SUMMARISED DATA

(INCLUDING MINING PLAN)

Sl. No.	Particulars	Unit	Partial Hiring Option
A.	**GENERAL**		
1	Name of Project		Durgapur Extension (Deep) OC
2	Name of Area / Company		Chandrapur Area, WCL
3	Nearest Railway Station from project	Name km	Chandrapur 10
4	Nearest National / State Highway / Approach road	Name km	Chandrapur-Mul road 7 km
B.	**GEOLOGICAL**		
1	Name of geological blocks considered	Name	Durgapur Block & Motaghat Block
2	Area of the geological block	sq. km	6.50
3	Borehole Density within blocks	BHs / sq.km	14
4	Description of all coal seams within block		
Name of seam	***Thickness (m)***		***Geological reserves (Mt)***
	Min.	***Max.***	
Composite Seam	14.26 (MWPD-15)	19.99 (D-45)	97.46 Durgapur Block - 46.91 Motaghat Block - 50.55
C.	**TECHNICAL**		
1	Area of the proposed mine block (excluding existing mine area)	sq. km	2.65
2	Borehole density within mine area	BHs/sq. km	14
3	Mine parameters Extent along strike (at floor) Extent along dip (at floor)	 km km	 4.23 0.58
4	Description of coal seams proposed to be worked along with the parting details		

Name of seam	***Mining Area (sq. km)***	***Thickness range considered (m)***	***Av. Thick. / Parting Thicness (m)***	***Av. Grade (UHV/ GCV)***	***Av. gradient***	***Mineable Reserves (Mt) (as on 01.04.16)***	***Volume of OB (Mm^3) (as on 01.04.16)***
OB	2.65	78-185	-	-	-	-	311.00
Composite Seam	2.11	15.50-16.35		G-10 (4581)	1 in 8 to 1in 10	47.27	
					Total	**47.27**	**311.00**
5	Av. Stripping Ratio				m^3/t	6.58	
6	Method of Mining					Incline Slicing (Shovel-Dumper combination)	

Sl. No.	Particulars			Unit	Partial Hiring Option	
					Option-I (3.00 Mty)	
7	Target Output					
	Nominal production capacity (at 100%)			Mt	**3.00**	
	Production capacity (at 85%)			Mt	2.55	
8	Year of achieving Target Production			Year	IV	
9	Year of start of Internal Dumping			Year	I	
10	Production Phasing			Mt		
Year / Coal Seam	*Coal / OB*	*Yr. 1*	*Yr. 2*	*Yr. 3*	*Yr. 4*	*Yr. 5*
OPTION-I	Coal (Mt)	1.60	2.00	2.50	**3.00**	3.00
(3.00 Mty)	OB (Mm^3)	14.70	15.50	19.25	20.00	20.50
11	Total Mine Life (at Nom. production capacity)					
	Pre-construction period			Years	0	
	Production build-up period			Years	3	
	Production period			Years	13	
	Tapering / mine closure period			Years	1	
	Total period			Years	**17**	

		Nos. & Capacity	Approved PR (Approved May, 2007)	**Project Report (August,2016)**
				Option-I (3.00 Mty)
12	**Major HEMM Deployed for Coal**			
	Shovels / (Diesel Hyd. B/H)	$2.8m^3$	2	-
		$4.0\text{-}5.0m^3$	-	3 (Repl)
	Dumpers	50T	10	-
		60T	-	11 (Repl)
	Drills	160mm	2	3 (Repl)
	Dozers	320 HP	2	-
		410HP	-	3 (Repl)
13	**Major HEMM Deployed for OB**			
	Electric Rope Shovels	$5m^3$	5	-
	Diesel Hydraulic Shovels	$5.0\text{-}6.0\ m^3$	-	3 (Repl)
	Dumpers	50T	41	-
		60T	-	16 (Repl)
	Drills	250mm	5	-
		160mm	-	3 (Repl)
	Dozers	320HP	5	-
		410HP	-	3 (Repl)
14	Total Manpower			
	Existing	Nos.	1327	972
	Required	Nos.	869	707
	Absorbed	Nos.	458	265

Sl. No.	Particulars	Unit	Approved PR (Approved May, 2007)	Project Report (August,2016)
				Option-I (3.00 Mty)
15	Overall Output per manshift (OMS)	Tonnes	8.718	16.073
16	Weighted average grade of coal (non-coking/coking)		Non-Coking, GCV- 4581 kcal/kg (G-10)	
17	Presence of Major Surface Constraints (nallas, road, power line, etc.)	(type)	Diversion of 220kV power line, diversion of seasonal nalla , diversion of 11 kV power line	
18	Coal Transport within the mine		By Dumpers	
19	Surface Coal Transport to CHP / Siding		By Road	
20	Any Railway Siding		Coal is transported though Aerial Ropeway of MAHAGENCO	
21	Name of any Specific Customer/Industry		MAHAGENCO/Power Industry	
D.	**ENVIRONMENTAL & OTHERS**			
1	Civil Construction			
	Residential houses required	Nos.	Nil	Nil
	Existing houses	Nos.	612	533
2	Water Demand			
	Colony	kl	Nil	1400*
	Industrial	kl	Nil	790
	* Water supply for entire Durgapur township from Erai River has been proposed in this PR			
3	Existing Land	Ha	886.04	1186.54
	Additional Land to be acquired within project area			
	Government land	Ha	27.22	29.29
	Tenancy land	Ha	259.76	260.09
	Forest land	Ha	124.70	121.58
	Total Land	Ha	**411.68**	**410.96**
4	Additional Land to be required outside project area (Land for rehabilitation of Sinhala, Navegaon, Masala Tukum & Masala rith villages)	Ha	Nil	*25.00*
5	Total land (existing+additional)		***1297.72***	***1622.50***
6	Habitation & Rehabilitation of Sinhala, Navegaon, Masala Tukum & Masala rith villages			
	No. of land oustees		273	*273*
	No. of PAFs to be rehabilitated		450	*1275*
7	Additional Capital for land Incl. Rehabilitation cost (As per Appendix-A.1)	Rs. crores	22.6261	231.6042

Sl. No.	Particulars	Unit	Approved PR (Approved May, 2007)	Project Report (August,2016) Option-I (3.00 Mty)
8	Additional Capital for Environment Pollution control Measures	Rs. crores	3.8699	1.5509
9	Make of Water 100 hours	lps	-	2829
10	Total installed pumping capacity	m^3/day	-	218880
11	Drainage of the Area (Name of river/nala)		Drainage by Motaghat and Upasa seasonal nala and Erai river	
12	Any proposed diversion of power line		Dioversion of 220 kV and 11 kV power line	
E.	**FINANCIAL OPTIONS (FOR POWER SECTOR)**			
1	Total Capital Investment Additional WDV on existing capital Total capital	 Rs. crores Rs. Crores Rs. crores	 42.9818 18.4586 61.4404	 328.0078 50.8633 378.8711
2	Specific Investment (Additional Capital)	Rs. / tonne Rs./m^3	214.90 30.42	1093.36 151.77
3	Additional Capital Investment on P&M	Rs. crores	7.2923	41.7308
4	Specific Investment on P&M (Additional)	Rs. / tonne	36.46	139.10
5	Capital requirement upto target year	Rs. crores	42.9818	323.0060
6	Year of opening of Revenue account (from zero date)	Year	Mine is already in revenue	Mine is already in revenue
7	Earnings per manshift (EMS)	Rs.	865.65	2535.65
8	Estimated Cost of Production At 100% production level At 85% production level	 Rs. / tonne	 809.54 875.66	 1380.52 1509.27
9	Escalated price as per Cost Plus Agreement	Rs. / tonne	900.74	-
10	Estimated average notified selling price (95% sales realization + Processing Charge)	Rs. / tonne	-	1200.00
11	Estimated Profit at Cost Plus price At 100% production level At 85% production level	 Rs. / tonne	 (+) 91.20 (+) 25.08	 - -
12	Estimated Profit at Notified price At 100% production level At 85% production level	 Rs. / tonne	 - -	 (-) 180.52 (-) 309.27

Sl. No.	Particulars	Unit	Approved PR (Approved May, 2007)	Project Report (August,2016) Option-I (3.00 Mty)
13	Financial Internal rate of return (FIRR) at Notified Price At 100% production level At 85% production level	%	 5.26 Negative	 Negative Negative
14	Financial Internal rate of return (FIRR) at escalated cost plus price At 100% production level At 85% production level	%	 23.57 12.53	 - -
15	Desired av. Selling Price to yield 12% FIRR At 100% production level At 85% production level	Rs. / tonne	 827.21 **896.47**	 1418.20 **1550.05**
16	Cost of Outsourcing (average) OB Coal	 Rs/m^3 Rs/tonne	 49.16 -	 74.24 -
17	Mine Closure Cost (for corpus fund) Rs./t		-	30.48
18	Expected Completion Capital (including WDV)	Rs. crores	46.4205	438.9590

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BRIEF OF PROJECT REPORT

(INCLUDING MINING PLAN)

1.0 INTRODUCTION

1.1 BACKGROUND OF THE REVISED PROJECT REPORT

This Revised Project Report has been prepared after amalgamating the balance reserves of Durgapur Extension (Deep) OC (Sector – IC, II, III & IV) and Durgapur OC (Sector-V) in Motaghat block as on 01.04.2016. The background of these opencast mines is detailed below.

Durgapur Extension (Deep) OC (Sector – IC, II, III & IV)

Feasibility Report (FR) for Durgapur OCP was planned for 100m depth for capacity of 1.80 Mty at Stripping ratio of 3.09 m^3/t and was approved by Govt. of India in Oct., 1978. The Project was linked to Pit head Chandrapur Super Thermal Power station (STPS) of MSEB. A Scheme for additional production of 0.5 Mty from this project (within approved FR limit) to meet the enhanced demand of Chandrapur STPS was approved by WCL. This scheme raised the production target upto 2.30 Mty.

Another Scheme for crushing and conveying of 2.25 Mm^3 of overburden/annum was prepared by CMPDI, RI-IV in October, 1989 to reduce the dumpers population and to achieve an overall efficiency in overburden removal. This scheme was approved by WCL Board in its 100th meeting held on 26/2/1990 for a capital outlay of Rs.1614.80 lakhs. No expenditure has been incurred against this scheme till date.

The project achieved its targeted production of 1.80 Mty of coal in 1985-86 as scheduled in approved FR. Revised Cost Estimate for this project amounting to Rs.7384.56 lakhs was submitted to Government of India in September, 1987. Completion Report treating it as completed on 31/3/1990 with a capital outlay of Rs. 73.85 crores was approved by WCL Board (104th meeting) held on 12/12/1990.

Project Report for Durgapur Extension (Deep) OC mine in dip side of existing Durgapur OC was prepared in December, 2003 considering balance reserves of Sector IC, II, III & IV upto 150m depth for a target capacity of 2.00 Mty with Partial Hiring of equipment. This PR was not yielding desired IRR @ 85% capacity and therefore an agreement was made with MSEB to supply coal at cost plus basis. This PR was updated in April, 2007 and approved by WCL Board in May, 2007 in Partial hiring option for Capital investment of Rs 42.9818 Crores on Cost plus basis with M/s MSEB. The total proposed capital for this project escalated to Rs. 61.4404 crores including WDV of Rs. 18.4586 crores and balance capital of Rs. 42.9818 crores. The project was yielding an IRR of 12.53% at 85% capacity utilization, at the escalated selling price of Rs. 900.74/t as on April, 2007 as per cost plus agreement. The price to yield 12% IRR at 85% capacity utilisation worked out to Rs. 896.47/t.

About 121.58 ha forest land was required for dip side extension of Durgapur Extension (Deep) OC (Sector- I, II, III & IV) which is yet to be acquired. However, about 80.77 ha of land within already acquired land for existing Durgapur OC mine was covered under forest safety zone. The coal reserves and overburden in forest safety zone as estimated by mine officials were about 9.06 Mt and 33.48 Mm^3 respectively. Mine official applied to forest authorities for release of forest safety zone for the purpose of mining of blocked reserves in the forest. After getting permission from forest authorities to work in forest safety zone, these reserves were also extracted till the year 2011-12. The quarry floor reached about at 105m FRL, 98m FRL, 95m FRL & 100m FRL in Sector-IC, Sector-II, Sector-III and Sector-IV respectively. The balance reserves of Durgapur Extension (Deep) OC as on 01.04.2016, beyond above floor boundary have been considered in this PR of Durgapur Extension (Deep) OC mine.

Durgapur OC (Sector-V) in Motaghat Block

The workings of Durgapur Extension (Deep) OC mine (Sector IC, II, III & IV) were stalled because of non-availability of Forest Land on the dip side. Accordingly, in June, 2003, a proposal was mooted at Chandrapur Area level for merging balance reserves of neighbouring Sector I & II of Padmapur OC upto PR limits with Durgapur OC and renaming as Sector V of Durgapur OC. Thus, the idle HEMM

and manpower of Durgapur OC was re-deployed effectively in the Durgapur Sector-V. The above proposal was approved by WCL and boundary adjustments were ratified by DGMS.

Sector V of Durgapur OC also reached approved PR limit in the year 2008-09. Meanwhile, for proper utilization of existing HEMM of Durgapur OC mine till the preparation of Motaghat OC (Recast) PR, a scheme (2008-09) was prepared by WCL beyond approved PR limit to sustain the production for three years (upto 2011-12). The scheme envisaged to extract 2.85 Mt of coal at an average stripping ratio of 3.97 m^3/t. The scheme was approved by competent authority and departmental HEMM were engaged in the proposed area of scheme.

Further, the Project Report of Motaghat OC (Recast) mine beyond the dipside limit of approved scheme (2008-09) was approved by WCL Board (Stage-I approval) in its 227th meeting held on 11.11.2010 for a capacity of 1.25 Mty and capital investment of Rs 131.0126 Crores, subject to cost plus agreement with the consumer at a price which yields 12% IRR at 85% production capacity. This PR envisaged to extract 25.88 Mt of coal at an average stripping ratio of 7.92 m^3/t.

As the coal reserves from the approved scheme was lasting upto 2011-12, and there was delay in implementation of Recast PR of Motaghat OC due to delay in Cost plus agreement, another Scheme was prepared by Mine/Area in July, 2012 after carving out the reserves upto about 65m FRL from the property of approved PR of Motaghat OC (Recast) to sustain the current production level for next three years i.e. upto 2014-15 and for gainful utilisation of the existing departmental HEMM & manpower. The scheme was approved by WCL Board to extract 4.072 Mt coal at an average stripping ratio of 7.28 m^3/t.

Since, the coal reserves from the above approved scheme (July,2012) was lasting upto 2014-15, and there was further delay in implementation of Recast PR of Motaghat OC due to delay in Cost plus agreement, another Scheme was prepared by Mine/Area in August, 2014 after carving out 5.332 Mt reserves from the property of approved PR of Motaghat OC (Recast) to sustain the current production level for next three years i.e. upto 2017-18 and for gainful utilisation of the existing departmental HEMM & manpower. The scheme was approved by WCL Board to extract 5.332 Mt coal at an average stripping ratio of 8.38 m^3/t.

Chronology of Previous Approved Reports

The chronology of different approved Reports/Scheme for Durgapur OC, Durgapur Extension (Deep) OC and Motaghat OC is as tabulated below :-

Chronology of Previous Approved Reports

Sl. No.	Report/Scheme	Status	Date of Approval	Capital Investment (Rs. Crores)	Target Cap. (Mty)	Reserves (Mt)
Durgapur Sector -IC, II ,III & IV						
1	Feasibility Report of Durgapur OC	Approved	Oct., 1978	34.6470	1.80	33.47
2	Scheme for enhanced production	Approved	19/10/87	18.5186	0.5	
3	Scheme for crushing & conveying of OB	Approved	26/02/1990	16.1480	2.30	33.47
4	Completion Report of Durgapur OC	Approved	12/12/1990	73.85		
5	PR of Durgapur Extension (Deep) OC (April,2007)	Approved On Cost Plus	May,2007	61.4404 (Incl. WDV of 18.4586)	2.00	24.27
Durgapur Sector – V (Motaghat Block)						
1	PR for Padmapur OC	Approved	March,1984	50.7445	1.25	
2	RCE for Padmapur OC	Approved	21.08.89	67.0568	1.25	
3	Scheme beyond PR limit of Sector-I & II of Padmapur OC renamed as Sector-V of Durgapur OC	Approved	2008-09			2.85
4	Recast PR of Motaghat OC	Approved on Cost Plus	11.11.2010	131.0128	1.25	25.88
5	Scheme carving out reserves of Recast PR of Motaghat OC upto 65m FRL (July,2012)	Approved	2012-13			4.072
6	Scheme carving out reserves of Recast PR of Motaghat OC (August,2014)	Approved	2014-15			5.332

1.1.1 SALIENT FEATURES OF LAST APPROVED REPORT OF DURGAPUR EXTENSION (DEEP) OC (SECTOR – IC, II, III & IV) AND RECAST PR OF MOTAGHAT OC

The PR of Durgapur Extension (Deep) OC was approved by WCL Board in May, 2007 after entering into cost plus agreement with MAHAGENCO. The Recast PR of Motaghat OC (March, 2010) was approved by WCL Board in November, 2010 subject to cost plus agreement with the customer. The salient features of these approved reports are as follows:

Sl. No.	Particulars	Approved PR of Durgapur Extension (Deep) OC (Updated April, 2007)	Approved Recast PR of Motaghat OC (March, 2010)
A	**Mining Parameters**		
1	Mineable Reserves (Mt)	24.27	25.88
2	Grade/GCV of coal (kcal/kg)	G-10 (4548)	G-9 (4639)
3	OB Volume (Mm^3)	156.41	205.08
4	Average S/R	6.44	7.92
5	Mine Capacity (Mty)	2.00	1.25
6	Manpower	869	306
7	Overall OMS (t)	8.718	15.47
B	**Financial Parameters**		
1	Total Capital incl WDV (Rs. In Crores)	61.4404	131.0126
2	Additional Capital Required (Rs. In Crores)	42.9818	131.0126
3	WDV (Rs. In Crores)	18.4586	0.0000
4	Cost of Production (Rs./t)		
4.1	@ 100% of target capacity (Rs./t)	809.54	1177.88
4.2	@ 85% of target capacity (Rs./t)	875.66	1255.96
5.1	Av. Selling Price (Notified) (Rs./t)	-	856.00
5.2	Selling Price as per Cost Plus Agreement	900.74	-
6	Profit (Rs./t)	At Cost Plus Price	At Notified Price
6.1	@ 100% of target capacity (Rs./t)	91.20	(-) 321.88
6.2	@ 85% of target capacity (Rs./t)	25.08	(-) 399.96
7.1	Financial IRR at Notified price @ 85% capacity (%)	Negative	Negative
7.2	Financial IRR at escalated cost plus price @ 85% capacity (%)	12.53	-
8	Price to yield 12 % IRR @ 85% capacity (Rs/t)	896.47	1411.03
9	Difference between Avg. Selling Price (Notified) & price to yield 12 % IRR @ 85% capacity (Rs./t)	-	(-) 555.03

1.2 EXPLORATION STATUS

GSI, DGM (MS), MECL and CMPDI have drilled 117 boreholes within Durgapur - Motaghat Block involving a total of 11900.87 m as detailed below:

Block	Agency /Within / Outside	DGM (MS)		GSI		CMPDI		MECL		TOTAL	
		Bh's	(m)	Bh's	(m)	Bh's	(m)	Bh's	(m)	Bh's	(m)
Durga-pur OCP	Within	29	2651.64	3	137.36	10	1409.60	3	541.80	45	4740.40
	Outside	4	474.39	-	-	1	43.50	2	93.00	7	610.89
	Sub-Total	33	3126.035	3	137.36	11	1453.10	5	634.80	52	5351.29
Mota-ghat	Within	22	2575.32	-	-	37	3863.15	13	722.00	72	7160.47
	Outside	3	332.02	-	-	7	730.50	2	40.00	12	1102.52
	Sub Total	25	2907.34	-	-	44	4640.65	15	762.00	84	8309.99
Total	Within	51	5226.96	3	137.36	47	5272.75	16	1263.80	117	11900.87
	Outside	7	806.41	-	-	8	821.00	4	133.00	19	1713.41
Total		**58**	**6033.37**	**3**	**137.36**	**55**	**6093.75**	**20**	**1396.80**	**136**	**13614.28**

Borehole Density

Out of 117 boreholes drilled within the block, 24 have been drilled to prove the subcrop of the seam. The density of the boreholes for the whole of Durgapur-Motaghat Block covering an area of about 6.50 sq.km. (excluding subcrop boreholes) comes to 14 boreholes per sq.km.

