(Cumulative)</th><th colspan="2">Internal Backfilling
(Cumulative)</th><th colspan="2">Embankment
(Cumulative)</th></tr>
<tr><th>Top Soil</th><th>OB</th><th>Total</th><th>Top Soil</th><th>OB</th><th>Top Soil</th><th>OB</th><th>Top Soil</th><th>OB</th></tr>
<tr><td>Up to Base year *</td><td>5.68</td><td>146.06</td><td>151.74</td><td>0</td><td>0</td><td>2.75</td><td>146.06</td><td>0</td><td>0</td></tr>
<tr><td>Y-1</td><td>6.41</td><td>156.39</td><td>162.80</td><td>0</td><td>0</td><td>3.06</td><td>156.39</td><td>0</td><td>0</td></tr>
<tr><td>Y-3</td><td>9.70</td><td>210.35</td><td>220.05</td><td>0</td><td>0</td><td>3.09</td><td>210.35</td><td>0</td><td>0</td></tr>
<tr><td>Y-5</td><td>11.43</td><td>313.92</td><td>325.35</td><td>0</td><td>0</td><td>3.86</td><td>313.92</td><td>0</td><td>0</td></tr>
<tr><td>Y-10</td><td>13.58</td><td>562.35</td><td>575.93</td><td>0</td><td>0</td><td>5.90</td><td>562.35</td><td>0</td><td>0</td></tr>
<tr><td>Y-15</td><td>16.02</td><td>814.44</td><td>830.46</td><td>0</td><td>0</td><td>11.95</td><td>814.44</td><td>0</td><td>0</td></tr>
<tr><td>Y-19</td><td>16.38</td><td>959.18</td><td>975.56</td><td>0</td><td>0</td><td>15.02</td><td>959.18</td><td>0</td><td>0</td></tr>
<tr><td>Post Closure</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Y-22</td><td>16.38</td><td>959.18</td><td>975.56</td><td>0</td><td>0</td><td>18.14</td><td>959.18</td><td>0</td><td>0</td></tr>
</table>
Total Top soil to be generated is 16.38 Mm3, and this total volume of top soil will be utilized for concurrent biological reclamation of internal dumps and green belt. Around 80 Ha of top soil dump has been proposed on backfilled OB dump for temporary storage of Top Soil.</td></tr>
</table>

	Parameters	*Details*
	Total OB already generated as a part of mining in Ashok OCP is 146.06 Mm3, and OB proposed to be generated is 813.13 Mm3 (Total of 959.18 Mm3). Total OB will be backfilled into mine voids. No external dump will be created.	
8.5	**Top Soil Management – (Including Action plan for Top Soil management) (Tentative)**	

(All Figures Cumulative and in MM^3)

Year/Stage (Life of the mine plus post closure period)	Top Soil Removal Plan	Top Soil Used					
		Spreading Over Embankment	Spreading over Backfill area	Spreading over External OB Dump area	Used in Green Belt area	Used in land Dismantled	Total Utilised
Up to Base year *	5.68	0	1.69	0	1.06	0.00	2.75
Y-1	6.41	0	1.69	0	1.36	0.00	3.06
Y-3	9.70	0	1.69	0	1.40	0.00	3.09
Y-5	11.43	0	2.41	0	1.45	0.00	3.86
Y-10	13.58	0	4.32	0	1.58	0.00	5.90
Y-15	16.02	0	10.16	0	1.79	0.00	11.95
Y-19	16.38	0	13.23	0	1.79	0.00	15.02
Post Closure							
Y-22	16.38	0	15.74	0	1.92	0.48	18.14

Total Top soil to be generated is 16.38 Mm3, and this total volume of top soil will be utilized for concurrent biological reclamation of internal dumps and green belt. Around 80 Ha. of top soil dump has been proposed on backfilled OB dump for temporary storage of Top Soil

8.6	**Management of Coal Rejects.**	No washery proposed.
8.7	**Restoration of Land used for Infrastructure**	It is proposed to restore 32.32 Ha. of land used for infrastructure by technical and biological reclamation by plantation.
8.8	**Disposal of Mining Machinery**	Mining machinery will either be surveyed off or transferred to other projects of CCL based on the balance life of HEMM. Detailed disposal plan will be submitted in Final Mine closure plan at 15th year of mine operation.
8.9	**Safety & Security**	**Measures to be implemented to prevent access to surface opening for underground working, excavation etc**
8.10	**Abandonment Cost and Financial Assurance**	

	Parameters	Details

8.10.1 Abandonment Cost:

Proposed Cost break-up for carrying out progressive and final mine closure activities as per the yardstick of CMPDI formulated based on the revised mine closure guidelines of MoC is as given below.