Geological Reports / Notes

Following Geological Reports have been published covering the Block area in the past by CMPDI and MECL :

1. Geological Report on Durgapur Block by CMPDI in May 1974.
2. Geological Report on Quarriable Potentiality of Durgapur Block by CMPDI in March 1977.
3. Geological Report on Motaghat Block by CMPDI in November 1981.
4. Geological Note on Durgapur Deep (Sinhala OC) by MECL in October 1998.
5. Geological Note on Revised structure of Sinhala (Durgapur Deep) blocks by CMPDI in Sept'02.
6. Geological Note on Revised structure of Padmapur Block by CMPDI in Sept'02.

1.3 PRESENT STATUS OF MINE/PROJECT

1.3.1 Land Acquisition

Total land already acquired by existing Durgapur Extension (Deep) OC mine including Durgapur OC Sector-V is 1186.54 ha which comprises of 785.11 ha of Tenancy land, 143.66 ha of Government land and 257.77 ha of forest land.

1.3.2 Production

Presently, Mining activity is going on in Durgapur OC (Sector-V) in Motaghat block. The year-wise combined production from Durgapur OC, Durgapur Extension OC and Durgapur Extension (Deep) OC mine since inception are tabulated below:

Sl. No	Year	Coal (Mt)		OB (Mm^3)			
		Yearly	Cummul.	Yearly			Cum.
				Deptt.	HOE	Total	
1	1979-80						
2	1980-81			0.18		0.18	0.18
3	1981-82			0.14		0.14	0.31
4	1982-83	0.28	0.28	1.65		1.65	`1.97
5	1983-84	0.59	0.87	2.76		2.76	4.73
6	1984-85	1.13	1.46	4.01		4.01	8.74
7	1985-86	1.80	3.26	5.01		5.01	13.75
8	1986-87	2.02	5.28	5.29		5.29	19.01
9	1987-88	2.00	7.28	4.45		4.45	23.57
10	1988-89	1.94	9.22	4.40		4.40	27.97
11	1989-90	1.41	10.63	4.02		4.02	32.00
12	1990-91	1.45	12.08	3.85		3.85	35.85
13	1991-92	1.54	13.62	4.27		4.27	40.12
14	1992-93	1.67	15.29	4.58		4.58	44.70
15	1993-94	1.64	16.93	4.38	0.73	5.10	49.82
16	1994-95	1.70	18.63	4.22	0.80	5.03	54.85
17	1995-96	1.60	20.23	4.53	0.74	5.27	60.13
18	1996-97	1.70	21.93	4.45	1.43	5.90	66.02
19	1997-98	1.72	23.65	4.79	1.23	6.03	72.05
20	1998-99	1.30	24.95	4.55	1.26	5.81	77.87
21	1999-00	1.74	26.69	6.12	1.03	7.16	85.03
22	2000-01	1.80	28.49	6.81	0.36	7.17	92.20
23	2001-2002	2.00	30.49	6.56	0.86	7.44	99.64
24	2002-2003	2.01	32.50	5.94	0.49	6.34	106.08
25	2003-2004	2.02	34.52	4.08	0	4.08	110.17
26	2004-2005	1.87	36.39	4.45	2.46	6.91	117.09

Sl. No	Year	Coal (Mt)		OB (Mm^3)			
		Yearly	Cummul.	Yearly			Cummul.
				Deptt.	Deptt.	Deptt.	
27	2005-2006	1.48	37.87	4.72	2.47	7.19	124.29
28	2006-2007	2.14	40.01	4.48	5.17	9.65	133.94
29	2007-2008	2.31	42.32	4.48	5.09	9.57	143.52
30	2008-2009	2.59	44.91	4.01	2.24	6.25	149.78
31	2009-2010	1.97	46.88	4.28	1.47	5.75	155.54
32	2010-2011	2.29	49.17	4.03	7.58	11.61	167.15
33	2011-2012	2.67	51.84	4.18	7.41	11.59	178.74
34	2012-2013	2.91	54.75	3.82	1.51	5.34	184.09
32	2013-2014	2.20	56.95	4.45	7.34	11.79	195.88
33	2014-2015	1.92	58.87	4.52	4.48	9.00	204.88
34	2015-2016	1.54	60.41	3.84	8.01	11.85	216.73

1.3.3 Manpower

Presently, Durgapur OC (Sector-V) is being worked as per the approved Scheme and the total existing manpower in the mine as on 01.04.2016 is **972**.

1.3.4 Financial Performance

The status of Durgapur Extension (Deep OC) / Durgapur OC Sector-V for last five years showing coal production, OB removal, cost of production and profitability etc. are as follows:

Particulars	Year / Details as per Cost Sheets				
	2011-12	2012-13	2013-14	2014-15	2015-16
Coal Production (Mt)	2.67	2.91	2.20	1.92	1.54
OB (Dept.) (Mm^3)	4.18	3.83	4.45	4.52	3.84
OB (Hiring) (Mm^3)	7.41	1.51	7.34	4.48	8.01
TOTAL OB (Mm^3)	11.59	5.34	11.79	9.00	11.85
SR (m^3/t)	4.34	1.83	5.36	4.69	7.69
EMS (Rs.)	2308.32	2812.54	2985.24	3381.06	3672.47
Cost of Production (Rs./t)	1289.62	1439.28	1319.16	1394.79	1289.80
Selling Price (Rs./t)	1435.71	1536.27	1701.56	1805.33	2013.10
Profit on Coal (Rs./t)	146.09	96.99	382.40	410.54	723.30
Misc. incl. accretion / decreation of stock	- 44.40	- 17.27	131.85	144.21	98.55
Overall Profit (Rs./t)	101.69	79.72	514.25	554.75	821.85
Overall Profit (Rs. in Crs.	27.20	23.27	113.26	106.75	126.67

1.4 JUSTIFICATION OF RPR OF DURGAPUR EXTENSION (DEEP) OC

Project Report for Durgapur Extension (Deep) OC mine (Sector-IC, II, III & IV) in dip side of existing Durgapur OC was approved by WCL Board in May, 2007 in Partial hiring option for total capital of Rs. 61.4404 crores (WDV of Rs. 18.4586 crores + additional capital of Rs. 42.9818 crores) after entering into Cost plus agreement with M/s MSEB. About 121.58 ha forest land was required for this PR of Durgapur Extension (Deep) OC (Sector- I, II, III & IV) which is yet to be acquired. However, about 80.77 ha of land within already acquired land for existing Durgapur OC mine was covered under forest safety zone. After getting permission from forest authorities to work in forest safety zone, the mine was worked till the year 2011-12. ***Thereafter, the working was stopped in Durgapur Extension (Deep) OC mine in Sector-IC, II, III & IV due to non-availability of forest land.***

Subsequently, Sector I & II of adjoining Padmapur OC mine was carved out and merged with Durgapur OC after renaming it as Sector V of Durgapur OC. Thus, the idle HEMM and manpower of Durgapur OC was re-deployed effectively in the Durgapur Sector-V. The above proposal was approved by WCL and boundary adjustments were ratified by DGMS. Sector V of Durgapur OC also reached approved PR limit in the year 2008-09. Meanwhile, for proper utilization of existing HEMM of Durgapur OC mine, a scheme (2008-09) was prepared by WCL beyond approved PR limit in Sector-V to sustain the production upto 2011-12.

Further, the Project Report of Motaghat OC (Recast) mine beyond the dipside limit of approved scheme (2008-09) was approved by WCL Board (Stage-I approval) in its 227th meeting held on 11.11.2010 for a capacity of 1.25 Mty and capital investment of Rs 131.0126 Crores, subject to cost plus agreement with the consumer.

As the coal reserves from the approved scheme was lasting upto 2011-12, and there was delay in implementation of Recast PR of Motaghat OC due to delay in Cost plus agreement, another Scheme was prepared by Mine/Area in July, 2012 after carving out the reserves upto about 65m FRL from the property of approved PR of Motaghat OC (Recast) to sustain the current production level for next three

years i.e. upto 2014-15 and for gainful utilisation of the existing departmental HEMM & manpower. The scheme was approved by WCL Board to extract 4.072 Mt coal at an average stripping ratio of 7.28 m^3/t. Since, the coal reserves from the above approved scheme (July,2012) was lasting upto 2014-15 and there was further delay in implementation of Recast PR of Motaghat OC due to delay in Cost plus agreement, another Scheme was prepared by Mine/Area in August, 2014 after carving out 5.332 Mt reserves from the property of approved PR of Motaghat OC (Recast) to sustain the current production level for next three years i.e. upto 2017-18 and for gainful utilisation of the existing departmental HEMM & manpower. The scheme was approved by WCL Board to extract 5.332 Mt coal at an average stripping ratio of 8.38 m^3/t.

The above Scheme of Durgapur Sector-V is likely to be exhausted in 2017-18. In the mean-time, the forestry clearance for Durgapur Extension (Deep) OC (Sector-IC, II, III & IV) is in advance stage. To continue the production from the mine, it is proposed to prepare the RPR of Durgapur Extension (Deep) OC after amalgamation of balance reserves of Durgapur Extn. (Deep) OC mine (Sector IC, II, III & IV) and balance reserves of Motaghat OC beyond quarry floor of existing approved Scheme (August, 2014) as on 01.04.2016 in Durgapur Sector V. This will have following benefits :

1. Optimization of backfilling of OB and extraction of blocked reserves by rehandling about 4.29 Mm^3 OB of existing External Dump-I situated in rise side of Sector-IV.
2. Full extraction of coal upto boundary fault between Sector-IV & Sector-V.
3. As the FC is in advance stage, till its finalization, mine will continue in Sector-V
4. No separate cost-plus agreement will be required for Motaghat OC as its reserves will be included in Durgapur Extension (Deep) OC.
5. The mine has been planned for higher target capacity (say 3.0 Mty) as more mineable reserves will be available by amalgamation of balance reserves of Motaghat block with Durgapur Extension (Deep) OC (Sector – IC, II, III & IV).

In view of above benefits, the Revised Project Report of Durgapur Extension (Deep) OC mine including the balance reserves of Motaghat block has been prepared. At present, the cost plus agreement for Durgapur Extension (Deep) OC

with M/s MAHAGENCO is for 85% of 2.0 Mty (1.70 Mty) in Partial Hiring Option. However, there is scope to increase the target production upto 3.0 Mty and therefore following two options were worked out for proposed RPR of Durgapur Extension Deep OC mine.

Option – I : Partial Hiring option for a target capacity of 3.0 Mty

The desired selling price to yield 12% IRR at 85% capacity works out to Rs. 1550.05/t for 3.0 Mty capacity (Option-I).

Option - II : Partial Hiring Option for existing cost plus capacity of 2.0 Mty

The desired selling price to yield 12% IRR at 85% capacity works out to Rs. 1795.90/t for 2.0 Mty capacity (Option-II).

MAHAGENCO has given their consent to enter into Cost plus agreement for 3.0 Mty capacity (option-I). Accordingly, this RPR of Durgapur Extension (Deep) OC mine has been prepared for 3.00 Mty capacity (option-I).

The above RPR of Durgapur Extension (Deep) OC mine was discussed in TSC of WCL Board on 12.12.2016 (Minutes enclosed in Annexure-I). The recommendations of TSC are as follows:

i) Revised Project Report (Including Mining Plan) of Durgapur Extension (Deep) OC mine for a capacity of 3.0 Mty at an additional capital investment of Rs. 328.0078 Crores (excluding the existing WDV of Rs. 50.8633 Crores) at desired selling price of Rs. 1550.05 /t to yield 12% IRR at 85% capacity for power sector.

ii) An amendment to existing Cost plus agreement dt. 18.04.2007 with MAHAGENCO and to terminate the existing Cost plus FSA for Scheme of Durgapur sector- V Phase-II dt. 22.05.2015.

iii) To obtain EC for the enhanced land area of 1622.50 Ha.

1.5 SALIENT FEATURES OF PRESENT REVISED PROJECT REPORT

This Revised Project Report has been prepared after amalgamating the balance reserves of Durgapur Extension (Deep) OC mine (Sector IC, II, III & IV) and reserves beyond quarry floor of existing approved Scheme (August, 2014) as on 01.04.2016 in Durgapur Sector V and upto dip side Lohara fault. At present, the

cost plus agreement for Durgapur Extension (Deep) OC with M/s MAHAGENCO is for 2.0 Mty in Partial Hiring Option. However, there is scope to increase the target production upto 3.0 Mty which will reduce the cost plus price. MAHAGENCO has agreed for entering into cost plus agreement for Option-I (3.0 Mty) capacity. Accordingly, this RPR of Durgapur Extension (Deep) OC mine has been prepared in Partial Hiring option for 3.0 Mty capacity.

The salient features of the RPR of Durgapur Extension (Deep) OC mine are tabulated below:

Sl. No.	Particulars	Approved PR (April, 2007)	Proposed RPR (August, 2016)
		Partial Hiring	**Partial Hiring**
01	Mineable Reserves (Mt)	24.27	47.27
02	Grade of coal GCV (kCal/kg)	G-10 (4548)	G-10 (4581)
03	Volume of OB (Mm^3)	156.41	311.00
04	Average S/R (m^3/t)	6.44	6.58
05	Mine Capacity (Mty)	**2.00**	**3.00**
06	Manpower Requirement (Nos.)	869	Existing-972 Required-707 Absorbed-265
07	Overall OMS (t)	8.718	16.073
8	Capital required (Rs. In Crores) a) Additional Capital b) WDV of Existing assets	61.4404 42.9818 18.4586	378.8711 328.0078 50.8633
09	Cost of Production (Rs./t) a) At 100% capacity b) At 85% capacity	 809.54 875.66	 1380.52 1509.27
10	Av. Selling Price (Rs./t) For Power sectors	900.74 (Escalated selling price)	1200.00 (Notified Price)
11	Profit/Loss (Rs./t) for Power sector a) At 100% capacity b) At 85% capacity	 91.20 25.08	 (-) 180.52 (-) 309.27
12	Financial IRR (%) for Power sector at Notified Price a) At 100% capacity b) At 85% capacity	 5.26 Negative	 Negative Negative
13	Financial IRR (%) for Power sector a) At 100% capacity b) At 85% capacity	 23.57 12.53	 Negative Negative
14	Price to yield 12 % IRR @ 85% capacity (Rs./t)	896.47	**1550.05**

1.6 CONSTRAINTS / RISK IN MINING

Various surface constraints / risks involved in the proposed RPR of Durgapur Extension (Deep) OC mine are as detailed below.

1. Acquisition of Land

Total land involved in proposed Durgapur Extension (Deep) OC mine is 1597.50 ha (1045.20 ha tenancy land, 172.95 ha govt. land and 379. 35 ha forest land) excluding 25 ha land required for rehabilitation of four number of villages. Out of this, 1186.54 ha land (785.11 ha tenancy land, 143.66 ha govt. land and 257.77 ha forest land) has already been acquired by WCL. Balance 410.96 ha land (260.09 ha tenancy land, 29.29 ha govt. land and 121.58 ha forest land) is yet to be acquired. The mine in Sector-IC, II, III & IV is not in operation due to non-availability of 121.58 ha forest land. Acquisition of balance land is one of the major surface constraints for this mine.

2. Rehabilitation of Villages

Four number of villages namely Sinhala, Navegaon, Masala Tukum and old Masala are proposed to be rehabilitated in this project. Appropriate capital provision for rehabilitation for these villages is envisaged in Appendix A.1.

3. Diversion of 220 kV Power Line

A 220 kV power line is passing along dip-rise direction in Sector-V originating from CTPS power plant and passing through reserve forest area situated in dip side of property. For complete extraction of coal reserves from Sector-V, diversion of this power line is required. A tentative route of diversion (about 8 km) has been shown in Quarry & Surface Layout plan.

4. Realignment of Nala

A nala is passing through proposed site of external dump. The re-alignment of this nala is proposed along periphery of external dump as shown in quarry and surface layout plan.

5. Slope Stability of Internal and External Dumps

Height of external OB dump has been proposed as 90m which requires proper layout of slopes and benches. Stability of Internal and External Dumps is very important and needs proper care. Provision for Slope Monitoring Radar has been made in the RPR.

1.7 PROJECT OBJECTIVES AND TARGET BENEFICIARIES

1.7.1 Objective of the Project

The main objectives of the proposed Durgapur Extension (Deep) OC mine are as follows:

a) To produce planned target production of coal to meet the demand.

b) To achieve the complete customer satisfaction in respect to quantity and quality of coal.

c) To achieve the desired productivity in respect to HEMM and manpower deployment.

d) Socio-economic development of the area.

1.7.2 Target Beneficiaries

The target beneficiaries of the proposed Durgapur Extension (Deep) OC project are the following stakeholders.

a) Consumer

The proposed mine is to supply coal to Chandrapur Super Thermal Power Station of MAHAGENCO which is the main beneficiary of this mine.

b) Company

This includes the employees, management and stake holders. The company including its employees, management and stake holders will be benefited by this project.

c) The Community

The community is one of the major stakeholders and it includes landholders, local business and service providers, neighbours and nearby residents, local government and NGOS and community groups. The land holders are given suitable compensation for their lands in addition to the land cost. Various welfare activities for the uplift of land losers and other community are taken up under the project. The proposed project will bring development in the area and its neighbourhood and nearby residents will be benefited by the job opportunities

created by the project. The local business and service providers will also be benefited due to several ancilliary activities generated due to this project.

d) The State

The State Government, the Central Government and various concerned Government agencies are also the target beneficiaries of the proposed project. The State Govt. will get royalty for the coal produced. The creation of various job opportunities and various development activities carried out under the project will ultimately benefit the State Govt. The Central Govt. being the owner of CIL & WCL, the profit earned by the project will ultimately be the profit of Central Govt. Moreover, the tax paid on the income will add the revenue income of the Central Government.

2.0 MARKETABILITY

2.1 DEMAND OF COAL

The year wise FSA/LOA commitment of WCL upto 2019-20 is detailed in table below :

SL. NO.	PARTICULARS	FSA / LOA COMMITMENT AS ON 01.07.2016							
		Applic-able Trigger Level	2016-17		2017-18		2018-19		2019-20	
			FSA Qty.	Qty. at Trigger Level	FSA Qty.	Qty. at Trigger Level	FSA Qty.	Qty. at Trigger Level	FSA Qty.	Qty. at Trigger Level
A)	**FSA ALREADY EXECUTED**									
1	Old Power Producers existing as on 31.03.2009 with whom FSAs have been signed	90 %	30.093	27.084	30.093	27.084	30.093	27.084	30.093	27.084
2	Past Commitment of Non Power Sector except Cokeries with whom FSAs are signed prior to 31.12.2011 & Commitment of Bhilai Steel Plant from Nandan washery	60 %	4.879	2.927	4.879	2.927	4.879	2.927	4.879	2.927
3	Past Commitment of Cokeries with whom FSAs are signed prior to 31.12.2011	30 %	0.039	0.012	0.039	0.012	0.039	0.012	0.039	0.012
4	New Non-power FSA executed	50 %	2.779	1.389	2.779	1.389	2.779	1.389	2.779	1.389
5	Cost Plus FSAs with Wardha Power Co. Ltd.	90 %	1.625	1.463	1.625	1.463	1.625	1.463	1.625	1.463

SL. NO.	PARTICULARS	FSA / LOA COMMITMENT AS ON 01.07.2016								
		Applic-able Trigger Level	2016-17		2017-18		2018-19		2019-20	
			FSA Qty.	Qty. at Trigger Level	FSA Qty.	Qty. at Trigger Level	FSA Qty.	Qty. at Trigger Level	FSA Qty.	Qty. at Trigger Level
6	New Power FSA executed with MPPGCL on 02.01.2013, with NTPC on 04.09.2013, with VIPL on 10.03.2014 and Mahagenco (as per IMTF's recommendations) on 27.04.2015	75% for 16-17 onwards	6.268	4.701	6.268	4.701	6.268	4.701	6.268	4.701
	TOTAL FSA already executed (1 to 6)		**45.682**	**37.576**	**45.682**	**37.576**	**45.682**	**37.576**	**45.682**	**37.576**
B)	**LOA COMMITMENT**									
7	Commitment of Power Plants achieved milestones and appearing in list circulated by MOC vide letter dated 17.07.2013	75% for 16-17 onwards	1.373	1.030	1.373	1.030	1.373	1.030	1.373	1.030
8	NTPC Telangana Cost Plus Tapering LOA for First year (2019-20) – 75%, Second year (2020-21) – 50%, Third year (2021-22) – 25%	90 %	0.000	0.000	0.000	0.000	0.000	0.000	5.688	4.266
9	Wardha Power Cost Plus	90 %	0.635	0.572	0.635	0.572	0.635	0.572	0.635	0.572
	TOTAL FSA TO BE EXECUTED (7 to 9)		**2.008**	**1.601**	**2.008**	**1.601**	**2.008**	**1.601**	**2.008**	**1.601**
C)	**OTHER LOA HOLDERS**									
10	Power Utility not achieved milestones and not appearing in MoC letter dated 17.7.2013 or achieved milestones but not appearing in Moc letter dated 17.7.20134	75% for 16-17 onwards	9.469	7.102	9.469	7.102	9.469	7.102	9.469	7.102
11	CPP LOA Holders	50 %	0.621	0.311	0.621	0.311	0.621	0.311	0.621	0.311
12	Sponge LOA Holders achieved minlestones	50 %	0.144	0.072	0.144	0.072	0.144	0.072	0.144	0.072
13	Cement LOA Holders not achieved milestones but BIFR Court directed not to take coercive action	50 %	0.042	0.021	0.042	0.021	0.042	0.021	0.042	0.021
	TOTAL (10 to 13)		**10.276**	**7.505**	**10.276**	**7.505**	**10.276**	**7.505**	**10.276**	**7.505**
	TOTAL FSA / LOA COMMITMENT		**57.966**	**46.682**	**57.966**	**46.682**	**57.966**	**46.682**	**63.654**	**50.948**
14	E-Auction		4.800	4.800	5.000	5.000	5.500	5.500	6.000	6.000
	TOTAL COMMITMENT INCLUDING E-AUCTION		62.766	51.482	62.966	51.682	63.466	52.182	69.654	56.948

The above table indicates that WCL has a FSA/LOA commitment of **57.966 Mty** at 100% supply and **46.682** Mty at trigger level from 2016-17 to 2018-19. The commitment under FSA/ LOA is **63.654** Mty at 100% supplies and **50.948** Mty at trigger level in 2019-20**.** In addition to this, the coal supply through E-Auction is envisaged as 4.80 Mty, 5.00 Mty, 5.50 Mty and 6.00 Mty in 2016-17, 17-18, 18-19 and 2019-20 respectively.

2.2 AVAILABILITY OF COAL

CIL is planning the target of 1 Billion Tonne Coal production by 2020 and the share of WCL is 60 Mt in this 1 BT planned production. The following table shows the availability of coal from the existing, completed, on-going and future mines of WCL:

(Fig. in Mt)

Sl. No.	Sector	Projections of Availability of Coal			
		2016-17	2017-18	2018-19	2019-20
1	Existing mines	0.31	0.30	0.31	0.31
2	Completed projects	16.71	11.32	10.34	8.68
3	On-going projects	30.85	37.74	42.15	47.55
4	Future projects	0.13	1.64	2.20	3.46
	Total	**48.00**	**51.00**	**55.00**	**60.00**

2.3 DEFICIT IN AVAILABILITY OF COAL FROM WCL

Following table shows the deficit in availability of coal, including middling, from the various Existing, Completed, On-going, and Future Projects of WCL:

(Fig. in Mt)

Sl. No.	Sector	Projections of Surplus / Deficit of Coal			
		2016-17	2017-18	2018-19	2019-20
1	Total Commitment + proposed E-Auction	62.766	62.966	63.466	69.654
2	Availability of coal	48.00	51.00	55.00	60.00
3	Surplus / Deficit (+/-)	(-) 14.766	(-) 11.966	(-) 8.466	(-) 9.654

From the above table, it is clear that the deficit in supply of coal from WCL is 14.766 Mt in 2016-17 and this deficit will be narrowed down to 8.466 Mt in 2018-19 and 9.654 Mt in 2019-20 if WCL achieves the target capacity of 55 Mt and 60 Mt in 2018-19 and 2019-20 respectively. The contribution from the proposed Durgapur Extension (Deep) OC is included in the 60 Mt production target of WCL to be achieved in 2019-20. Thus, there will not be any difficulty in marketing of proposed coal produced from the proposed mine. Moreover, there is cost plus agreement with M/s Mahagenco to supply 1.70 Mty coal (85% of 2.0 Mty) from Durgapur Extension (Deep) OC mine and It has agreed to enter into cost plus agreement for enhance capacity from the proposed mine.

3.0 PROJECT SITE INFORMATION

3.1 LOCATION

Durgapur- Motaghat Block that extends over an area of about 6.50 sq.km. is located in Southern part of the eastern Limb of Wardha Valley Coalfield. The block is about 6 km from Chandrapur district Town. The block falls in Survey of India Top Sheet No. 55 P/8 and 56 M/5 and is bounded by latitudes: 19^0 59' 37" and 20^0 02' 08" N and longitudes: 79^0 18' 10" and 79^0 20' 27" E. The coordinates of the area on National Grid are N – 1081846.510 and 1086456.576 and Departure E–3031648.144 and 3035643.549 (Plate – I).

The adjacent mines are Padmapur OC in the north and Durgapur Rayatwari UG in the south side of the project. Chandrapur Super Thermal Power Station is located in the west of the project across Chandrapur-Tadoba road whereas the eastern part is overlain by Durgapur Reserve Forest. The area of the proposed mine Block is about 4.90 km^2 whereas the area of the Geological block is 6.50 km^2.

3.2 ACCESSIBILITY AND COMMUNICATION

. Chandrapur is the nearest town from this mine which is only 6 km south of the project. The project is approached via Chandrapur-Tadoba road and Chandrapur-Mul road. Chandrapur railway station lies on the Nagpur-Wardha -Ballarshah section of the Central Railway at a distance of about 10m.

3.3 CLIMATE AND RAINFALL DATA

Climate of the proposed area is of extreme nature with temperature rising to a maximum of 48^o C during summer and falling to a minimum of 10^o C during winter. Relative humidity falls to 15-20% during summer. Average annual rainfall is about 1250 mm though 1500 mm is not uncommon.

3.4 TOPOGRAPHY WITH DRAINAGE PATTERN OF AREA

Durgapur block is almost a flat terrain with elevation generally ranging between 205m to 225 m above MSL. The ground rises towards the North-East. The area drains into Motaghat nullah and Upasa nullah which are seasonal tributaries

of Erai river flowing far west of the area. The HFL of Motaghat Nala is 189.74m dated 04.08.2008. The HFL of Erai river is 184 m (1994) which flows from North to South at the Eastern end of the Bhatadi block. Due to construction of dam on the upstream of Erai river by MSEB (MAHAGENCO), the chances of Durgapur block being below HFL of Erai river is remote. However, during unprecedented heavy rains of 1994, water level of Erai river touched 189m due to discharge of water through the gates of Erai dam of MAHAGENCO which may flow back into the Motaghat nullah and Upasa nullah which are seasonal tributaries of Erai river.

3.5 SURFACE FEATURES

The coal bearing area in Sector IC, II, III & IV lies mostly in reserve forest land. Four villages namely Sinhala, Navegaon, old Masala and Masala Tukum are situated in the north of the property and would require rehabilitation for external dumping of OB. A 220 kV MSEB HT line passes across the quarry between Sector IV & V which requires diversion.

4.0 GEOLOGY

4.1 INTRODUCTION

Durgapur- Motaghat Block that extends over an area of about 6.50 sq.km. is located in Southern part of the eastern Limb of Wardha Valley Coalfield. The block is about 6 km from Chandrapur district Town. Durgapur Opencast Mine is in operation within the Block since1979-80.

4.1.1 Geological Reports Prepared for the Blocks Under Reference

Following Geological Reports have been published covering the Block area in the past by CMPDI and MECL.

1 GR on Durgapur Block by CMPDI in May 1974.

2. GR on Quarriable Potentiality of Durgapur Block by CMPDI in March 1977.
3. GR on Motaghat Block by CMPDI in November 1981.
4. Geological Note on Durgapur Deep (Sinhala OC) by MECL in October 1998.
5. Geological Note on Revised structure of Sinhala (Durgapur Deep) blocks by CMPDI in Sept'02.

6. Geological Note on Revised structure of Padmapur Block by CMPDI in Sept'02.

4.1.2 Block Boundaries

The Block boundaries of Durgapur Motaghat Block are as follows :

North : Boundary Fault F16 - F16 separating Motaghat and Padmapur Blocks.

South : Northern Boundary of Durgapur Rayarwari UG Mine.

East : F1-F1 (Lohara Fault) and Western Boundary of Durgapur 6, 7 & 8 UG Mine

West : Sub-crop of Composite Coal Seam Rise side Existing Floor of Composite Coal Seam.

4.2 EXPLORATION STATUS

4.2.1 GSI, DGM (MS), MECL and CMPDI have drilled 117 boreholes within Durgapur - Motaghat Block involving a total of 11900.87 m as detailed below:

Block	Agency /Within / Outside	DGM (MS)		GSI		CMPDI		MECL		TOTAL	
		Bh's	(m)	Bh's	(m)	Bh's	(m)	Bh's	(m)	Bh's	(m)
Durga-pur OCP	Within	29	2651.64	3	137.36	10	1409.60	3	541.80	45	4740.40
	Outside	4	474.39	-	-	1	43.50	2	93.00	7	610.89
	Sub-Total	33	3126.035	3	137.36	11	1453.10	5	634.80	52	5351.29
Mota-ghat	Within	22	2575.32	-	-	37	3863.15	13	722.00	72	7160.47
	Outside	3	332.02	-	-	7	730.50	2	40.00	12	1102.52
	Sub-Total	25	2907.34	-	-	44	4640.65	15	762.00	84	8309.99
Total	Within	51	5226.96	3	137.36	47	5272.75	16	1263.80	117	11900.87
	Outside	7	806.41	-	-	8	821.00	4	133.00	19	1713.41
Total		**58**	**6033.37**	**3**	**137.36**	**55**	**6093.75**	**20**	**1396.80**	**136**	**13614.28**

4.2.2 Borehole Density

Out of 117 boreholes drilled within the block, 24 have been drilled to prove the subcrop of the seam. The density of the boreholes for the whole of Durgapur-Motaghat Block covering an area of about 6.50 sq.km (excluding sub-crop boreholes) comes to 14 boreholes per sq.km.

4.2.3 Analytical Status

Analytical details available for the boreholes in Durgapur - Motaghat Block are furnished in the following table:

Seam	Band by band Analysis	Proximate Analysis (60% RH & 40^0 C)	GCV (Calc)	Ultimate Analysis	HGI	Ash Anal-ysis	Sulphur Distri-bution	AAFTR	Soil Test
Top Section	97 Bhs	08	18	02	01	-	-	01	3 Sam-ples
Bot Section		09	26	02	01	-	01	02	
Top + Bottom Section (excld parting)		08	17	03	01	01	01	03	
Combined Seam		12	51	02	-	-	01	03	

4.2.4 Based on the density of boreholes drilled in the block, the data generated appears to be reliable to quite some extent.

4.3 GEOLOGICAL STRUCTURE OF BLOCK

4.3.1 Strike & Dip

The general strike of the coal seam is almost NS which swings to almost NW-SE in the northern part i.e. in Motaghat area of the block as observed from the floor contour plan of Composite seam. The dip of the strata is towards east and northwest that varies around 3.5^0 to 9.5^0 (gradient 1 in 6.0 to 1 in 16). Around boreholes D57, D02, CMWDU12 and 20, the gradient is flat compared to other parts in the area.

4.3.2 Faults

A total of 19 faults i.e. F1-F1 to F17-F17 have been interpreted based on the sub surface data generated from the boreholes. Out of the 19 faults, F1-F1 and F16-F16 are the major boundary faults. F16-F16 separates the Motaghat from Padmapur Block with a throw of about +100m whereas F1-F1 forms the eastern boundary with a throw of +150m resulting in occurrence of Talchir formation against the coal seam. The other faults are within the block with varying throw from nil to 75m. The details of the faults are furnished in the following table:

Sl. No.	Fault No.	Strike of fault	Amount and Direction of throw	Linear Extension (approx.)	Nature and Evidence
1	F1-F1 (Lohara Fault)	Almost NW-SE	>150m due SW	> 4.00km. Forms the Eastern boundary of the Block.	1. Strike/Oblique fault 2. Absence of coal seam and occurrence of Talchir formation in D063, CMWDU18, CMWDU19 and MWDD04 on the up thrown side.
2	F2-F2	Almost EW	0m to 20m Northerly	0.90 Km	1 Oblique fault. 2. Difference in FRL value between D112 on the up thrown side and D015 on the down thrown side.
3	F3-F3	Almost NS	5m Westerly	0.55 Km	1. Strike fault.
4	F4-F4	Almost EW	0m to 15m Northerly	0.95 Km	1. Oblique fault. 2. Difference in FRL value between D108 and D014 on the up thrown side and, D085 and CMWDU04 on the down thrown side.
5	F5-F5	Almost EW, abets against F6 and F3	5m to 25m due S	1.20 Km	1. Oblique fault. 2. Difference in FRL value between MWDD10 and MWDD08 on the up thrown side and MWDD11 and D039 on the down thrown side.
6	F6-F6	Almost SW	60m to 95m due SE	2.40 Km	1 .Oblique fault. 2. Difference in FRL value between WC18 and CMWDU03 on the up thrown side and D012, MWDD07, and D038 on the
7	F7-F7	Almost NS. Abets against F8	5m due wes	0.55 Km	1. Strike/Oblique fault. 2. Repetition of subcrop around boreholes D004 and D001.
8	F8-F8 (Separates Motaghat and Durgapur Blocks)	Almost E-W	20m to 75m due Northerly	2.35 Km	1.Oblique fault 2. Omission of composite seam in CMWP25 and CMWP20 due to faulting. 3. Difference in FRL value between CMWP23, CMWDU24 and D002 on the up thrown side and D004 and D031 on the down thrown side.
9	F9-F9	Curviline ar ,NW-SE to WNW	0m to 10m westerly	0.85 Km	1. Strike/Oblique fault. 2. Difference in FRL value between D057, CMWDU12 on the up thrown side and D047 on the down thrown side.

Sl. No.	Fault No.	Strike of fault	Amount and Direction of throw	Linear Extension (approx.)	Nature and Evidence
10	F10-F10	Curvilinear fault, WSW-to almost NE-SW. Abets against F8 in the west and against F13 in the North.	5m to 15m due North Westerly	0.9 km	1.Oblique fault 2. Intersected in D059 at 69.55m with faulted floor resulting in reduced seam thickness in the borehole 3. Difference in FRL value between MWPD16, D045 and CMWP34 on the up thrown side and MWPD17and D053 on the down thrown side
11	F11-F11	Almost E-W	0m to 5m southerly	0.60 km	1.Oblique fault 2. Difference in FRL value between D60, MWPD15 and CMWP50 on the up thrown side and CMWP44and CMWP08 on the down thrown side.
12	F12A-F12A	Almost NW-SE	5m to 20m due SW	1.25 Km	1. Oblique fault. 2. Intersected in CMWDU15 at 125.68m with faulted roof resulting in reduced seam thickness in the borehole. 3. Difference in FRL value on both sides of the fault
13	F12B-F12B	NW-SE	10m due SW	0.45 Km	1. Oblique fault 2. Intersected in CMWDU23 at 137.13m with faulted roof resulting in reduced seam thickness in the borehole. 3. Difference in FRL value between CMWDU23 on the up thrown and CMWDU22 on the down thrown side.
14	F12C-F12C	Almost NW-SE	15m due SW	0.40 Km	1. Strike fault. 2. Intersected in CMWDU21 at 171.00m with faulted roof resulting in reduced seam thickness in the borehole. 3. Difference in FRL values on the up thrown and down thrown side of the fault.
15	F13-F13	Almost EW	0m to 30m due southerly	1.25km.	1.Oblique fault 2. Intersected in CMWP36 at 45.00m with faulted floor resulting in reduced seam thickness in the borehole. 3. Difference in FRL value between D037, CMWP11 and D040 on the up thrown side and MWPD19, CMWP32and CMWP35 on the down thrown side.

Sl. No.	Fault No.	Strike of fault	Amount and Direction of throw	Linear Extension (approx.)	Nature and Evidence
16	F14-F14	Almost NW-SE	0m to 40m due North and NE	1.35 Km	1. Strike/Oblique fault. 2. Intersected in CMWDU17 and CMWDU14 at 146.00m and 151.29m respectively with faulted roof resulting in reduced seam thickness in both the boreholes. 3. Difference in FRL value between CMWDU14 and CMWDU17 on the up thrown side and D048 and D058 on the down thrown side.
17	F15-F15	Almost EW	20m Southerly	2.10km.	1. Oblique fault 2. Intersected in MWPD07 and in CMWP05 at 36.00m and 71.60m respectively with faulted floor resulting in reduced seam thickness in both the boreholes. 3. Difference in FRL value between MWPD08, CMWP45, D042 and D056 on the up thrown side and D061, D135, CMWP37 and CMWDU16 on the down thrown side.
18	F16-F16	Almost NW-SE	Approximately >100m due South.	Appx. 2.00 km. Forms the northern boundary and separates	1. Strike fault 2. Omission of composite seam in CMWP46 and absence of Seam in D050, CMWP56 and D137 in the up thrown side
19	F17-F17	Almost NE-SW	50m due SE	0.50km.	1. Oblique fault 2. Difference in FRL value between CMWP49 and CMWP04 on the up thrown side and MWPD09 and D033 on the down thrown side.

The position and throw of the faults are likely to shift/vary to some extent as the same are interpreted on the basis of sub surface data of the boreholes in the area.

4.3.3 Presence of Dyke, Sill (Igneous Intrusive)

The block is devoid of any igneous activity and as such dyke, sill is not found.

4.4 DESCRIPTION OF COAL SEAM

Detailed exploration in Durgapur - Motaghat Block reveals the existence of Composite Seam with 2 split sections i.e. Top Section and Bottom Section. The Composite Seam occurs in split sections in Durgapur OCP area where as it occurs as combined seam in the whole of Motaghat block and also in the northern part of Durgapur OCP area. The roof of the potential Top Section/Combined Seam occurs in the depth range of 18.74m (MWPD09) to 175.36m (MWDD05) as per the boreholes drilled in the block.

In Durgapur - Motaghat Block, the stratigraphic thickness of Top Section varies from 4.82 m (MWDD06) to 8.52 m (D15) and thickness of Bottom Section varies from 7.00 m (CMWDU07) to 11.47 m (D34) whereas the same for Combined Seam varies from 14.26m (MWPD15) to 19.99m (D45). Thickness of Top + Bottom Section (excluding intervening parting) varies from 13.24 (CMWDU07) to 17.51 (D112). The roof of Top Section in D34 is deteriorated to carbonaceous shale resulting in reduced seam thickness. The parting between Top Section and Bottom Section varies from 1.17 m (D08) to 3.55m (D36). General parting range is between 1.50m to 2.50m. Different seam/sections have been delineated including all the bands within the seams irrespective of nature and thickness and quality and other parameters have been assessed accordingly.