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			
	Barbered 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, Viewpoints, 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			
F	**Post Closure Monitoring**	**0**	**3.2**	**1.6**
	Air Quality			
	Water Quality			

	Parameters	Details			
		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**	**100**	**100**
8.10.2	**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**				

	Parameters	Details

ESCROW ACCOUNT	
Ashok	
Project Area (Ha)	1766.03
Escrow Amount per Ha. For OC Project as on April, 2019 (lakhs/ Ha)	9
WPI as on April 2019	121.1
WPI as on May 2020	117.5
Escrow Amount per Ha. For OC Project as on May 2020 (lakhs/ Ha)	8.73
Current value of corpus as on May 2020	15421.77
Balance in the Escrow account as on date (of Ashok Exp. OCP)	**6211.04**
Balance Corpus for which provision is to be made	9210.73
Balance Life of mine	19
Annual corpus (Balance corpus / Balance life, in Rs. Lakh)	484.78
Year	**Amount in Lakh (Rs.)**
1	484.78
2	509.02
3	534.47
4	561.19
5	589.25
6	618.71
7	649.65
8	682.13
9	716.24
10	752.05
11	789.65
12	829.13
13	870.59
14	914.12
15	959.83
16	1007.82
17	1058.21
18	1111.12
19	1166.68
Total	**14804.64**
Total Mine closure cost (in Rs Lakhs)	**21015.68**

*Note: The figure mentioned in the section (*Balance in the Escrow account as on date*) in the above table is the net balance in escrow amount. Whereas, the mine closure guidelines suggest the actual deposited value is to be considered instead of net balance value. Therefore, the figure mentioned in the above said section may tend to change.

FINANCIAL EVALUATION

For Expansion Project Report of Ashok OCP, at the peak rated target production of 20.0 Mty of coal, the estimated economics of the proposed Ashok OCP has been worked out considering three variants which are :-

Variant-I - In Variant-I, coal production and OB removal is envisaged to be done by departmental means. This variant envisages HEMM in common category to facilitate ancillary mining activities.

Variant-II - The Variant-II proposes coal and OB upto upper Dakra departmental and Coal and OB above Upper Dakra outsourced.

Variant-III - The Variant-III proposes complete outsourcing of coal production and OB removal along with reclamation.

In all the above three variants ROM coal has been envisaged to be crushed departmentally to (-) 100 mm before dispatch to the proposed railway siding.

The estimated economics has been discussed in the subsequent paragraphs.

TOTAL CAPITAL INVESTMENT

Initial capital investment has been provided in the proposal till the 5th year i.e. the year of achieving rated coal production. The capital investment, both Initial as well as beyond target year, has been proposed from the internal resources of the Company. Head wise distribution of Total Existing Capital has been shown in Appendix-A of respective variants. The capital requirements are given below:

Particulars	Variant-I	Variant-II	Variant-III
Total Capital upto Project Life (Rs crores)	4811.07	2633.16	1693.07
Existing Assets considered (as on 31.3.2019) (Rs crores)	120.19	111.99	77.21
Additional Capital Required (up to Project Life) (Rs crores)	4690.88	2521.17	1615.86
Additional Capital upto Target Year (Rs crores)	4289.04	2510.41	1610.26
Additional Capital beyond target year (Rs crores)	401.84	10.76	5.60

With conformity to resolution of 317th CIL Board Meeting regarding Cost Provisioning in Project Report of CIL Projects, the cost of existing Prospecting & Boring as on 31st March 2019 has not been considered in IRR calculation but is included at WDV in the Appendix- A of PR for the purpose of total cost estimation.