4.4.1 Details of Individual Seam-Sections

The details of the different Seam Sections for the whole of Durgapur OCP and Motaghat block area are furnished below:

Top Section

The details of Top Section of Composite Seam are tabulated below :

General Parameters	Range	
	Minimum	**Maximum**
Borehole intersections	22 boreholes	
Full seam intersections/Considered	17 boreholes	
Part thickness due to sub-crop	2 boreholes (D84 and WC18)	
Bhs where seam is faulted/part drilled/deterioration	3 MWDD09/CMWDU01/D34	

General Parameters	Range	
	Minimum	**Maximum**
Depth Range of Roof (m)	22.85 m (D084)	175.36 m (MWDD05)
Full Seam thickness Range	4.82 m (MWDD06)	8.52 m (D15)
No of combustible bands (<1.00m)	1 (CMWDU8,WWDD 5, 6, WC 8) etc)	6 (D094)
Thick of individual bands (m)	0.05m (D094)	0.51m (D015)
Cumulative thickness of bands (m)	0.19m (MWDD05)	1.57m (D015)
No of non-combustible bands	1	2
Thick of individual bands (m)	0.14m (D112)	0.71m (CMWDU08)
Cumulative thickness of bands (m)	0.22 (D13)	1.06m (MWDD06)
Parting with Bottom Section (m)	1.17 m (D08)	3.55m (D36)
Litho logy of parting with Bot Section	Carbonaceous shale/ shale/ sandy shale/	
Immediate Roof	Carbonaceous shale/Shale	
Immediate Floor	Carbonaceous shale/ shale	

Quality Parameters	Without Dilution at Roof/Floor (Thick: Roof to Floor including all bands)	
Moisture %	6.1 (CMWDU07)	8.0 (D26)
Ash%	28.6 (D013)	43.8 (CMWDU07)
UHV Kcal/kg	2014 (CMWDU07)	3849 (D013)
GCV Kcal/kg	3546 (CMWDU07)	4700 (D013)
VM%	25.0 (D85)	29.8 (MWDD06)
Unit VM%	39.4 (D103)	43.9 (MWDD05)
FC%	28.5 (D85)	35.5 (D103)
Grade	G	E

Average Quality	M%	Ash%	GCV K.Cal/kg	BAND	UHV K.Cal/kg	GRADE
	7.4	33.4	4335	G10	3270	F

Ultimate Analysis for Top Section is available for two boreholes, result of which is furnished below:

Ultimate Analysis for Top Section, Durgapur Motaghat Block

Bh No	From (m)	To (m)	Thick (m)	C%	H%	N%	S%	Co_2%
MWDD05	175.36	180.75	5.39	47.30 (79.19)	3.00 (5.02)	1.10 (1.84)	0.70 (1.17)	0.57 -
MWDD06	169.78	174.60	4.82	49.10 (79.55)	3.30 (4.86)	1.20 (1.78)	0.70 (1.13)	1.17 -

Note: Figures within bracket are on DMMF basis

Ash Fusion Temperature Range is available for one boreholes, result of which is furnished below:

Ash Fusion Temperature Range for Top Section, Durgapur Motaghat Block

Bh No	From (m)	To (m)	Thick (m)	Sample	IDT^o	HT^o	FT^o
CMWDU08	133.00	139.09	5.38	I100	1180	>1400	>1400

HGI is available for one borehole, result of which is furnished below:

HGI for Top Section, Durgapur Motaghat Block

Bh No	From (m)	To (m)	Thick (m)	Sample	HGI
D112	47.23	55.99	8.76	I	82

Results of Sulphur, Sulphur distribution and Ash Analysis are not available for the Top Section.

Bottom Section

The details of Bottom Section of Composite Seam are tabulated below **:**

General Parameters	**Range**	
	Minimum	**Maximum**
Borehole intersections	31 boreholes	
Full seam intersections/Considered	28 boreholes	

General Parameters	Range	
	Minimum	**Maximum**
Part thickness due to sub-crop	03 borehole (D001, D004 and D022)	
Bhs where seam is faulted	-	
Depth Range of Roof (m)	18.02 m (D001)	182.44 m (MWDD05)
Full Seam thickness Range	7.00 m (CMWDU07)	11.47 m (D034)
No of combustible bands (<1.00m)	1 (D003, D013 and	6 (D084 and D094)
Thick of individual bands (m)	0.05 m (D84,D85	0.90 m (WC21)
Cumulative thickness of bands (m)	0.16 (MWDD06)	1.46 m (D026)
No of non-combustible bands	1 (CMWDU6, D003,	2 (MWDD06)
Thick of individual bands (m)	0.04 (D08)	0.33 (MWDD06)
Cumulative thickness of bands (m)	0.04 (D08)	0.44 (MWDD06)
Parting with Top Section (m)	1.17 m (D08)	3.55m (D36)
Litho logy of parting with Top	Carbonaceous shale/ shale/ sandy shale/	
Immediate Roof	Carbonaceous shale	
Immediate Floor	Carbonaceous shale/ shale	
Quality Parameters	**Without Dilution at Roof/Floor (Thick: Roof to Floor including all bands)**	
Moisture %	6.2 (CMWDU07)	8.8 (MWDD09)
Ash%	21.2 (MWDD09)	41.9((CMWDU07)
UHV Kcal/kg	2262 (CMWDU07)	4760 (MWDD09)
GCV Kcal/kg	3710 (CMWDU07)	5280 (MWDD09)
VM%	24.9 (D94)	28.9 (MWDD08)
Unit VM%	36.3 (D116)	42.2 (MWDD05)
FC%	30.7 (MWDD05)	40.7 (D116)
Grade	F	E

Average Quality	M%	Ash%	GCV kCal/kg	BAND	UHV kCal/kg	GRADE
	8.0	27.6	4794	G9	3987	E

Ultimate Analysis for Bottom Section is available for two boreholes, result of which is furnished below:

Ultimate Analysis for Bottom Section, Durgapur Motaghat Block

Bh No	From (m)	To (m)	Thick (m)	C%	H%	N%	S%	Co_2%
MWDD05	182.44	191.00	8.56	46.1000 (86.80)	2.80 (5.65)	1.00 (2.07)	0.50 (1.32)	- -
MWDD06	176.24	185.02	8.78	50.00 (80.59)	3.00 (4.84)	1.10 (1.77)	0.60 (1.13)	0.50 -

Note: Figures within bracket are on DMMF basis

Ash Fusion Temperature Range is available for three boreholes, result of which is furnished below:

Ash Fusion Temperature Range for Bottom Section, Durgapur Motaghat Block

Bh No	From (m)	To (m)	Thick (m)	Sample	IDT^o	HT^o	FT^o
CMWDU08	141.45	150.40	8.95	BCS	1200	>1400	>1400
D10	35.78	46.29	10.51	I	1190	>1400	>1400

HGI is available for one borehole, result of which is furnished below:

HGI for Bottom Section, Durgapur Motaghat Block

Bh No	From (m)	To (m)	Thick (m)	Sample	HGI
D112	57.71	67.52	9.81	I	63

Sulphur and Sulphur Distribution is available for one borehole result of which is furnished below:

Sulphur Distribution for Bottom Section, Durgapur Motaghat Block

Bh. No.	From (m)	To (m)	Thick (m)	Total Sulphur	Pyritic Sulphur	Sulphate Sulphur	Organic Sulphur
MWDD06	176.24	185.02	8.78	0.63	0.29	0.02	0.32

Combined Seam

General Parameters	**Range**	
	Minimum	**Maximum**
Borehole intersections	84 boreholes	
Full seam intersections/Considered	64 boreholes	

General Parameters	**Range**	
	Minimum	**Maximum**
Part thickness due to sub-crop	10 (CMWP4, 6, 7, 16,17, 24,31, D60, MWPD18 and 20)	
Part thickness due to Floor/Roof Fault	10 Bh (MWPD 7, D 59, CMWP 5, 36, 50, CMWDU 14,15,17, 21 and 23)	
Depth Range of roof (m)	18.74 m	175.36 (MWDD05)
Full Seam thickness Range	14.26 m	19.99 m (D45)
No of combustible bands up to1.00m	1 (CMWDU1, 5,	14 (D61)
Thick of individual bands (m)	0.02 (CMWP31)	1.00 (D45)
Cumulative thickness of bands (m)	0.10 (MWPD08)	3.52 (CMWP10)
No of combustible bands (>1.00m)	3 (CMWDU 22, 23 and CMWP12)	
Thick of individual bands (m)	1.07 (CMWP12)	1.62 (CMWDU22)
Cumulative thickness of bands (m)	1.07 (CMWP12)	1.62 (CMWDU22)
No of non-combustible bands	1 (CMWPG 06,11	8 (MWP30)
Thick of individual bands (m)	0.05 (CMWP10)	0.76 (MWPD07)
Cumulative thickness of bands (m)	0.05 (CMWP10)	2.34 (MWPD14)
Immediate Roof	Carbonaceous shale/Shale	
Immediate Floor	Carbonaceous shale/ shale/sst	
Quality Parameters	**Without Dilution at Roof/Floor (Thick: Roof to Floor including all bands)**	
Moisture %	5.8 (CMWDU09)	8.4 (D042)
Ash%	24.7 (D42)	45.4 (CMWDU09)
UHV Kcal/kg	1834 (CMWDU09)	4332 (D42)
GCV Kcal/kg	3439 (CMWDU09)	5008 (D42)
VM%	20.4 (CMWP45)	28.5 (D42)
Unit VM%	36.9 (CMWP11)	40.9 (D102)
FC%	28.0 (D102)	38.5 (CMWP11)
General Grade	G	D

Average Quality	M%	Ash%	GCV kCal/kg	BAND	UHV kCal/kg	GRADE
	7.8	29.3	4663	G-9	3780	E

Ultimate Analysis for Combined Seam is available for one borehole, result of which is furnished below:

Ultimate Analysis for Combined Seam, Durgapur Motaghat Block

Bh No	From (m)	To (m)	Thick (m)	Sample	C%	H%	N%	S%	Co_2%
CMWDU2	123.70	143.20	19.46	BCS	39.90 (79.19)	2.50 (4.80)	0.90 (1.70)	1.23 (2.40)	- (13.80)

Ash Fusion Temperature Range is available for three boreholes, result of which is furnished below:

Ash Fusion Temperature Range, Combined Seam, Durgapur Motaghat Block

Bh No	From (m)	To (m)	Thick (m)	Sample	IDT^o	HT^o	FT^o
CMWDU2	123.74	143.20	19.46	BCS	1220	>1400	>1400
CMWDU3	92.62	109.05	16.43	I	1300	>1400	>1400
D031	59.06	76.25	17.61	I	1180	>1400	>1400

Sulphur and Sulphur Distribution is available for one borehole, result of which is furnished below:

Sulphur Distribution for Combined Seam, Durgapur Motaghat Block

Bh No	From (m)	To (m)	Thick (m)	Sample	Total Sulphur	Pyritic Sulphur	Sulphate Sulphur	Organic Sulphur
CMWDU2	123.74	143.20	18.83	BCS	1.23	0.71	0.44	0.08

Top Section + Bottom Section (Excluding Parting)

The Composite seam has been split as Top and Bottom Section and mostly occurs in Durgapur opencast area.

General Parameters	**Range**	
	Minimum	**Maximum**
Borehole intersections	21 boreholes	
Full seam intersections/Considered	18 boreholes	
Part thickness due to sub-crop	02 Borehole (D84 and 18)	
Part thick due to Floor/Roof Fault	1 Bh (MWDD09 FF)	
Depth Range of floor (m)	22.85m (D84)	175.36m (MWDD05)
Full Seam thickness Range	13.24m (CMWDU07)	17.51 m (D112)
No of combustible bands (<1.00m)	1 (MWDD08 and,	12 (D94)
Thick of individual bands (m)	0.05 (D85, 94 and 116)	0.55 (MWDD05)
Cumulative thickness of bands (m)	0.33 (MWDD09)	2.77 (D15)
No of non-combustible bands	1 (CMWDU6, D15,	4 (MWDD06)
Thick of individual bands (m)	0.06 (D116)	0.71 (CMWDU08)
Cumulative thickness of bands (m)	0.06 (D116)	1.50 (MWDD06)
Parting between Top & Bot Section (m)	1.17 m (D08)	3.55m (D36)
Immediate Roof	Carbonaceous shale	
Immediate Floor	Carbonaceous shale/ shale	
Quality Parameters	**Without Dilution at Roof/Floor**	
Moisture %	6.1 (CMWDU07	8.3 (D115)
Ash%	25.3 (D115)	42.8 (CMWDU07)
UHV Kcal/kg	2152 (CMWDU07)	4263 (D115)
GCV Kcal/kg	3640 (CMWDU07)	4966 (D115)
VM%	25.0 (D94)	27.8 (MWDD05 & 06)
Unit VM%	38.8 (D103)	43.6 (MWDD05)
FC%	31.7 (MWDD05)	38.4 (D103)
General Grade	G	D

Average Quality (Top + Bottom Section exclud. parting)	M%	Ash%	GCV kCal/kg	BAND	UHV kCal/kg	GRADE
	7.7	30.3	4583	G10	3656	E

Ultimate Analysis for Top + Bottom Section (excluding parting) are furnished below:

Ultimate Analysis for Top+Bottom Section (excld Parting), Durgapur Motaghat

Bh No	From (m)	To (m)	Thick (m)	C%	H%	N%	S%	Co_2%
D112	48.29	67.52	19.23	52.90 (89.10)	3.00 (5.10)	1.20 (2.00)	0.60 (1.00)	- -
D116	73.64	91.32	17.68	53.00 (87.60)	3.00 (5.00)	1.20 (2.00)	0.70 (1.120)	-
MWDD05	175.36	191.00	13.95	46.70 (83.02)	3.00 (5.33)	1.10 (1.96)	0.60 (1.24)	0.54 -
MWDD06	169.78	185.02	13.60	49.50 (79.79)	2.90 (4.84)	1.10 (1.77)	0.60 (1.13)	0.59 -

Ash Fusion Temperature Range is available for three boreholes, result of which is furnished below:

Ash Fusion Temperature Range for Top+Bottom Section (excld Parting), Durgapur Motaghat Block

Bh No	From (m)	To (m)	Thick (m)	Sample	IDT^o	HT^o	FT^o
CMWDU08	133.00	150.40	14.33	I100	1280	>1400	>1400
				I	1260	>1400	>1400
D112	48.29	67.52	19.23	I	1260	>1400	>1400
D116	73.64	91.32	17.68	I	1200	>1400	>1400

HGI is available for one borehole, result of which is furnished below:

HGI for Top+Bottom Section (excld Parting), Durgapur Motaghat Block

Bh No	From (m)	To (m)	Thick (m)	Sample	HGI
D116	72.30	91.32	17.68	I	71

Sulphur and Sulphur Distribution is available for one borehole, result of which is furnished below:

Sulphur Distribution, Top+Bottom Section (excld Parting), Durgapur Motaghat

Bh No	From (m)	To (m)	Thick (m)	Total Sulphur	Pyritic Sulphur	Sulphate Sulphur	Organic Sulphur
MWDD06	169.78	185.02	13.60	0.64	0.10	0.01	0.53

Ash Analysis is available for one borehole that is furnished below:

Bh No	From (m)	To (m)	Thick (m)	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	CaO	MgO	SO_3	Alk
D112	48.29	67.52	19.23	61.46	24.03	7.85	2.34	0.23	0.99	1.35	1.13	0.62

4.5 QUALITY OF COAL SEAM IN QUARRIABLE AREA

The quality of Composite coal seam has been assessed for the quarriable area based on the borehole wise quality data in different Sectors and the details are tabulated below :

QUALITY OF COMPOSITE SEAM IN THE QUARRIABLE AREA IN SECTORS I, II, III, IV AND V FOR DURGAPUR DEEP EXTN OPENCAST MINE

Sector/ Quarry	Bh No	From (m)	To (M)	Thick (m)	Including All Bands (Excluding Parting)						
					E T (m)	M%	ASH%	GCV (Kcal/Kg)	GCV BAND	UHV (Kcal/Kg)	Grade
I - III	CMWDU04	99.40	116.65	17.25	17.25	7.2	34.4	4270	G11	3159	F
	CMWDU05	109.23	127.20	17.97	17.97	8.4	25.2	4961	G8	4263	D
	CMWDU07	120.46	135.70	15.24	13.24	6.1	42.8	3640	G13	2152	G
	D011	117.96	133.29	15.33	15.33	7.5	32.3	4424	G10	3408	E
	D012	123.36	140.18	16.82	16.82	8.0	28.1	4747	G9	3918	E
	D016	137.14	153.86	16.72	16.72	7.6	31.2	4513	G10	3546	E
	AVERAGE					**7.5**	**32.3**	**4426**	**G10**	**3408**	**E**
IV	CMWDU02	123.74	143.20	19.46	19.46	6.9	36.7	4097	G11	2883	F
	CMWDU10	125.30	143.35	18.05	18.05	7.8	29.6	4635	G9	3739	E
	CMWDU13	98.00	116.55	18.55	18.55	8.1	27.2	4817	G9	4029	E
	D116	73.64	91.32	17.68	16.05	8.2	26.2	4896	G9	4153	E
	AVERAGE					**7.8**	**29.9**	**4611**	**G9**	**3701**	**E**
V	D002	129.85	146.56	16.71	16.71	7.2	34.6	4251	G11	3132	F
	CMWDU24	94.52	109.00	14.48	14.48	7.8	29.7	4625	G9	3725	E

Sector/ Quarry	Bh No	From (m)	To (M)	Thick (m)	Including All Bands (Excluding Parting)						
					E T (m)	M%	ASH%	GCV (Kcal/Kg)	GCV BAND	UHV (Kcal/Kg)	Grade
V	D056	134.08	148.56	14.48	14.48	7.4	33.0	4373	G10	3325	F
	D057	125.92	142.83	16.91	16.91	8.3	26.0	4901	G8	4167	E
	D058	155.15	170.72	15.57	15.57	7.6	31.5	4485	G10	3504	E
	CMWDU20	134.35	150.58	16.23	16.23	8.2	26.7	4849	G9	4084	E
	CMWP23	116.91	134.75	17.84	17.84	8.1	27.5	4789	G9	3987	E
	D043	91.01	107.05	16.04	16.04	8.1	27.1	4826	G9	4042	E
	D047	124.94	142.24	17.30	17.30	7.9	29.1	4667	G9	3794	E
	CMWDU12	135.60	152.00	16.40	16.40	7.7	30.3	4583	G10	3656	E
	CMWDU22	149.30	164.53	15.23	15.23	7.1	35.1	4219	G11	3076	F
	D049	166.10	183.67	17.57	17.57	8.4	25.2	4961	G8	4263	D
	D048	165.36	184.47	19.11	19.11	8.1	27.6	4779	G9	3973	E
	CMWP37	104.36	122.00	17.64	17.64	7.8	29.5	4644	G9	3753	E
	AVERAGE					**7.8**	**29.5**	**4639**	**G9**	**3749**	**E**
I - V	CMWDU04	99.40	116.65	17.25	17.25	7.2	34.4	4270	G11	3159	F
	CMWDU05	109.23	127.20	17.97	17.97	8.4	25.2	4961	G8	4263	D
	CMWDU07	120.46	135.70	15.24	13.24	6.1	42.8	3640	G13	2152	G
	D011	117.96	133.29	15.33	15.33	7.5	32.3	4424	G10	3408	E
	D012	123.36	140.18	16.82	16.82	8.0	28.1	4747	G9	3918	E
	D016	137.14	153.86	16.72	16.72	7.6	31.2	4513	G10	3546	E
	CMWDU02	123.74	143.20	19.46	19.46	6.9	36.7	4097	G11	2883	F
	CMWDU10	125.30	143.35	18.05	18.05	7.8	29.6	4635	G9	3739	E
	CMWDU13	98.00	116.55	18.55	18.55	8.1	27.2	4817	G9	4029	E
	D116	73.64	91.32	17.68	16.05	8.2	26.2	4896	G9	4153	E
	D002	129.85	146.56	16.71	16.71	7.2	34.6	4251	G11	3132	F
	CMWDU24	94.52	109.00	14.48	14.48	7.8	29.7	4625	G9	3725	E
	D056	134.08	148.56	14.48	14.48	7.4	33.0	4373	G10	3325	F
	D057	125.92	142.83	16.91	16.91	8.3	26.0	4901	G8	4167	E
	D058	155.15	170.72	15.57	15.57	7.6	31.5	4485	G10	3504	E
	CMWDU20	134.35	150.58	16.23	16.23	8.2	26.7	4849	G9	4084	E
	CMWP23	116.91	134.75	17.84	17.84	8.1	27.5	4789	G9	3987	E
	D043	91.01	107.05	16.04	16.04	8.1	27.1	4826	G9	4042	E
	D047	124.94	142.24	17.30	17.30	7.9	29.1	4667	G9	3794	E
	CMWDU12	135.60	152.00	16.40	16.40	7.7	30.3	4583	G10	3656	E
	CMWDU22	149.30	164.53	15.23	15.23	7.1	35.1	4219	G11	3076	F
	D049	166.10	183.67	17.57	17.57	8.4	25.2	4961	G8	4263	D
	D048	165.36	184.47	19.11	19.11	8.1	27.6	4779	G9	3973	E
	CMWP37	104.36	122.00	17.64	17.64	7.8	29.5	4644	G9	3753	E
	AVERAGE					**7.7**	**30.3**	**4581**	**G10**	**3655**	**E**

4.6 GEOLOGICAL RESERVES

Part reserves of two Geological Blocks namely Durgapur Block and Padmapur-Motaghat Block are involved in the proposed Durgapur Extension (Deep) OC mine. The geological reserves of these two blocks and different mines projectised in these two blocks are detailed below :

Name of Block	Year of GR	Geological Reserves (Mt)	Name of Project	Year of Approval	Geological Reserves projectized (Mt)	Status of project
Durgapur Block	May, 1974	149.00 (proved reserves)	Durgapur Rayatwari UG	Dec.,1990 (RPR)	60.96	Operating
			DRC – 6, 7 & 8 UG	April, 2001	31.18	Operating
			Durgapur OC RCE (incl. Expansion)	Oct, 1978	32.59	Exhausted
			Durgapur Extension Deep OC (Sector-IC, II, III & IV)	May, 2007	24.27	Suspended due to non-availability of forest land
Padmapur Motaghat Block	Nov., 1981	105.00 (99.00 Mt proved & 6.00 Mt Indicated)	Padmapur OC RCE (excluding Reserves worked by Durgapur Sector-V)	May, 1992	41.16	To be exhausted within a year
			Sector-I & II of Padmapur worked as Durgapur OC Sector-V upto PR limit & Scheme		24.53	Balance reserve as on 1.4.2016 is 1.60 Mt.
			Motaghat OC (Sector-V) beyond PR limit		26.84	Virgin
			Padmapur Deep OC	March, 2012	12.47	Replacement of Padmapur OC RCE

The proposed Durgapur Extension (Deep) OC mine includes balance reserves of PR of Durgapur Extension (Deep) OC (Sector-IC, II, III & IV) approved in May, 2007 and entire reserves of PR of Motaghat OC (Sector-V) beyond PR limit of existing Durgapur Sector-V. The balance reserves of Scheme of Sector-V as on 01.04.2016 has also been included in this PR. Thus, the total geological reserves considered for this PR works out to **49.76 Mt**.