Further the above resolution of the Board Meeting also requires sunk cost to be considered at WDV, only in the total capital cost and such cost should not be considered for IRR calculation. Except Prospecting & Boring, no other existing capital expenditure has been considered as sunk cost in this PR.

The details of capital investment under various heads viz. Land (A.1), Buildings (A.2), Vehicles (A.6), Prospecting & Boring (A.7) and Development (A.8), are given in the appendices mentioned against each of them.

CAPITAL INVESTMENTS FOR P&M

Capital investment on P&M is given in Appendix-A.3. The detailed break-up for HEMM, Electrical, Pump & Pipes, Workshop and Other P&M etc. are given in Appendix-A.3.1 to A.3.5 for all the options separately. The capital investment on P&M for Project life worked out for the options is given below:

Sl	Particulars	Rs. Crores		
		Variant-I	**Variant-II**	**Variant-III**
1	Investment on P&M	3432.40	1379.88	545.50
2	Investment on HEMM	2860.68	817.06	24.19
4	Investment on P&M other than HEMM	571.73	562.82	521.32

Method of Estimation of Capital Cost

The method of estimation of capital investment for P&M, Civil estimates, Development Capital, Revenue expenditure capitalised etc. is as follows.

Prices of Plant & Machinery

For the plant and machinery, as far as possible, the prices have been taken from the Standard Price List of Mining Equipment published by CMPDI and whenever information regarding price was not available, a broad estimate was made.

ESTIMATED COST OF CIVIL CONSTRUCTION

The basis for the estimation of the cost of civil construction viz. residential buildings, service buildings, roads etc. has been given in Appendices - A.2.1, A.2.2 & A.8.2.

CAPITAL INVESTMENT ON VEHICLES

The total estimated capital investment on vehicles is Rs. 2.49 Crores in Variant I, Rs. 2.48 Crores in Variant II and Rs. 1.43 Crores in Variant III. Over and above this, 11 nos of Vehicles has been outsourced in all the three variants and the cost is included in Other Outsourcing Cost.

DEVELOPMENT

Under this head, estimated investment is given for (a) capital outlay in mines (Appendix A.8.1), (b) Roads and culverts, including haul roads (A.8.2), (c) Water Supply & Sewerage (A.8.3). The details of each item are given in the respective Appendix.

OPENING OF REVENUE ACCOUNT

The proposed PR of the ASHOK OCP to produce target 20.0 Mty has been planned to come under revenue account from 1st year with the mine designed to produce 3.30 Mty.

ESTIMATES OF OPERATING COST

Appendix-C gives the details of average cost and profitability for the target production of 20.0 Mty. The method adopted in estimating the costs are briefly explained as follows:

(a) Wages

The requirement of manpower for the targeted production of 20.0 MTY of coal is estimated category wise/ scale wise. Prevalent revised pay scales for executives and non- executives (NCWA-X) are adopted. *With conformity to resolution of 317th CIL Board Meeting regarding Cost Provisioning in Project Report of CIL Projects, Initial basic + 7.97% of the relevant pay scales of executives & non-executives have been considered in estimating the salary and wages cost.* The average wages cost per Tonne has been shown in Appendix - C and is also shown in Table C below.

Over and above this, 65 persons has been outsourced as Security and other manpower in all three variants. The cost is included in Other Outsourcing Cost.

(b) Stores

Stores cost consists (1) diesel and lubricants, (2) explosives and detonator, (3) spares for routine repairs etc. Prevalent norms have been followed in estimating stores cost. The average store cost per tonne has been shown in Table C below.

(c) Power

The average Power cost per Tonne has been shown in Table C below based on annual KWH consumed.

(d) Miscellaneous Expenditure

This covers the expenditure on printing & stationery, postages, telephone, repairs and maintenance of assets other than P&M, workshop debits for annual servicing and overhauling of HEMM, insurance and taxes for vehicles, normative contractual cost of major maintenance of HEMM. The average Miscellaneous cost /Tonne has been shown in Table C below.

(e) Final Mine closure Cost

A fund equal to Rs. 8.69 Lakhs/hectare of land (updated till May 2020 WPI) is proposed to be created towards a fund for final mine closure. Existing corpus as on 31st Mar 2019, i.e., deposit of Rs. 26.75 Crores towards Ashok OCP in the escrow account has been adjusted for to arrive at balance corpus required for mine closure, which has been distributed over the revenue life of mine with a yearly escalation of 5%.