5.0 MINE BOUNDARY, MINEABLE RESERVES, TARGET & MINE LIFE

5.1 MINE BOUNDARY DELINEATION

Presently, Durgapur Sector-V is being worked through a Scheme and the balance reserves of the Scheme as on 01.04.2016 has been considered in this PR of Durgapur Extension (Deep) OC mine. In this PR of Durgapur Extension (Deep) opencast mine, existing coal floor boundary as on 01.04.2016 has been assumed as rise side coal floor in Sector-IC, II, III & IV and V. The dip most side floor boundary corresponds to 55 m FRL, 60 m FRL, 78 m FRL, 56 m FRL & (-2) m FRL in Sector IC, II, III , IV & V respectively. Thus, the final depth of quarry in proposed Durgapur Extension (Deep) OC mine is about 150-155m in Sector IC, II, III & IV whereas the maximum depth in Sector-V is about 205 m. The distance between dip side quarry surface in Sector-IC, II & III and common boundary with DRC 6,7 & 8 underground mine has been kept about 30m. The sector-wise coal floor boundaries of proposed Durgapur Extension (Deep) OC mine are as follows:

Sl. No.	Sectors	Rise side	North side	South side	Dip side
1.	Sector V	Existing Floor boundary as on 01.4.2016 (FRL – 58 m)	Fault F_{16}- F_{16} towards Padmapur OC	Fault F_8- F_8 towards Durgapour OC (Sector IV)	Coal floor upto dip side boundary fault F_1- F_1 (Lohara Fault)
2.	Sector-IV	Floor boundary as on 01.4.2016 (FRL – 100 m)	Fault F_8- F_8	Fault F_6-F_6	Coal floor upto dip side boundary fault F_1- F_1
3	Sector-IC, II, & III	Floor boundary as on 01.4.2016 (FRL 100m to105 m)	Fault F_6-F_6	100-150 m from common boundary of existing DRC incline No.6, 7 & 8 UG mine	Coal floor at about 200m from common boundary of existing DRC incline no.6, 7 & 8 UG mine (upto about 150 m depth)

Mine Boundaries

The mine boundary of proposed Durgapur Extension (Deep) OC mine are as follows :

North : The northern Quarry floor boundary has been planned along Fault F_{16}- F_{16} towards Padmapur OC.

South : The southern Quarry floor boundary has been demarcated leaving safe distance from Durgapur 6, 7 & 8 UG mine boundary.

East : In Sector-IV & V, the dip side eastern Quarry floor boundary has been planned along Fault F1-F1 (Lohara Fault).

In Sector- IC, II & III, the eastern dip side Quarry surface boundary has been planned leaving safe distance from western mine boundary of Durgapur 6, 7 & 8 UG mine.

West : The quarry coal floor boundary of existing Opencast mine in Sector – IC, II & III, IV & V as on 01.04.2016 (FRL 95-105m in Sector- IC, II & III, FRL – 100m in Sector-IV and FRL 58m in Sector-V).

5.2 MINEABLE RESERVES

The total net geological reserves in proposed Durgapur Extension (Deep) OC mine as on 01.04.2016 is estimated as 49.76 Mt and it includes balance geological reserves of Durgapur Extension Deep OC PR (May, 2007) in Sector – IC, II, III & IV and balance geological reserves of Motaghat OC PR in Sector-V including balance reserves of approved Scheme. Considering 5% mining losses, the total mineable reserves as on 01.04.2016 work out to 47.27 Mt (49.76 x 0.95).

The seam-wise and sector wise break-up of mineable reserves in proposed Durgapur Extension (Deep) OC mine as on 01.04.2016 are tabulated below :

SECTORS	COAL(Mt)		
	TOP SECTION	**BOTTOM SECTION**	**TOTAL**
SECTOR IC,II & III	3.32	4.60	7.92
SECTOR IV	6.24	9.15	15.39
SECTOR V	23.96		23.96
TOTAL			**47.27**

5.3 TARGET CAPACITY

The proposed Project Report of Durgapur Extension Deep OC mine has been prepared for a targeted capacity of **3.00 Mt/annum**. The parameters of opencast mine field and technical conditions of its development make this target feasible with normal indices namely length, width & depth of the excavated block, number of coal seams, seam gradient, method of mining, location of equipment and deployment, etc. Moreover, with proposed target of 3.00 Mty, the rate of deepening is close to prevailing rate of deepening in the adjacent opencast mines.

5.4 MINE LIFE

The proposed rated output of mine **is 3.00 Mty.** Considering 47.27 Mt balance mineable reserves as on 01.04.2016, the mine life works out to **17 years.**

The breakup of mine life is as under :

Construction period	-	NIL
Production Build-up period	-	3 years
Target Production period	-	13 years
Tapering Production period	-	1 year
Total Mine Life	**-**	**17 years**

5.6 FUTURE EXPANSION POTENTIAL, IF ANY

The project is not having future expansion potential in dip side of sector IV & V (Lohara fault) as there is no coal bearing area beyond Lohara Fault. However, the dip side reserve beyond Sector IC, II & III of Durgapur Extension (Deep) OC is presently being extracted from existing DRC 6, 7 & 8 Incline underground mine. Solid safety Barrier at surface of 30 m width has been left between the quarry surface of proposed Durgapur Extension (Deep) OC and common boundary of DRC 6,7 & 8 Incline underground Mine. Only bottom section of Composite seam has been proposed for extraction by underground method of mining in DRC 6, 7 & 8 UG mine. Hence, in future, DRC 6, 7 & 8 Incline underground mine will have to be converted in Opencast for full extraction of coal.

6.0 METHOD OF MINING

6.1 GENERAL

Presently, Durgapur OC (Sector-V) is being worked in Partial Hiring Option with Shovel-Dumper combination. The same system has been proposed in Durgapur Extension Deep OC mine. The existing departmental capacity (about 4.75 Mm^3 per annum) has been maintained for extraction of entire coal 3.0 Mty (1.875 Mm^3) and part of Top OB (2.90 Mm^3). Rest entire Top OB has been proposed to be removed by out-sourcing agency.

6.2 GEO-MINING PARAMETERS

6.2.1 Seam Gradient

The average seam gradient in Sector-IC, II & III is 1 in 8, while in Sector-IV & V the gradient is 1 in 10.

6.2.2 Geological Disturbances

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A total of nineteen normal faults have been interpreted in the proposed area of Durgapur Extension (Deep) OC mine based on the evidences such as omission of seam, reduction in the thickness of the seam and or parting, fracturing and slickensiding of the cores, floor level difference in the adjacent boreholes, etc. The description of faults has been provided in tabular form in para 4.3.2.

6.2.3 Details of Coal Seams and Parting

One Composite Seam with 2 split sections i.e. Top Section and Bottom Section exists in Durgapur Sector-IC, II, III & IV. However, it occurs as Combined Seam in Sector-V. The roof of the potential Top Section/Combined Seam occurs in the depth range of 18.74m (MWPD09) to 175.36m (MWDD05) as per the boreholes drilled in the block.

The stratigraphic thickness of Top Section varies from 4.82 m (MWDD06) to 8.52 m (D15) and thickness of Bottom Section varies from 7.00 m (CMWDU07) to 11.47 m (D34) whereas the same for Combined Seam varies from 14.26m (MWPD15) to 19.99m (D45). Thickness of Top + Bottom Section (excluding

intervening parting) varies from 13.24m (CMWDU07) to 17.51m (D112). The roof of Top Section in D34 is deteriorated to carbonaceous shale resulting in reduced seam thickness. The parting between Top Section and Bottom Section varies from 1.17 m (D08) to 3.55m (D36). General parting range is between 1.50m to 2.50m. Different seam/sections have been delineated including all the bands within the seams irrespective of nature and thickness and quality and other parameters have been assessed accordingly.

6.3 MINE PARAMETERS

Mine parameters of the different Sectors of the proposed Durgapur Extension (Deep) OC mine as on 01.04.2016 (excluding the worked out area) are tabulated below :-

MINE PARAMETERS (EXTENSION AREA ONLY)

Sl. No.	Particulars	Sector-IC, II & III	Sector-IV	Sector-V	Total
1.	Area of the Quarry				
a)	On floor (ha)	34.52	65.50	111.25	211.27
b)	On surface (ha)	44.65	81.40	138.50	264.55
2.	Depth (m)				
a)	Initial	95	115	140	95
b)	Final	150	155	205	205
3.	Gradient of Seams	1 in 8	1 in 10	1 in 10	1 in 8 to 1 in 10
4.	Average thickness of seams (m)	16.35	16.35	15.5	16.0
5.	Average Strike length (m)	1385	1240	1600	4225
6.	Width on surface (m) [dip rise]	450	525	810	450-810
7.	Width on floor (m) [dip rise]	270	450	580	270-580
8.	GCV (kCal/kg)	4581(G-10)			
9.	Mineable Reserves (Mt)	7.92	15.39	23.96	47.27
10.	OB (Mm^3)	48.22	90.45	172.33	311.00
11.	Average stripping ratio (m^3/t)	6.09	5.88	7.19	6.58

6.4 CHOICE OF TECHNOLOGY

The Shovel Dumper system of technology, which is already in operation in Durgapur Sector-V, has been envisaged in this PR of Durgapur Extension (Deep) OC mine. Deployment of Dragline & Surface Miner would not be effective and economical due to faulted property. Shovel-Dumper Technology is most flexible system and moreover, well adopted in existing & neighbouring coal mines of WCL.

6.5 EQUIPMENT SELECTION

This Project Report of Durgapur Extension Deep OC mine has been prepared in Partial Hiring option for target production of 3.0 Mty. The existing departmental capacity of the mine has been maintained to extract the entire coal and part of Top OB. As per the data provided by Mine / Area, the system capacity of the existing departmental HEMM of mine as on 01.04.2016 is about 4.688 Mty (Digging capacity - 9.655 Mm^3/y and Dumper capacity - 4.688 Mm^3/y).

The total annual volume of coal extraction at target capacity is 1.786 Mm^3 and therefore OB removal by departmental HEMM is proposed as 2.90 Mm^3 to maintain total departmental capacity at 4.686 Mm^3.

The existing HEMM presently deployed in Durgapur OC Sector-V and proposed HEMM are tabulated below :

Sl. No.	Existing HEMM		Proposed HEMM (Replacement + New)	
	Particulars	Qty.	Particulars	Qty. (Partial Hiring)
A	**FOR OB**			
1	5 m^3 Electric Rope Shovel	5	5 - 6 m^3 diesel hyd. shovel	3 (Repl.)
2	4 - 5 m^3 diesel hyd. backhoe	2		
3	160 mm Diesel Drill	6	160 mm Diesel Drill	3 (Repl.)
4	50T RD Dumpers	22	60T RD Dumpers	16 (Repl.)
5	60 T RD Dumpers	4		
6	320 HP Dozer	7	410 HP Dozer	3 (Repl.)

Sl. No.	Existing HEMM		Proposed HEMM (Replacement + New)	
	Particulars	Qty.	Particulars	Qty. (Partial Hiring)
B	**FOR COAL**			
1	6.1 m^3 diesel hyd. shovel	2	4-5 m^3 diesel Hyd. Backhoe	3 (Repl.)
2	1.5 m^3 diesel hyd. backhoe	1		
3	60T RD Dumpers	11	60T RD Dumpers	11 (Repl.)
4	160 mm Diesel Drill	3	160mm Diesel Drill	3 (Repl.)
5	320 HP Dozer	3	410 HP Dozer	3 (Rep)
C	**FOR COMMON**			
1	30 - 40 t Mobile Crane	1	30 - 40 t Mobile Crane	1 (Repl.)
2	8 t Mobile Crane	2	8 t Mobile Crane	2 (Repl.)
3	Fire Fighting Truck	0	Fire Fighting Truck	1 (New)
4	Water Tanker	3	28 kL Water Sprinkler	3 (Repl.)
5	280 HP Motor Grader	1	280 HP Motor Grader	2 (1 New + 1 Repl.)
6	Mobile Maintenance Van	0	Mobile Maintenance Van	2 (New)
7	9 kL Diesel Bowser	2	9 kL Diesel Bowser	2 (Repl.)
8	Tyre handler	1	Tyre handler	1 (Repl.)
9	2.8 m^3 diesel hyd. backhoe	1	2.8 m^3 diesel hyd. backhoe	1 (Repl.)
10	4 – 6 m^3 Front End Loader	1	4 – 6 m^3 Front End Loader	1 (Repl.)
D	**FOR RECLAMATION**			
1	320 HP Wheel Dozer	1	450 HP Wheel Dozer	1 (Repl.)
2	Water Tanker	1	Water Tanker 28 kL	1 (Repl.)

6.4 MINING SYSTEM PARAMETERS

6.4.1 Width and Height of Benches

For Coal and Overburden, keeping the bench height of 10 m, the width of working and non-working benches are kept as 30 m and 20 m respectively. However, the actual bench width and height in OB would depend upon the size of equipment deployed by the hiring/outsourcing agency. Haul road would be constructed on the floor of the quarry at a gradient of 1 in 16 with a width sufficient for dumper movement, dozer path, drainage and electrification etc.

6.4.2 Slope of Benches & Quarry

i) During Mining Operation

The slope of individual benches depends on the type of strata. In this report, the slope of individual bench is proposed as 45^{o} in soil, alluvium and clay whereas, it is 70^{o} in hard strata. The overall slope of the quarry in rise side is about 37^{0} whereas the overall slope of the quarry in dip side during mining operation varies from 20^{o} to 22^{o} from horizontal plane depending on the nature of strata in the entire depth of quarry.

ii) At the End of Quarry

The slope of individual benches in the batter at the end of quarry remains same as that during mining operation i.e. 45^{o} in soil, alluvium and clay and 70^{o} in hard strata. Overall angle of batter considered at the end of quarry is about 40^{o} for the dip side batter and about 37^{o} in rise side batter. However, it is proposed to do scientific study for slope stability in quarry benches and OB dumps by any Scientific Agency.

7.0 MINING & DUMPING STRATEGY

7.1 CONSTRAINTS ON MINE DEVELOPMENT

Various surface constraints involved in the proposed Durgapur Extension (Deep) OC mine are as detailed below.

1) Acquisition of Land

Total land involved in proposed Durgapur Extension (Deep) OC mine is 1597.50 ha (1045.20 ha tenancy land, 172.95 ha govt. land and 379. 35 ha forest land) excluding 25 ha land required for rehabilitation of four number of villages. Out of this, 1186.54 ha land (785.11 ha tenancy land, 143.66 ha govt. land and 257.77 ha forest land) has already been acquired by WCL. Balance 410.96 ha land (260.09 ha tenancy land, 29.29 ha govt. land and 121.58 ha forest land) is yet to be acquired. The mine in Sector-IC, II, III & IV is not in operation due to non-availability of 121.58 ha forest land. Acquisition of balance land is one of the major surface constraints for this mine.

2) Rehabilitation of Villages

Four number of villages namely Sinhala, Navegaon, Masala Tukum and old Masala are proposed to be rehabilitated in this project. Appropriate capital provision for rehabilitation for these villages is envisaged in Appendix A.1.

3) Diversion of 220 KV Power Line

A 220 kV power line is passing along dip-rise direction in Sector-V originating from CTPS power plant and passing through reserve forest area situated in dip side of property. For complete extraction of coal reserves from Sector-V, diversion of this power line is required. A tentative route of diversion (about 8 km) has been shown in Quarry & Surface Layout plan.

4) Realignment of Nala

A nala is passing through proposed site of external dump. The re-alignment of this nala is proposed along periphery of external dump as shown in quarry and surface layout plan.

5) Slope Stability of Internal and External Dumps

Height of external OB dump has been proposed as 90m which requires proper layout of slopes and benches. Stability of Internal and External Dumps is very important and needs proper care. Provision for Slope Monitoring Radar has been made in the PR.

7.2 MINING STRATEGY

The proposed PR of Durgapur Extension (Deep) OC mine is amalgamation of balance property of Sector IC, II, III & IV of approved updated PR (May, 2007) of Durgapur Extension (Deep) OC Mine and balance property of Durgapur OC Sector V (including balance reserve of Scheme) as on 01.04.2016.

Initially coal extraction has been proposed to continue in Sector-V. Considering the prevailing geo-mining parameters of Sector-V, maximum 2.50 Mty production can be achieved from this sector. Therefore, to achieve target capacity of 3.0 Mty, it is proposed to work both Sector-V and Sector-IC, II & III simultaneously from 4th year to produce 2.50 Mty and 0.5 Mty respectively. In initial 3 years, only Sector-V

will be worked to produce 1.60 Mty, 2.00 Mty and 2.50 Mty in 1st, 2nd and 3rd year respectively as the working in Sector-IC, II & III can be started only after acquisition of forest land. It is envisaged in this PR that acquisition of forest land will be completed in 3 years and thereafter mine working may be started in Sector-IC, II & III from 4th year. After exhaustion of Sector-V in 11th year, Sector-IV and Sector- IC, II & III will be worked simultaneously to produce 3.0 Mty upto 17th year of mine life.

The existing Access trench would be used for further dip side extension of mine in sector IC, II, III & IV. However, presently working is going on in Sector-V under approved scheme in which backfilling is being done in area of existing access trench. Coal is being transported to Coal stock yard prepared on backfill area in Sector-V by making temporary haul road through backfilled area, hence a new access trench is proposed to be made through batter towards adjoining Sector-IV. Till the formation of proposed haul road, coal is proposed to be transported to coal stock yard with existing practice by making temporary haul road through backfilled area. Haul Road would be constructed with help of motor grader and dozer at the gradient of 1 in 16.

7.2.1 Volume Regime

Quarry

The Sector-wise and Cut wise coal, OB and stripping ratio in the quarry of proposed Durgapur Extension (Deep) OC as on 01.04.2016 is given below:

BALANCE COAL, OB & STRIPPING RATIO AS ON 01.04.2016

Sector	Cut No.	Coal Reserves as on 01.04.2016	Volume of OB (Mm^3)	Stripping Ratio (m^3/t)
Sector-V	Cut-I	7.47	57.43	7.69
	Cut-II	7.74	51.66	6.67
	Cut-III	8.75	63.23	7.23
	Sub Total	**23.96**	**172.32**	**7.19**
Sector-IC, II & III	Cut-IV	1.13	8.19	7.25
	Cut-V	3.06	23.98	7.84
	Cut-VI	1.12	9.02	8.05
	Cut-VII	2.61	7.02	2.69
	Sub Total	**7.92**	**48.21**	**6.09**

Sector	Cut No.	Coal Reserves as on 01.04.2016	Volume of OB (Mm^3)	Stripping Ratio (m^3/t)
Sector-IV	Cut-VIII	9.34	56.58	6.06
	Cut-IX	6.05	33.89	5.60
	Sub Total	**15.39**	**90.47**	**5.88**
TOTAL		**47.27**	**311.00**	**6.58**

Trench Cutting

In addition to above, it is proposed to make a trench of 120m width along the periphery of External Dump – X for stability of the dump. The volume of BC soil proposed to be removed from this trench cutting has been assessed as **1.65 Mm^3.**

Re-handling of OB

An external Dump-I exists in rise side of Sector-IV having maximum height of 90m. A part of this OB dump (5.29 Mm^3) will have to be re-handled to release about 4.3 Mt coal reserves in the quarry after diversion of 220 kV power line. In addition to this, about 1.00 Mm^3 and 0.50 Mm^3 OB will have to be re-handled from the backfilled Dumps in Sector-V and Padmapur OC respectively. The amount of rehandling OB is proposed to be re-assessed by detailed survey of the mine. It is proposed to dump the entire 6.79 Mm^3 (5.29 Mm^3 + 1.00 Mm^3 + 0.50 Mm^3) re-handled OB in the space between existing external Dump-AB and external Dump-I. The details of re-handling of OB in proposed Durgapur Extension (Deep) OC mine is tabulated below :

Sl. No.	Particulars	Rehandled OB (Mm^3)
1	Rehandling of External Dump - I	5.29
2	Rehandling of Backfilled Dump from Sector-V	1.00
3	Rehandling of backfilled Dump from Padmapur OC	0.50
	Total (Rehandling)	**6.79**

Thus, total OB removal in proposed Durgapur Extension (Deep) OC mine including in-situ OB from quarry (311.00 Mm^3), trench cutting (1.65 Mm^3) and re-handling of OB (6.79 Mm^3) works out to **319.44 Mm^3**.