(f) Administrative Charges

This includes area overhead, apex overhead etc. and the cost has been taken as per the actual administrative cost of CCL which is Rs. 247.78 per tonne. *With conformity to resolution of 317th CIL Board Meeting regarding Cost Provisioning in Project Report of CIL Projects, 10% of Administrative Overhead has been adopted as administrative cost for the calculation*

of IRR and for calculation of per tonne cost, actual administrative cost of CCL has been considered. The above mentioned administrative cost per tonne has been duly adjusted for incremental production.

(g) Interest on Working Capital

Rate of the interest on working capital is taken as 14.50% per annum.

(h) Interest on Loan Capital:

As the investment for the project is proposed to be met from the internal resources of the Company, thereis no impact due to interest on loan capital.

(i) Coal Outsourcing cost & OBR Outsourcing cost.

The coal, OB and OB rehandling outsourcing cost is based on the approved SOR, CCL. The above rate does not include explosive costs and includes diesel and wage escalation as per SOR.

Over and above this, reclamation activities are also outsourced in Variant-II and III and considered in Other Outsourcing Cost along with outsourced vehicle and manpower (in all three variants).

(j) Depreciation

Depreciation on assets is computed as per the prevalent norms. The straight-line method of charging depreciation has been adopted.

(k) Cost & Profitability

The details of the average cost and profitability estimates, at 100% capacity and at 85% capacity are given in Appendix-C &C1. These have been summarised in the table below for both variants: -

SR.NO	PARTICULARS	VARIANT I	VARIANT II	VARIANT III
1	SALARY & WAGES	70.39	45.95	22.46
2	STORES	333.91	137.70	31.96
3	POWER	16.97	10.07	10.07
4	MISC EXP	62.26	43.46	36.17
5	ADMN EXP	19.43	19.43	19.43
6	MINE CLOSURE COST	6.27	6.27	6.27
7	CONTRACTUAL OB REMOVAL		233.77	321.90
8	CONTRACTUAL COAL COST		39.78	96.19
9	OTHER CONTRACTUAL COST	1.64	15.26	15.26
10	INTEREST ON WORKING CAPITAL	24.69	26.66	27.05
11	**OPERATING COST**	**535.56**	**578.35**	**586.76**
12	DEPRECIATION	151.64	79.35	47.16

13	ADMINSTRATIVE COST (NOTIONAL)	174.87	174.87	174.87
14	**TOTAL COST**	**862.07**	**832.57**	**808.78**

(l) Selling Price

The notified Selling Price per tonne of ROM coal has been adopted for the G-11 grade (GCV 4000-4300) Coal i.e. Rs. 955/- with additional charges of Rs. 87/ per tonne for sizing of coal up to -100mm and Rs. 29/- per tonne for RLS and Rs. 40/- per tonne for handling of coal. The weighted average selling price per tonne of coal works out to Rs. 1063.25/-.

FINANCIAL ANALYSIS

The year-wise cash flows at 100% and 85% capacity utilisation have been estimated and are detailed in Appendix-D. & D.1, respectively. The cash-flows exclude depreciation and interest on loan capital. The financial IRR on total capital of the project at 100% and 85% level of the rated output have been worked out based on the estimates of the aforesaid cash flows. These have been worked out for all the variants which is summarised in the table below.

Sl. No.	Particulars	Variant - I	Variant - II	Variant III
Internal Rate of Return in %				
1	At 100% Capacity	27.87	41.29	56.29
2	At 85% Capacity	18.83	31.23	45.69

INCLUSION OF GST IN PR

The prices of capital assets i.e., HEMMs, P&M, Civil constructions etc. have been considered inclusive of GST. A standard rate of GST @ 18% on HEMMs, P&M other than HEMMs and Washery P&M has been considered. Input tax credit on GST paid on such capital assets will be available which can be utilized against output tax liability and hence due adjustment has been made on account of GST Credit on such capital assets for computation of cash flow analysis.

Calculations of operating expenditure have been made without considering impact of GST.