7.2.2 Lead

The weighted average lead for OB has been calculated as 3.50 km for proposed Durgapur Extension (Deep) OC mine. The maximum lead for coal transport has also been assessed as 3.50 km.

7.1 DUMPING STRATEGY

Total OB proposed to be removed in Durgapur Extension (Deep) OC works out to 319.44 Mm^3 including 1.65 Mm^3 BC soil from trench cutting along the periphery of the External Dump-X and re-handling of 6.79 Mm^3 OB from different dumps. It is proposed to accommodate 116.85 Mm^3 OB in External Dumps and the rest 202.59 Mm^3 OB will be accommodated in the void of quarries as Internal Dumps. The dump capacity of different External and Internal Dumps in proposed Durgapur Extension (Deep) OC are tabulated below :

DUMP CAPACITY

Sl. No.	Dump	Dump-Capacity (Mm^3) as on 01.04.2016
A)	**External Dumps**	
1	Dump - X	90.11
2	Merging of Dump - X with Kargil Dump	10.51
3	On existing Dump – C & D	9.44
4	Merging of Dump – I with Dump – A+B	6.79
	Sub-Total (External Dumps)	**116.85**
B)	**Internal Dumps**	
5	Void of Sector - V	166.61
6	Void of Sector - IV	8.36
7	Void of Sector – IC, II & III	27.62
	Sub-Total (Internal Dumps)	**202.59**
TOTAL (EXTERNAL + INTERNAL DUMPS)		**319.44**

Thus the total OB from the quarry of Durgapur Extension (Deep) OC mine (311.00 Mm^3), BC Soil from Trench cutting (1.65 Mm^3) and re-handled OB (6.79 Mm^3) will be accommodated in the above OB dumps.

8.0 MINING SCHEDULE & EQUIPMENT PHASING

8.1 DESIGN CRITERIA

The Project Report of Durgapur Extension (Deep) OC mine has envisaged 330 days of working in a year based on 7 days schedule of mine working. As per the prevalent practice in WCL, there will be 3 working shifts in a day and each shift will be of 8 hours duration.

The excavation category of OB material has been assumed as 50% Category– III + 50% Category-IV, whereas, for coal it is assumed as Category-IV. The in-situ volume weight of OB material has been considered as 2.1 t/m^3 whereas for coal it is taken as 1.68 t/m^3.

8.2 ANNUAL PRODUCTIVITY OF HEMM PROPOSED

The Project report for Durgapur Extension (Deep) OC mine has been prepared in Partial hiring option for 3.0 Mty capacity. The annual productivity of HEMM proposed in the proposed PR is tabulated below :

(A) Shovel Productivity

Sl. No	Particulars	Coal / OB	Productivity (Mm^3/yr)
1.	5.0 - 6.0 m^3 Diesel Hydraulic Shovel with 60 T Rear Discharge dumpers	OB	1.323
2	4.0 - 5.0 m^3 Diesel Hydraulic Shovel with 60 T Rear Discharge dumpers	Coal	1.209

(B) Dumper Productivity

Sl. No	Particulars	Coal / OB	Productivity (Mm^3/yr)
1.	60 T Rear Discharge Dumpers for 3.50 km lead with 5.0- 6.0 m^3 Diesel Hydraulic Shovel	OB	0.1758
2.	60 T Rear Discharge Dumpers for 3.25 km lead with 4.0 – 5.0 m^3 Diesel Hydraulic Backhoe	Coal	0.1722

System Capacity

Based on the productivity of HEMM as detailed in above table and number of Shovels and Dumpers proposed in this report, the overall System capacity of the mine is as follows :

OB / Coal	Annual Dept. Workload (Mm^3)	Annual Digging Capacity (Mm^3)	Annual Transport Capacity (Mm^3)	System Capacity (Mm^3)
OB	2.900	= 3 x 1.323 = 3.969	= 16 x 0.1758 = 2.813	4.707
Coal	1.786	= 3 x 1.209 = 3.627	= 11 x 0.1722 = 1.894	
Total	4.686	7.596	4.707	

* (Annual transport capacity for coal + OB is 4.707 Mm3 which is more than annual Dept. Workload (4.686 Mm^3). From the above table it is clear that the system capacity is limited by the transport capacity.

8.3 PRODUCTION SCHEDULE (CALENDAR PROGRAMME

Calendar Programme showing year-wise coal production, natural OB and programmed OB is tabulated below. The programmed OB removal by departmental HEMM and by hiring agency is given separately.

CALENDER PROGRAMME OF EXCAVATION

Yr	Sector	Cut	Coal (Mt) (Dept.)		Natural O.B (Mm^3)		Programmed OB (Mm^3)			
			Yearly	Cum.	Yearly	Cum.	Dept.	Hiring	Total	Cum.
1	V	Cut-I	1.60	1.60	12.30	12.30	4.30	10.40	14.70	14.70
2	V	Cut-I	2.00	3.60	15.38	27.68	3.50	12.00	15.50	30.20
3	V	Cut-I	2.50	6.10	19.22	46.90	3.20	16.05	19.25	49.45
4	V	Cut-I	1.37	7.47	10.53	57.43	2.90	5.08	7.98	57.43
		Cut-II	1.13	8.60	7.54	64.97	0.00	7.54	7.54	64.97
	IC, II & III	Cut-IV	0.50	9.10	3.62	68.59	0.00	4.48	4.48	69.45
	Sub-Total		**3.00**		**21.69**	**68.59**	**2.90**	**17.10**	**20.00**	**69.45**
5	V	Cut-II	2.50	11.60	16.69	85.28	2.90	14.00	16.90	86.35
	IC, II & III	Cut-IV	0.50	12.10	3.62	88.90	0.00	3.60	3.60	89.95
	Sub-Total		**3.00**		**20.31**	**88.90**	**2.90**	**17.60**	**20.50**	**89.95**
6	V	Cut-II	2.50	14.60	16.69	105.59	2.90	14.74	17.64	107.59
	IC, II & III	Cut-IV	0.13	14.73	0.95	106.54	0.00	0.11	0.11	107.70
	IC, II & III	Cut-V	0.37	15.10	2.90	109.44	0.00	3.00	3.00	110.70
	Sub-Total		**3.00**		**20.54**	**109.44**	**2.90**	**17.85**	**20.75**	**110.70**

Yr	Sector	Cut	Coal (Mt) (Dept.)		Natural O.B (Mm^3)		Programmed OB (Mm^3)			
			Yearly	Cum.	Yearly	Cum.	Dept.	Hiring	Total	Cum.
7	V	Cut-II	1.61	16.71	10.74	120.18	2.90	6.68	9.58	120.28
		Cut-III	0.89	17.60	6.43	126.61	0.00	7.97	7.97	128.25
	IC, II & III	Cut-V	0.50	18.10	3.92	130.53	0.00	3.95	3.95	132.20
	Sub-Total		**3.00**		**21.09**	**130.53**	**2.90**	**18.60**	**21.50**	**132.20**
8	V	Cut-III	2.50	20.60	18.07	148.60	2.90	14.65	17.55	149.75
	IC, II & III	Cut-V	0.50	21.10	3.92	152.52	0.00	3.95	3.95	153.70
	Sub-Total		**3.00**		**21.99**	**152.52**	**2.90**	**18.60**	**21.50**	**153.70**
9	V	Cut-III	2.50	23.60	18.07	170.59	2.90	14.65	17.55	171.25
	IC, II & III	Cut-V	0.50	24.10	3.92	174.51	0.00	3.95	3.95	175.20
	Sub-Total		**3.00**		**21.99**	**174.51**	**2.90**	**18.60**	**21.50**	**175.20**
10	V	Cut-III	2.50	26.60	18.07	192.58	2.90	14.70	17.60	192.80
	IC, II & III	Cut-V	0.50	27.10	3.92	196.50	0.00	3.90	3.90	196.70
	Sub-Total		**3.00**	**27.10**	**21.99**	**196.50**	**2.90**	**18.60**	**21.50**	**196.70**
11	V	Cut-III	0.36	27.46	2.59	199.09	2.56	0.00	2.56	199.26
	IV	Cut-VIII	2.14	29.60	12.96	212.05	0.00	13.10	13.10	212.36
	IC, II & III	Cut-V	0.50	30.10	3.92	215.97	0.34	3.50	3.84	216.20
	Sub-Total		**3.00**	**30.10**	**19.47**	**215.97**	**2.90**	**16.60**	**19.50**	**216.20**
12	IV	Cut-VIII	2.50	32.60	15.14	231.11	2.90	12.21	15.11	231.31
	IC, II & III	Cut-V	0.19	32.79	1.48	232.59	0.00	1.39	1.39	232.70
		Cut-VI	0.31	33.10	2.50	235.09	0.00	3.00	3.00	235.70
	Sub-Total		**3.00**	**33.10**	**19.12**	**235.09**	**2.90**	**16.60**	**19.50**	**235.70**
13	IV	Cut-VIII	2.50	35.60	15.14	250.23	2.90	12.20	15.10	250.80
	IC, II & III	Cut-VI	0.50	36.10	4.03	254.26	0.00	3.90	3.90	254.70
	Sub-Total		**3.00**	**36.10**	**19.17**	**254.26**	**2.90**	**16.10**	**19.00**	**254.70**
14	IV	Cut-VIII	2.20	38.30	13.34	267.60	2.90	10.37	13.27	267.97
	IC, II & III	Cut-VI	0.31	38.61	2.49	270.09	0.00	2.12	2.12	270.09
		Cut-VII	0.49	39.10	1.32	271.41	0.00	1.61	1.61	271.70
	Sub-Total		**3.00**	**38.61**	**15.83**	**271.41**	**2.90**	**14.10**	**17.00**	**271.70**
15	IV	Cut-IX	2.50	41.60	14.00	285.41	2.90	11.20	14.10	285.80
	IC, II & III	Cut-VII	0.50	42.10	1.34	286.75	0.00	1.40	1.40	287.20
	Sub-Total		**3.00**	**42.10**	**15.34**	**286.75**	**2.90**	**12.60**	**15.50**	**287.20**
16	IV	Cut-IX	2.50	44.60	14.00	300.75	2.90	11.20	14.10	301.30
	IC, II & III	Cut-VII	0.50	45.10	1.34	302.09	0.00	1.40	1.40	302.70
	Sub-Total		**3.00**	**45.10**	**15.34**	**302.09**	**2.90**	**12.60**	**15.50**	**302.70**
17	IV	Cut-IX	1.05	46.15	5.89	307.98	2.90	2.79	5.69	308.39
	IC, II & III	Cut-VII	1.12	47.27	3.02	311.00	0.00	2.61	2.61	311.00
	Sub-Total		**2.17**	**47.27**	**8.91**	**311.00**	**2.90**	**5.40**	**8.30**	**311.00**
TOTAL			**47.27**		**311.00**		**51.60**	**259.40**	**311.00**	

From above table, it is clear that entire 47.27 Mt coal and 51.60 Mm^3 OB will be excavated by departmental HEMM and rest 259.40 Mm^3 Top OB will be removed by hiring / out-sourcing agency. In addition to this, the OB removal from trench cutting at the external dump site and re-handling of OB will be done by hiring / out-sourcing agency as tabulated below :

Year	Volume of Trench Cutting (Mm^3)	Volume of OB Re-handling (Mm^3)
2	0.65	2.00
3	0.50	2.29
4	0.50	1.00
10	-	1.00
11	-	0.50
Total	**1.65**	**6.79**

8.4 DUMPING SCHEDULE

Total OB proposed to be removed in Durgapur Extension (Deep) OC works out to 319.44 Mm^3 including 1.65 Mm^3 BC soil from trench cutting along the periphery of the External Dump-X and re-handling of 6.79 Mm^3 OB from different dumps. It is proposed to accommodate 116.85 Mm^3 OB in External Dumps and the rest 202.59 Mm^3 OB will be accommodated in the void of quarries as Internal Dumps.

The year-wise dumping schedule in different External and Internal Dumps in proposed Durgapur Extension (Deep) OC is tabulated below:

DUMPING SCHEDULE

Year	Source of OB	Volume of OB (Mm^3)	External Dump				Internal Dump		
			Dump-X	Merging of Dump X with Kargil dump	Dump – C & D	Merging of Dump-I with Dump – A+B	Void of Sector-V	Void of Sector-IV	Void of Sector-IC+II+III
1	Sector-V	14.70					14.70		
2	Sector-V	15.50	12.00				3.50		
	Trench Cutting	0.65					0.65		
	Rehandling OB	2.00					2.00		
	Sub Total	**18.15**	**12.00**	**0.00**	**0.00**	**0.00**	**6.15**	**0.00**	**0.00**

Year	Source of OB	Volume of OB (Mm^3)	External Dump				Internal Dump		
			Dump-X	Merging of Dump X with Kargil dump	Dump – C & D	Merging of Dump-I with Dump – A+B	Void of Sector-V	Void of Sector-IV	Void of Sector-IC+II+III
3	Sector-V	19.25	15.00				4.25		
	Trench Cutting	0.50					0.50		
	Rehandling OB	2.29					2.29		
	Sub Total	**22.04**	**15.00**	**0.00**	**0.00**	**0.00**	**7.04**	**0.00**	**0.00**
4	Sector-V	15.52	12.00				3.52		
	Sector-IC,II&III	4.48			3.98				0.50
	Trench Cutting	0.50					0.50		
	Rehandling OB	1.00					1.00		
	Sub Total	**21.50**	**12.00**	**0.00**	**3.98**	**0.00**	**5.02**	**0.00**	**0.50**
5	Sector-V	16.9	12.00				4.90		
	Sector-IC,II&III	3.60			2.48				1.12
	Sub Total	**20.50**	**12.00**	**0.00**	**2.48**	**0.00**	**4.90**	**0.00**	**1.12**
6	Sector-V	17.64	12.00			2.00	3.64		
	Sector-IC,II&III	3.11			2.37				0.74
	Sub Total	**20.75**	**12**	**0**	**2.37**	**2.00**	**3.64**	**0**	**0.74**
7	Sector-V	17.55	12.00				5.55		
	Sector-IC,II&III	3.95			0.61				3.34
	Sub Total	**21.50**	**12.00**	**0.00**	**0.61**	**0.00**	**5.55**	**0.00**	**3.34**
8	Sector-V	17.55	12.00				5.55		
	Sector-IC,II&III	3.95							3.95
	Sub Total	**21.50**	**12.00**	**0.00**	**0.00**	**0.00**	**5.55**	**0.00**	**3.95**
9	Sector-V	17.55	3.11	2.95			11.49		
	Sector-IC,II&III	3.95							3.95
	Sub Total	**21.50**	**3.11**	**2.95**	**0.00**	**0.00**	**11.49**	**0.00**	**3.95**
10	Sector-V	17.60		5.00			12.60		
	Sector-IC,II&III	3.90							3.90
	Rehandling OB	1.00					1.00		
	Sub Total	**22.50**	**0.00**	**5.00**	**0.00**	**0.00**	**13.60**	**0.00**	**3.90**
11	Sector-V	2.56		2.56					
	Sector-IV	13.10				2.00	11.10		
	Sector-IC,II&III	3.84							3.84
	Rehandling OB	0.50					0.50		
	Sub Total	**20.00**	**0.00**	**2.56**	**0.00**	**2.00**	**11.60**	**0.00**	**3.84**
12	Sector-IV	15.11				2.00	13.11		
	Sector-IC,II&III	4.39						1.00	3.39
	Sub Total	**19.50**	**0.00**	**0.00**	**0.00**	**2.00**	**13.11**	**1.00**	**3.39**

Year	Source of OB	Volume of OB (Mm^3)	External Dump				Internal Dump		
			Dump-X	Merging of Dump X with Kargil dump	Dump – C & D	Merging of Dump-I with Dump – A+B	Void of Sector-V	Void of Sector-IV	Void of Sector-IC+II+III
13	Sector-IV	15.10				0.79	14.31		
	Sector-IC,II&III	3.90						2.01	1.89
	Sub Total	**19.00**	**0.00**	**0.00**	**0.00**	**0.79**	**14.31**	**2.01**	**1.89**
14	Sector-IV	13.27					13.27		
	Sector-IC,II&III	3.73					2.79	0.94	
	Sub Total	**17.00**	**0.00**	**0.00**	**0.00**	**0.00**	**16.06**	**0.94**	**0.00**
15	Sector-IV	14.10					14.10		
	Sector-IC,II&III	1.40						0.40	1.00
	Sub Total	**15.50**	**0.00**	**0.00**	**0.00**	**0.00**	**14.10**	**0.40**	**1.00**
16	Sector-IV	14.10					14.10		
	Sector-IC,II&III	1.40						1.4	
	Sub Total	**15.50**	**0.00**	**0.00**	**0.00**	**0.00**	**14.10**	**1.40**	**0.00**
17	Sector-IV	5.69					5.69		
	Sector-IC,II&III	2.61						2.61	0.00
	Sub Total	**8.30**	**0.00**	**0.00**	**0.00**	**0.00**	**5.69**	**2.61**	**0.00**
Total		**319.44**	**90.11**	**10.51**	**9.44**	**6.79**	**166.61**	**8.36**	**27.62**

8.5 SCHEDULE OF EXPENDITURE ON HIRING/OUTSOURCING OF HEMM

The cost of OB removal by hiring/outsourcing of equipment depends on type of strata and lead/lift. In Durgapur Extension (Deep) OC mine, the strata under consideration is medium hard strata. The rates for OB removal by hiring/outsourcing of equipment for the proposed mine have been estimated on the basis of approved rates of FD's of WCL. The approved rates are updated with change in price of diesel for November, 2016. Accordingly, rates for excavation for hiring/ outsourcing of HEMM is being adopted in this report for planning purpose and economic evaluation of the project. These rates may vary at the time of actual implementation. The rates include excavation, transport, drilling, dozing at face & dumps, haul road maintenance, water spraying and land reclamation etc. It is also suggested here that before awarding the work to hiring agency, geological structure should be further confirmed by drilling additional boreholes.

In this PR of Durgapur Extension (Deep) OC mine, out of total OB of 311.00 Mm^3 in-situ OB from quarry, 259.40 Mm^3 Top OB will be removed by hiring/ outsourcing of HEMM. In addition to this, 1.65 Mm^3 OB from trench cutting at external dump site and re-handling of 6.79 Mm3 OB will also be carried out by hiring/out-sourcing agency.

Year-wise weighted average rates of hiring for OB removal considered for planning purpose are given below:

EXPENDITURE ON HIRING/OUTSOURCING OF HEMM

Year	OB from Quarry			OB from Trench Cutting			Re-handling of OB		
	Volume (Mm^3)	Lead (km)	Hiring Rate (Rs/m^3)	Volume (Mm^3)	Lead (km)	Hiring Rate (Rs/m^3)	Volume (Mm^3)	Lead (km)	Hiring Rate (Rs/m^3)
1	10.40	1.50	55.92*						
2	12.00	2.00	67.84	0.65	1.50	44.40	2.00	1.50	55.49
3	16.05	2.50	72.57	0.50	1.50	44.40	2.29	1.50	55.49
4	17.10	3.00	77.10	0.50	1.50	44.40	1.00	1.50	55.49
5	17.60	3.00	77.10						
6	17.85	3.00	77.10						
7	18.60	3.25	79.47						
8	18.60	3.25	79.47						
9	18.60	3.00	77.10						
10	18.60	3.00	77.10				1.00	2.00	60.22
11	16.60	2.50	72.57				0.50	2.00	60.22
12	16.60	2.50	72.57						
13	16.10	2.50	72.57						
14	14.10	2.50	72.57						
15	12.60	2.50	72.57						
16	12.60	2.50	72.57						
17	5.40	2.50	72.57						
Total	**259.40**			**1.65**			**6.79**		

* $Rs.55.92/m^3$ is the existing awarded rate for OB removal

The average cost of OB removal works out to $Rs.74.24/m^3$. The average cost of OB removal from trench cutting and rehandling of OB are Rs. $44.40/m^3$ and Rs. $56.53/m^3$ respectively.

8.5.1 SCOPE OF WORK BY HIRING/OUTSOURCING OF HEMM

The scope of work by hiring/outsourcing of HEMM shall include blast hole drilling, earth work excavation, loading, transportation, dumping, dozing, maintenance of haul road, leveling at dumping sites as per guidelines of the project authorities highlighted in this project report or otherwise to suit the local conditions. All statutory rules, regulations and applicable laws are to be followed including those related to government licenses, workmen compensation, insurances etc.

Excavation materials shall have to be dumped at sites which will be shown by project authorities from time to time in accordance with dump plan of this report. Haul roads have to be maintained with the requisite gradient as per regulation and in accordance with the conditions imposed by DGMS in its permission under regulation 98(1) and (3) and other relevant provisions of Coal Mines Regulations, 1957. Surface illumination, pumping and CHP facilities have been kept in OPM of Appendix A.3.

8.6 EQUIPMENT SCHEDULE

This Project Report of Durgapur Extension (Deep) OC mine has been prepared in Partial Hiring option for target production of 3.0 Mty. In the proposed PR, the existing departmental capacity of the mine has been maintained to extract the entire coal and part of Top OB. As per the data provided by Mine / Area, the system capacity of the existing departmental HEMM of mine as on 01.04.2016 is about 4.688 Mty (Digging capacity -9.655 Mm^3/y and Dumper capacity - 4.688 Mm^3/y).

In the proposed PR, the total annual volume of coal extraction at target capacity is 1.786 Mm^3 and therefore OB removal by departmental HEMM is proposed as 2.90 Mm^3 to maintain total departmental capacity at 4.686 Mm^3.

The Schedule of major equipment along with its phasing in proposed Durgapur Extension (Deep) OC mine is tabulated below:

Phasing of Major HEMM

Sl. No.	HEMM	Nos	Phasing of HEMM (Years)					
			Yr-1	Yr-2	Yr-3	Yr-4	Yr-5	Yr-6
A)	**For Overburden**							
1	5.0-6.0 m^3 Diesel Hyd. Shovel	3		3 (R)				
2	60 T RD Dumpers	16		16(R)				
3	160 mm dia. Diesel Drill	3		3 (R)				
4	410 HP dozer	3		3 (R)				
B)	**For Coal**							
1.	4.0-5.0 m^3 Diesel Hyd. Backhoe	3						3 (R)
2.	60 T RD Dumpers	11		7 (R)			2 (R)	2 (R)
3.	160 mm dia. Diesel Drill	3		3 (R)				
4.	410 HP dozer	3				2 (R)	1 (R)	
C)	**For Common Activities**							
1.	30-40 t crane	1		1 (R)				
2.	8 t Mobile Service crane	2		2 (R)				
3.	28 kl Water Sprinkler	3		3 (R)				
4.	280HP Motor Grader	2	1 (N)			1(R)		
5.	Mobile Maintenance Van	2	2 (N)					
6.	Diesel Bowser 8 kl	2		1(R)				1(R)
7.	Fire Fighting Truck	1	1 (N)					
8.	Tyre Handler	1		1 (R)				
9.	4.0-6.0 m^3 Front End Loader	1		1 (R)				
10	2.8 m^3 Diesel hyd. Backhoe	1		1 (R)				
D)	For Reclamation							
1.	450 HP Wheel Dozer	1				1(R)		
2.	Water Tanker 28 kl	1		1(R)				

Note: 'R" denotes replacement HEMM and "N" denotes new HEMM

8.7 DRILLING & BLASTING

The degree of fragmentation in opencast mine has to be optimised so that total cost of drilling, blasting, excavating, transport and crushing as a total system is minimised. In order to reduce the excessive vibrations at nearby surface structures and also to achieve satisfactory blasting results, an optimized control blasting system depending upon rock formations using combination of delays and relays will have to be evolved. Drilling pattern in overburden, with a bench height of 10 m, the burden has been assumed as 4 m and spacing of 5m. For coal

extraction, depending upon the thickness, bench height from 6 m to 8 m is being proposed. Powder factor of 2.10 m^3/kg for OB and 6.12 t/kg for Coal has been considered for blasting in coal for planning purpose. However at the time of operation of mine, drilling parameters have to be optimized on the basis of actual field trial depending upon joint pattern, bedding plane and local geology of the blast site and accordingly powder factor for OB & coal may be deviated after final trial of blasting. *It is proposed that for increasing ground resistance for improving internal dump stability floor blasting may be done.*

For storage of explosive use of existing magazine has been proposed for catering to the requirement of proposed Durgapur Extension (Deep) OC mine.

9.0 OVERALL QUALITY OF COAL

The quality of Composite coal seam has been assessed for the quarriable area based on the borehole wise quality data in different Sectors and the details are tabulated below:

Sector/ Quarry	Bh No	From (m)	To (M)	Thick (m)	Including All Bands (Excluding Parting)				
					E T (m)	M%	ASH%	GCV (kCal/Kg)	GCV BAND
I - III	CMWDU04	99.40	116.65	17.25	17.25	7.2	34.4	4270	G11
	CMWDU05	109.23	127.20	17.97	17.97	8.4	25.2	4961	G8
	CMWDU07	120.46	135.70	15.24	13.24	6.1	42.8	3640	G13
	D011	117.96	133.29	15.33	15.33	7.5	32.3	4424	G10
	D012	123.36	140.18	16.82	16.82	8.0	28.1	4747	G9
	D016	137.14	153.86	16.72	16.72	7.6	31.2	4513	G10
	AVERAGE					**7.5**	**32.3**	**4426**	**G10**
IV	CMWDU02	123.74	143.20	19.46	19.46	6.9	36.7	4097	G11
	CMWDU10	125.30	143.35	18.05	18.05	7.8	29.6	4635	G9
	CMWDU13	98.00	116.55	18.55	18.55	8.1	27.2	4817	G9
	D116	73.64	91.32	17.68	16.05	8.2	26.2	4896	G9
	AVERAGE					**7.8**	**29.9**	**4611**	**G9**
V	D002	129.85	146.56	16.71	16.71	7.2	34.6	4251	G11
	CMWDU24	94.52	109.00	14.48	14.48	7.8	29.7	4625	G9
	D056	134.08	148.56	14.48	14.48	7.4	33.0	4373	G10
	D057	125.92	142.83	16.91	16.91	8.3	26.0	4901	G8
	D058	155.15	170.72	15.57	15.57	7.6	31.5	4485	G10
	CMWDU20	134.35	150.58	16.23	16.23	8.2	26.7	4849	G9
	CMWP23	116.91	134.75	17.84	17.84	8.1	27.5	4789	G9

Sector/ Quarry	Bh No	From (m)	To (M)	Thick (m)	Including All Bands (Excluding Parting)				
					E T (m)	M%	ASH%	GCV (kCal/Kg)	GCV BAND
V	D043	91.01	107.05	16.04	16.04	8.1	27.1	4826	G9
	D047	124.94	142.24	17.30	17.30	7.9	29.1	4667	G9
	CMWDU12	135.60	152.00	16.40	16.40	7.7	30.3	4583	G10
	CMWDU22	149.30	164.53	15.23	15.23	7.1	35.1	4219	G11
	D049	166.10	183.67	17.57	17.57	8.4	25.2	4961	G8
	D048	165.36	184.47	19.11	19.11	8.1	27.6	4779	G9
	CMWP37	104.36	122.00	17.64	17.64	7.8	29.5	4644	G9
	AVERAGE					**7.8**	**29.5**	**4639**	**G9**
I - V	CMWDU04	99.40	116.65	17.25	17.25	7.2	34.4	4270	G11
	CMWDU05	109.23	127.20	17.97	17.97	8.4	25.2	4961	G8
	CMWDU07	120.46	135.70	15.24	13.24	6.1	42.8	3640	G13
	D011	117.96	133.29	15.33	15.33	7.5	32.3	4424	G10
	D012	123.36	140.18	16.82	16.82	8.0	28.1	4747	G9
	D016	137.14	153.86	16.72	16.72	7.6	31.2	4513	G10
	CMWDU02	123.74	143.20	19.46	19.46	6.9	36.7	4097	G11
	CMWDU10	125.30	143.35	18.05	18.05	7.8	29.6	4635	G9
	CMWDU13	98.00	116.55	18.55	18.55	8.1	27.2	4817	G9
	D116	73.64	91.32	17.68	16.05	8.2	26.2	4896	G9
	D002	129.85	146.56	16.71	16.71	7.2	34.6	4251	G11
	CMWDU24	94.52	109.00	14.48	14.48	7.8	29.7	4625	G9
	D056	134.08	148.56	14.48	14.48	7.4	33.0	4373	G10
	D057	125.92	142.83	16.91	16.91	8.3	26.0	4901	G8
	D058	155.15	170.72	15.57	15.57	7.6	31.5	4485	G10
	CMWDU20	134.35	150.58	16.23	16.23	8.2	26.7	4849	G9
	CMWP23	116.91	134.75	17.84	17.84	8.1	27.5	4789	G9
	D043	91.01	107.05	16.04	16.04	8.1	27.1	4826	G9
	D047	124.94	142.24	17.30	17.30	7.9	29.1	4667	G9
	CMWDU12	135.60	152.00	16.40	16.40	7.7	30.3	4583	G10
	CMWDU22	149.30	164.53	15.23	15.23	7.1	35.1	4219	G11
	D049	166.10	183.67	17.57	17.57	8.4	25.2	4961	G8
	D048	165.36	184.47	19.11	19.11	8.1	27.6	4779	G9
	CMWP37	104.36	122.00	17.64	17.64	7.8	29.5	4644	G9
	AVERAGE					**7.7**	**30.3**	**4581**	**G10**

From above table, it is clear that the average GCV for the Composite Seam for entire Sector- IC, II, III, IV & V including all in-seam bands but excluding parting works out to **4581 kCal/kg** which is in **G-10** band of GCV.

10.0 PROVISION OF PUMPS, PIPES AND PIPE FITTINGS

10.1 PUMPING CAPACITY

The Pumping capacity required at the time of five years after reaching the target has been calculated as under:-

Sl. No.	DISCRIPTIONS	CALCULATED DATA		
		Sec-I/II/III	Sec-IV	Sec-V
1	Maximum exposed area (ha)	165	125	225
2	Maximum backfilled area (ha)	28	35	72
3	Surface area of mine considered for excavation (ha)	137	90	153
4	Area beyond excavation (ha) 5% of item (3)	6.85	4.5	7.65
5	Run-off co-efficient for			
	(a) Open excavation	0.70	0.70	0.70
	(b)Area beyond excavation	0.10	0.10	0.10
6	Rainfall infiltration co-efficient for backfilled area	0.20	0.20	0.20
7	Probable max. rainfall in a day (mm)	300	300	300
8	Water collected in the quarry due to exposed area and area beyond excavation (cum/day)	306555	211350	366795
9	Required pumping capacity to handle the whole water of the rain water in 100 hrs (lps)	852	588	1019
10	Seepage due to strata (15% of Item 9)	128	89	153
11	Total pumping capacity (lps)	980	677	1172
12	Depth in target plus five years (m)	150	150	205

Pumping system has been designed for the volume of water accumulated in the mine at the target plus five year production considering maximum rainfall in a day as **300**mm. Peak pumping capacity worked out as **352,539** cum in sector I/II/III; **243,053** Cum in Sector IV; **421,815** Cum in Sector V. Above volume of water will be dewatered in **5** days at the rate of **20** hrs pumping per day.

Pumping capacity per day thus worked out as **70,508** cum in sector I/II/III; **48,611.00** Cum in Sector IV; **84,363.00** Cum in Sector V

10.5 SELECTION OF PUMPS AND DELIVERY RANGES

(i) Ten pumps with SS body & SS impellor of 160 lps x 250m head have been proposed for Sector-V. Out of ten pumps, two pumps are standby.

(ii) Twelve pumps with SS body & SS impellor of 160 lps x 200m head have been proposed for Sector-I/II/III/IV. Out of twelve pumps, two pumps are standby.

(iii) Two existing pumps of 80 lps x 200m head will be utilised in Sector-I/II/III/IV.

(iv) Three existing pumps of 160 lps x 150m head will be utilised in the initial stages of the mine.

(v) Two existing pumps of 80 lps x 150m head will be utilised in the initial stages of the mine.

(vi) Two diesel pump with SS body & SS impellor of 80 lps x 60m head have been proposed. Out of two one is existing.

(vii) Ten face pumps of with SS body & SS impellor 11 lps x 30 m head have been envisaged in this report and out of ten pumps, two are standby.

(viii) Eight delivery ranges of HDPE pipe 250mm dia. have been proposed for main pumps of 160lps x 250m head and maximum one pump will be connected in each delivery.

(ix) Ten delivery ranges of HDPE pipe 250mm dia. have been proposed for main pumps of 160lps x 200m head and maximum one pump will be connected in each delivery.

(x) Two delivery ranges of HDPE pipe 250mm dia. have been proposed for main pumps of 80lps x 200m head and maximum one pump will be connected in each delivery.

(xi) Three existing delivery ranges has been used for pumps of 160lps x 150m head.

(xii) Two existing delivery ranges has been used for pumps of 80lps x 150m head.

(xiii) GI pipe 80 mm dia. will be used for face pumps.

(xiv) No piping provision have been made for standby pumps.

Note: Stainless steel pump & HDPE pipes are provided due to acidic water.

11.0 COAL HANDLING PLANT

11.1 INTRODUCTION

11.1.1 Existing System

A full-fledged coal handling plant with crushing, picking and storage facilities already exists at Durgapur OCP. Presently, coal processed in the CHP is being fed to customer's belt conveyor for onward transportation to CTPS power plant by Aerial Ropeway owned by CTPS.

Two numbers of crushers are used for crushing of coal. One crusher is working and other is standby.

Details of crushers in CHP are given below:

1. L & T make Gundlach Crusher of 600 tph capacity.
2. BWF make crusher of 400 tph capacity.

As discussed with Area and Colliery authority, the proposed 3.00 Mty production of mines can be crushed by existing system. In case of surplus coal, it can be crushed at Chanda- Raitwari Colliery (CRC) CHP or Hindustan Lalpeth OC CHP where crushing capacity is available beside the coal of existing mines for crushing to (-) 100 mm size.

Basic data

a)	Target production from mine	:	3.0 Mty
b)	Target production from CHP	:	3.0 Mty
c)	Product size	:	(-) 100 mm
d)	Mine operation	:	3 Shifts/Day
e)	CHP Operation	:	3 Shifts/Day
f)	Life of the Mine	:	17 years
g)	Grade of the Coal	:	G-10
h)	Mode of Dispatch	:	By Road to Siding
i)	Customer	:	MSEB and Others

11.2 Coal Transport System

1. Coal form Durgapur mine brought by dumpers/tippers is unloaded in the main 300t capacity receiving hopper through grizzly. This coal is feed to L&T make Gundlach Crusher. Crushed coal is discharged on the belt conveyor C1 of width 1200mm. C1 discharge the coal into bunker above the belt conveyor C2/C3. Conveyor belt C2/C3 of width 1200 mm receives coal from bunker and discharge on the belt conveyor C4 of width 1200 mm. This conveyor transports coal into 6 Nos of RCC bunker of 1000t capacity each (6000 t). System capacity is 600 tph.

2. Conveyor P1 of 1200mm wide belt collects crushed coal of size (-) 200 mm from BWF crusher and discharges onto P2 Conveyor of 1200mm width. Coal from P2 conveyor is discharged for further crushing to (-) 100 mm using secondary crusher. (-) 100 mm size coal will be discharged on to conveyor C4 of belt 1200mm wide. Presently Conveyor discharges coal into 6 Nos. RCC bunker of 1000 T (6000t) capacity each. System capacity is 400 tph.

   Coal from these bunkers is being reclaimed and fed to MSEB's conveyor using reciprocating feeders fitted below each opening of the bunker.

11.3 Dust Suppression, fire fighting System and miscellaneous

To provide dust suppression, fire fighting system and miscellaneous in existing CHP, provision of fund has been made in this report.

11.4 Capital Investment Requirement

The total capital requirement for provision made in this report (as on August 2016) works out to **Rs. 102.55 lakhs**. The details are given in Appendix – A.3.5.0

The estimates of Plant & Machinery are based on 'Standard Price List of Mining Machinery', June 2015 (escalated to August 2016) circulated by CMPDI (HQ) and the latest supply order of the equipment.

12.0 WORKSHOP & STORES

12.1 WORKSHOP

12.1.1 Introduction

To provide maintenance and repair of various HEMM, CHP, equipment, pumps, LMVs, electrical etc of the mine, independent full fledge unit workshop has been envisaged for the project.

As discussed with Area and Colliery authority, existing workshop meets current requirement. Replacement has been provided for some of the useful items. Existing workshop consists of two types of maintenance and repair shops. These maintenance and repair shops are as follows: -

i) **Excavation workshop: -** Existing Excavation workshop would meet basic engineering support in respect of maintenance and repair of various HEMM deployed in the mine. Capital repair of HEMM and other equipment would be carried out at central workshop, Tadali.

ii) **E & M workshop: -** Existing E & M workshop would meet basic support to carry out maintenance & repair of the CHP, equipment, pumps, LMVs, electrical etc. These workshops are essentially a unit workshop and will depend on central/regional workshop for major repair and part manufacture. Shovel and drill maintenance & minor repairs will be carried out at site and components/assemblies requiring running repair will be dismantled from the machine and transported to the workshop for necessary repairs.

12.1.2 Maintenance Facilities

Work load, equipment, electrical load and manpower of the workshop has been assessed on the basis of population of various HEMM, CHP, equipment, pumps, LMVs, electrical etc and fulfill their running repairs and maintenance.

12.1.3 Scope of Work

Following activities are proposed to be carried out in the respective workshop.

12.1.3.1Unit Excavation workshop

i) Daily cleaning, by weekly washing of dumpers and other HEMM, daily inspection, checking of air system, hydraulic system, electrical & mechanical system of dumpers.

ii) Daily oiling, greasing, lubrication of assemblies/ sub-assemblies of various HEMM.

iii) Replacement of leaky hoses, tubes, filters, air cleaners etc.

iv) Tyre replacement and tyre inflation.

v) Incidental minor repairs/ replacement of assemblies/ sub- assemblies.

vi) Changing of piston rings, valves, crankshaft bearings, packing, parts of transmission, axles, differentials etc.

vii) Battery charging, repairs of self-starters, dynamos, coil of HEMM.

viii) Machinery/ minor repairs/ limited manufacture of various parts of HEMM as per the requirement.

ix) Welding on dumper bodies, shovels, buckets etc.

x) Miscellaneous structural works.

xi) Scheduling for repair needs at central workshop.

12.1.3.2 Main Workshop

Central/Regional workshops are envisaged as main workshop for this project. These workshop will provide all the support to unit workshop under their scope.

12.1.3.3 Unit E&M Workshop

Following activities are proposed to be carried out in the respective workshop:

i) Maintenance and repair of CHP equipment, Pumps, LMVs, Electrical etc. of the Project.

ii) Manufacture of spares to a limited extent

iii) Transformer oil filtration.

12.2 PROJECT STORE

One small and independent unit stores exists in the mine to cater the routine needs of consumables, spares, POLs etc. This will depend on Regional/Central stores for major spares.

13.0 POWER SUPPLY

13.1 SOURCE OF POWER

The proposed Durgapur Extension Deep OC Mine is located at a distance of approximately 12 kms from Chandrapur Town and comes under the administrative control of Chandrapur Area of WCL.

Presently Durgapur OC receives power at 11 kV, 3km long overhead line from MSEDCL s/s near, Chandrapur Thermal power station. This 11 kV feeder will not be able to cater the load of proposed Durgapur Extension Deep OC Mine. In view of this it is proposed to draw **33 kV, 3 km long double feeder overhead line** from nearby CTPS/MSEDCL substation, Chandrapur to a suitable location near Durgapur Extension Deep OCM in non coal bearing area where a 33kV/6.6kV substation is proposed to be installed. For erecting 33 kV double feeder line provision has been made in Appendix A.8.1.