SENSITIVITY ANALYSIS

The following parameters have been identified for assessing their impact on the profitability of the project.

a) Capital investment

b) Operating cost

c) Capacity utilisation

d) Selling price of coal

The above parameters have been increased / decreased in Steps of 5% to a maximum of 25% over the base case and the IRR have been computed. The following tables summarises the results of sensitivity analysis at different capacity utilisation:

VARIANT I

Sl No.	Particulars	Capacity Utilisation				
		100%	90%	85%	80%	75%
A	Base Case	27.87%	21.85%	18.83%	15.76%	12.64%
B	Increase in Capital					
	1)5%	26.22%	20.46%	17.55%	14.60%	11.59%
	2)10%	24.70%	19.17%	16.37%	13.53%	10.62%
	3)15%	23.31%	17.99%	15.29%	12.54%	9.72%
C	Increase in Op.Cost					
	1)5%	25.95%	20.01%	17.01%	13.96%	10.83%
	2)10%	24.05%	18.17%	15.18%	12.13%	8.99%
	3)15%	22.15%	16.32%	13.34%	10.29%	7.12%
D	Decrease in Sales					
	1)5%	24.17%	18.50%	15.62%	12.69%	9.68%
	2)10%	20.46%	15.10%	12.36%	9.54%	6.62%
	3)15%	16.72%	11.63%	8.99%	6.25%	3.40%
E	Increase in Cap.+Op.Cost					
	1)5%	24.39%	18.69%	15.80%	12.86%	9.85%
	2)10%	21.21%	15.78%	13.00%	10.16%	7.21%
	3)15%	18.27%	13.06%	10.38%	7.60%	4.72%

VARIANT II

Sl No.	Particulars	Capacity Utilisation				
		100%	90%	85%	80%	75%
A	Base Case	41.29%	34.53%	31.23%	27.96%	24.71%
B	Increase in Capital					
	1)5%	39.22%	32.79%	29.63%	26.50%	23.40%
	2)10%	37.33%	31.18%	28.16%	25.17%	22.18%
	3)15%	35.59%	29.70%	26.81%	23.93%	21.06%
C	Increase in Op.Cost					
	1)5%	38.39%	31.88%	28.69%	25.53%	22.38%
	2)10%	35.52%	29.25%	26.16%	23.10%	20.05%
	3)15%	32.67%	26.62%	23.64%	20.67%	17.71%
D	Decrease in Sales					
	1)5%	36.10%	29.95%	26.92%	23.92%	20.92%
	2)10%	30.96%	25.37%	22.60%	19.85%	17.09%
	3)15%	25.82%	20.76%	18.24%	15.71%	13.16%
E	Increase in Cap.+Op.Cost					
	1)5%	36.46%	30.25%	27.20%	24.17%	21.16%
	2)10%	32.07%	26.34%	23.51%	20.69%	17.88%
	3)15%	28.05%	22.73%	20.10%	17.46%	14.82%

VARIANT III

Sl No.	Particulars	Capacity Utilisation				
		100%	90%	85%	80%	75%
A	Base Case	56.29%	49.18%	45.69%	42.23%	38.81%
B	Increase in Capital					
	1)5%	53.82%	47.03%	43.69%	40.39%	37.10%
	2)10%	51.55%	45.05%	41.85%	38.68%	35.53%
	3)15%	49.45%	43.22%	40.15%	37.10%	34.08%
C	Increase in Op.Cost					
	1)5%	52.30%	45.62%	42.34%	39.08%	35.84%
	2)10%	48.38%	42.12%	39.02%	35.95%	32.90%
	3)15%	44.52%	38.65%	35.75%	32.86%	29.97%
D	Decrease in Sales					
	1)5%	49.41%	43.11%	40.01%	36.93%	33.86%
	2)10%	42.66%	37.13%	34.39%	31.66%	28.94%
	3)15%	36.02%	31.21%	28.80%	26.40%	23.98%
E	Increase in Cap.+Op.Cost					
	1)5%	50.02%	43.63%	40.49%	37.36%	34.26%
	2)10%	44.33%	38.58%	35.74%	32.91%	30.09%
	3)15%	39.15%	33.96%	31.39%	28.82%	26.24%