The existing 11 kV/3.3 kV substation will remain unaltered, so that it will cater the load of existing CHP system as no provision has been made for new CHP. The existing CHP system is sufficient enough for the proposed mine & the incoming source for CHP will remain at 3.3 kV. For any future change, two nos. (One as a spare) of 6.6 kV feeder has been provided in the new proposed 33 kV/ 6.6 kV substation. Separate metering point arrangement will be made for 33 kV incoming power supply.

The incoming source of 11 kV will also be used as a standby feeder for nearby mines of Chandrapur Area to increase the reliability factor.

As per the demand chart developed for the proposed Durgapur Extension Deep OC mine, it is seen that the maximum demand of the mine will be 7997 kVA (Including Township).

Following provisions has been made for incoming power arrangement and diversions of HT lines falling under the mine boundary:

Sl. No.	Particulars	Quantity	Amount
1	33 kV, 3km long double feeder overhead line from nearby CTPS/MSEDCL substation, Chandrapur to a suitable location near Durgapur Extension Deep OC at non coal bearing area where a 33kV/6.6kV substation is proposed to be installed.	3 km	75 lakh
2	Diversion of 220 kV overhead line falling within the mine boundary, for a tentative length of 8 km.	8 km	1000 lakh
3	Diversion of 11 kV HT overhead line falling within the mine boundary for a tentative length of 2 km (between Kargil and Padmapur dump)	2 km	28 lakh
	Sub-Total		1103 lakh
4	Service Tax (on work contract to execute the above job) 15% on 40% of the total amount		67 lakh
	TOTAL		**1170 lakh**

Thus a total amount of Rs. 1170 lakhs (including service tax @ 15% on 40% amount) has been provided in Appendix A.8.1 to meet the above cost.

13.2 SALIENT FEATURES OF ELECTRICAL PARAMETERS

Cost Estimate

The estimated phased capital investment requirement for electrical plant and machinery and communication along with brief specifications are given in Appendix A.3.2.

The present two part tariff of MSEDCL as applicable for August – 2016 is as follows:-

Description	Industrial/Mine load	Township
i) M.D Charges	Rs.220 / kVA / month	Rs.220 / kVA / month (for Industrial feeder)
ii) Energy charges	Rs.7.21 / KWh	Rs. 5.81 / kWh
iii) FCA charges	Rs. 0.6366 / kWh	Rs. 0.6366 / kWh
iv) Electricity duty	9.3 % of [(i)+(ii)+(iii)]	16 % of [(i)+(ii)+(iii)]
v) Tax on sale	Rs. 0.0904 / kWh	Rs. 0.0904/ kWh

Based on the above tariff the power cost estimate of the mine has been calculated and placed in the table given below:-

Sl. No.	ITEM HEAD	PARTIAL HIRING OPTION
1.	SPECIFIC ENERGY CONSUMPTION (Including township)	5.58 kWh/t
2.	SPECIFIC POWER COST (Including township)	Rs.55.68 /t
3.	FIXED PERCENTAGE OF POWER COST	81.95%
4.	VARIABLE PERCENTAGE OF POWER COST	18.05 %
5.	SPECIFIC DEMAND	2.666 MVA/Mt.
6.	CAPACITOR BANK PROVIDED	
	a) Only mine	4050 kVAR
	b) Only township	175 kVAR
	c) Total	4225 kVAR
7.	AVERAGE COST OF PURCHASED POWER	Rs. 9.98 /kWh
8.	COAL PRODUCTION	3.000 Mty.

The details of capital of electrical P & M and estimated capital required is given at Appendix-A.3.2.

14.0 CIVIL CONSTRUCTION

14.1 GENERAL

14.1.1 Life of the project & specifications

The estimated life of the proposed Durgapur Extension (Deep) OC mine is 17 years. As such all civil works have been envisaged on permanent specifications. It should be ensured that all the service & residential buildings are constructed on non-coal bearing area.

14.1.2 Nature of Soil

Provision has been made for poor soil safeguarding uncertainty of foundation strata. However, provision for soil investigations has also been made in the estimates. Therefore, it is suggested that before undertaking detailed engineering and construction work, geo-engineering investigations of soil should be done.

14.1.3 Building Cost Index

The Building Cost Index for the Maharashtra has been worked out to 597 in 2016 (2^{nd} half) taking the prevalent rates of materials and labour's of Maharashtra region. This Building Cost Index is with reference to base 100 in Nagpur as on 1.1.1992. The detailed calculations of Building Cost Index are shown in Appendix-A.2.3. The cost index with reference to 01.10.1976 comes to 3582.

14.1.4 Contingencies & Service tax

Contingencies @ 3% and Service tax (i.e., 15% of 40% of work vaue) @ 6% have also been taken for all items of Civil Works.

14.2 SERVICE BUILDINGS

Keeping in view the needs and requirements of this mine, provision for service buildings such as, Manager Office, Pit office , Excavation workshop, E & M Workshop, Unit Stores, facility outside the workshop, Sub-stations and other service buildings have been provided.

14.2.1 Excavation Workshop

In excavation workshop, washing ramp for 60T dumpers –2 no's & concrete pavement for dumper movement of 2000 m^2 area are considered as additional provisions.

14.2.2 E & M workshop

E & M workshop consists of main workshop building, LMV repair shed, LMV washing ramp, workshop office, workshop stores, switch room, cycle and scooter shed, security post, bituminous pavement, underground water tank, pump house, washing platform and lavatories along with a boundary wall with gate.

14.2.3 Unit Stores

Unit Store comprises of store shed of 6m height and hard stand surrounded by a boundary wall with a gate.

14.2.4 Sub-Station

Sub-station has been provided for project only. Substation building has been proposed with a clear height of 4.5m, along with barbed wire fencing with a gate.

14.2.5 Magazine

No new magazine is proposed as the existing magazine will be utilised.

14.2.6 Estimated amount for Service Building

Details and estimated amount of the proposed service buildings are shown in appendix –A.2.1

14.3 RESIDENTIAL BUILDING

14.3.1 Manpower & Nos. of Quarters

Total manpower proposed for this project is 707. No new quarters has been proposed, as the existing residential colony will be utilised which consists of Typed quarter 415 MQ's, 102 B-type, 15 C-type and1 D-type.

14.4 ROADS AND CULVERTS

14.4.1 Colony Road

As the existing colony will be utilized no colony road has been provided.

14.4.2 Haul Roads & Heavy Duty Roads with Culverts

For transportation of Coal (Inside mine), Haul Road of 2 km length for 60T dumpers has been proposed as additional provision.

For transportation on surface, Heavy Duty Road of 2 km length for 60T dumpers have been proposed as additional provision.

14.4.3 Service Roads & Culverts

For approaching different Service Buildings 0.5 km long Sector Road on Stratum `C' specification with culverts, drain, tree guards etc. are envisaged as additional provision.

14.4.4 Approach Road to Mine

An approach road to mine of 1.0 km length long Sector Road on Stratum `D' specification with culverts, drain, tree guards etc. are envisaged as additional provision.

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14.4.5 Estimated Amount for Roads and Culverts

The estimated amount and other details of different roads and culverts are given in Appendix-A.8.2.

14.5 WATER SUPPLY ARRANGEMENT

14.5.1 Water Demand for Colony

Water supply arrangements have been envisaged for colony and project both. With reference to the letter no. WCL/CHA/SAM/DOCSA/PR/932 dated 16.08.2016 water demand for colony consisting of 1700 quarters has been considered. Accordingly intake well & water drawing arrangements for the length of 7km from Erai River to Durgapur colony has been envisaged as additional provision.

The total water demand for 1700 no's of quarter is 1400 kl.

Sl. No.	Particulars	Unit	Partial Hiring Option
(i)	Manpower	Nos	707
(ii)	Total No. of houses	Nos	1700
	Population		
1	Residential Population @ 5 person per house	Nos	8500
2	Non Residential workers	Nos	-
A	**Water Demand for Colony**		
(i)	Water requirement for residential population @ 135 litre per capita per day	Litres	1147500
(ii)	Water requirement for Welfare/ community buildings to be located in the colony @ 10 % of item (A) (I) above	Litres	114750
(iii)	Process and other losses @ 10% of (A) (i) & (ii)	Litres	126225
	Total of (A)	Litres	1388475
	Say	KL	**1400**

Industrial Water Demand for Project including Potable Water demand for Persons working in the Project

The total water requirement for project site has been worked out to 790 kl as per HEMM proposed in Departmental Option of approved PR considering water requirement for out-sourcing agency also. Water demand for project site includes water to be supplied for dust suppression, fire fighting, water sprinkling on roads, etc.

Sl No.	Particulars	Unit	Partial Hiring Option
	For Opencast Projects		
	Capacity: 3.00 Mty		
	No. of Dumpers (considering departmental option) =	143	
	No. of Dozers (considering departmental option) =	11	

Sl No.	Particulars	Unit	Partial Hiring Option
a)	Water requirement for total manpower of Project @ 45 litre/capita/day	Litres	31815
b)	Water requirement for washing of dumpers @ 1800 litre/ dumper/day	Litres	277200
c)	Water requirement for dust suppression in CHP & other industrial premises @22500 litre/ day/million tonne of coal production per year	Litres	67500
d)	Water requirement for fire fighting @45000 litre/ day/million tonne of coal production per year	Litres	135000
e)	Water requirement for road watering @ 67500 litre/ day/million tonne of coal production per year	Litres	202500
f)	Water requirement of Service Buildings @ 10% of item (a) of above	Litres	3180
g)	Allowance for loss & wastage @ 10% (a) to(f)	Litres	71800
	Total Water Demand	Litres	778995
	Say	KL	**790**

14.5.2 Source of Water

With reference to the letter no. WCL/CHA/SAM/DOCSA/PR/932 dated 16.08.2016, source proposed by project officials has been envisaged as the source. However, it is suggested that the source of water may be ascertained after carrying out necessary investigations with regards to the quality and quantity of water.

14.5.3 Salient features of Water Supply arrangement

The Erai river passing between the Padmapur OC & Bhatadi OC Mine (near bridge of Bhatadi Road) at a distance of 7km from the Durgapur colony has been considered as source of water supply. Accordingly intake well & water drawing arrangements have been proposed to be conveyed to O.H. reservoirs via ground sumps. Further, water from O.H. reservoir shall be supplied under gravity to different buildings after chlorination.

It is, however, suggested that permanent water supply arrangement should be formulated after carrying out detailed survey, investigations for the adequate source of water and detailed engineering.

14.5.4 Estimated Amount of Water Supply

The details and estimated amount for Water supply in colony and industrial use is given in Appendices- **A.8.3 (B-I) and A.8.3 (B-II**)

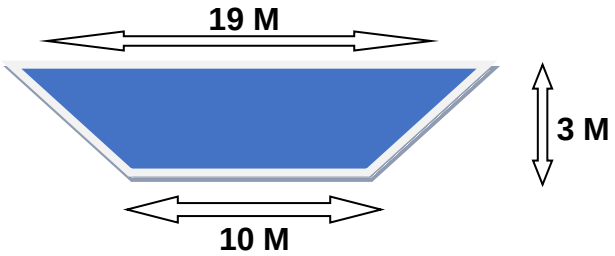
14.6 SEWAGE DISPOSAL ARRANGEMENT

To avoid any discharge of effluent into natural watercourses, sewage disposal arrangement has been envisaged. Estimated amount for sewage disposal arrangement for project site along with required surface drains is given in Appendices **A.8.3 (A-II)**. However, final economical scheme may be formulated after detailed survey & engineering considering the site parameters. As the existing colony will be utilized no provision has been made for colony.

14.7 DIVERSION OF NALLAH

Due to unavailability of data, cross section details of the nallah are assumed as shown in the figure below. Diversion length, i.e., 1.7 km used are as per proposed mine plan and cost is provided only for earthwork excavation.

It is however suggested that actual diversion of nallah should be done after carrying out detailed survey & investigations, catchment area, adequate side slopes may be lined or unlined, accordingly bed slope, and detailed engineering.



14.8 CONSTRUCTION MANPOWER

The proposed civil engineering manpower in the project report is for the repair & maintenance works of the project i.e., for repair & maintenance of buildings, roads, water supply, sewage disposal arrangement, etc. Personnel required for the construction period of the project are not included in the total manpower proposed for the project. Following construction manpower has been proposed for the construction period only.

i) Sr. Manager(C)	1 No.
ii) Manager (C) / Deputy Manager (C)	2 No.
iii) Assistant Manager (C)/ Sr.Officer (C)	4 No.
iv) Engineering Asstt./Overseer (C)	6 No.
v) Accountant	3 No.
vi) Clerk	3 No.

It is proposed to arrange this manpower for the construction period from the total available manpower in WCL under Civil Engineering Discipline.

15.0 SAFETY & CONSERVATION

The project report has been drawn in conformity with the prevailing statutory provisions as per Mines Act 1952 and CMR 1957 applicable for safety in Opencast Mines. However, all statutory rules, regulations, applicable laws etc. and statutory requirement related to Govt. licenses, workers compensation, Insurance, etc. including minimum wage act for workers employed by the agency outsourcing HEMM shall have to be adhered to. All the regulations & schedules of coal mines Regulations 1957 relating to opencast mining have to be adhered to and implemented in order to maintain safety precautions as per statute.

15.1 PRECAUTIONS AGAINST SURFACE WATER

Durgapur block is almost a flat terrain-elevation generally ranging between 205m to 225 m above MSL. The ground rises towards the north-east. The main catchment area drains into Motaghat nallah and Upasa nullah which are seasonal tributaries of Erai river flowing far west of the area.

One seasonal nalla is flowing from the proposed area for external dumping. Provision for diversion of nalla has been made in this Revised Project Report. Necessary precaution such as garland drain, embankment etc. 6 m above HFL shall be maintained. Surface water would be canalized through proper garland drains around the quarry.

15.2 DUST SUPPRESSION

Suppression of mine dust may be done by using package bond & dust bond, for methodology of application DGMS Circular No.8 of 1997 may be referred.

15.3 FIRE & SPONTANEOUS HEATING

Wild or herbaceous plants shall be removed from the mine. No person shall deposit heated material or ashes on any opencast working. Also no person shall light a fire or permit a fire to be lighted in any OC working except by the permission in writing of the Manager and only for a special purpose specified therein. No coal shall be left exposed in coal benches more than its incubation period to avoid fire in seam due to spontaneous heating. Proper type of the extinguisher to be kept in each HEMM ready for use in case of emergency.

In coal stock, coal shall be despatched on the basis of first in first out.

15.4 SLOPE STABILITY

It is suggested that following action may be taken to deal with slope stability problem.

i) Vulnerable area may be identified and marked on quarry plan.

ii) Observation of actual alignment of fault, its throw, joints, etc. may be recorded during the process of exploitation.

iii) Water drainage system may be properly implemented to prevent accumulation of water in cracks. Also dumps shall be leveled to prevent accumulation of water over it. Proper drainage in dumps shall also be provided to prevent erosion of toe of dump.

iv) Regular monitoring of tension cracks, horizontal and vertical movement of strata in critical area may be done.

v) Rise side slope to be reinforced if required because it has to stand throughout quarry life. No dumps/surface structures to be located within 15m of quarry edge as it will act as surcharge there by destabilizing the slope.

vi) No undercutting of slopes to be done.

vii) Proper hydrogeological studies to be done and if water table is at level of slope it should be brought down by using submersible pumps to prevent hydrostatic pressure.

viii) Proper selection of site for dumping to be done before dumping place shall be made free from loose material. Dumping shall not be done at an angle more than angle of repose of material being dumped.

ix) After completion of dumping operations dumps to be stabilized by growing vegetation.

x) Every person deployed by leaser of HEMM must be trained & briefed about aspects related to slope stability.

15.5 HAUL ROAD MAINTENANCE

Adequate care must be taken for proper construction and maintenance of haul road as per the existing guidelines. The gradient of haul road should not be steeper than 1 in 16.

15.6 BLASTING

As explosives are required in bulk for blasting in OC mines, provision of regulation-164 A of CMR 1957 should be ensured. All blasting operations shall be carried out in day light. Suitable precautions shall be taken as per statute before and after blasting operations. Controlled blasting technique has to be practised to minimise fly off rocks and ground vibrations and keep them within safe limits. In order to keep the ground vibrations within the permissible limit as per DGMS Circular No. 7 of 1997, to avoid flying of rock fragments and also to achieve

satisfactory blasting results, optimized drilling / blasting parameters depending upon rock formation using combination of relays / delays will have to be evolved. It is further recommended that at the time of actual execution, proper study for controlled blasting and ground vibration is done with scientific body in order to evolve site specific charge distance relationship.

15.7 SCIENTIFIC STUDIES

Following areas have been identified in Durgapur Extension (Deep) OC mine for detailed scientific studies:

a) Slope Stability

It is proposed to carry out scientific study on slope stability of external and internal OB dumps as well as for final slope of quarry batter. Based on the findings of scientific research the proposed slope of dumps and batter in the report may change.

b) Drilling & Blasting

For optimum fragmentation of rock and coal to minimize the overall cost of excavation, it is proposed in this report to engage some scientific body to carry out research for optimum drilling and blasting. Accordingly, the powder factor suggested after this study will be followed in the proposed mine.

c) Hydrogeology

Proper provision has been made in this report for scientific study to assess the hydrogeological parameters of the proposed area.

In addition to this, various other studies like soil testing, etc. need scientific study.

15.8 SAFETY ASPECTS FOR OUTSOURCING/HIRING OF HEMM

Special precaution should be taken while deploying workers in the mine. Before employing any worker to the mine proper vocation training should be imparted and recommendations of recent Safety Conference should be strictly followed. Terms and conditions shall be fixed by management for deployment of labours by leaser of HEMM as well as machineries.

16.0 ENVIRONMENTAL MANAGEMENT

16.1. INTRODUCTION

Durgapur OC Project was granted an Environmental clearance for production of 2.30 Mty and mining leasehold area of 1354.64 ha on 30.03.2007. About 168.10 ha land was reduced after transfer of land to nearby Durgapur 6, 7 & 8 Underground mine and boundary adjustment with nearby Padmapur OCP. Now the existing Durgapur Extension (Deep) OC is having 1186.54 ha land. MOEF has accorded Environmental clearance for enhancement of production from 2.30 Mty to 3.00 Mty in existing mining leasehold area of 1186.54 ha acquired within the existing mining leasehold area of 1354.64 ha vide letter no. J-110.15/56/2008-IA-II(M) dated 16.03.2012.

For the proposed RPR of Durgapur Extension (Deep) OC mine, 410.96 Ha additional land will be required and therefore fresh EC will have to be obtained for the project area of 1597.50 ha. In addition to this 25 ha land has been proposed for village rehabilitation purpose.

In the subsequent paragraphs an attempt has been made to assess the likely environmental impacts due to proposed mining activities.

16.2 EXISTING ENVIRONMENTAL QUALITY

16.2.1 AMBIENT AIR QUALITY IN PROJECT AREA

Regular Environmental monitoring is being carried out by Environment Department, RI-IV, CMPDI Nagpur for the existing Durgapur OCP at following AAQ Monitoring Locations

S. No.	Details of Location		Code No.
1.	Durgapur village	-	CDOA-1
2.	Filter plant DOC/ POC	-	CDOA-2
3.	Sinhala village	-	CDOA-3
4.	Manager Office, Sec- V	-	CDOA-4

AIR QUALITY MONITORING DATA

1. Durgapur village : CDOA-1

(24 hourly values in µg/m³)

Month	Dates of Sampling	Parameters				
	From - To	TPM*	PM-10	NOx	SOX	PM-2.5*
APRIL.2016	04.04.16 - 05.04.16	295	187	10	31	31
APRIL.2016	24.04.16 - 25.04.16	280	135	9	11	56
MAY.2016	04.05.16 - 05.05.16	128	91	8	10	-
MAY.2016	17.05.16 - 18.05.16	249	188	9	11	59
JUNE.2016	02.06.16 - 03.06.16	194	113	9	16	33
JUNE.2016	20.06.16 - 21.06.16	103	60	9	13	50
Permissible Limits		**200**	**100**	**80**	**80**	**60**

2. Filter plant (colony) : CDOA-2

(24 hourly values in µg/m³)

Month	Dates of Sampling	Parameters				
	From - To	TPM*	PM-10	NOx	SOX	PM-2.5*
APRIL.2016	14.04.16 - 15.04.16	286	221	9	15	47
MAY.2016	04.05.16 - 05.05.16	124	73	7	17	-
MAY.2016	23.05.16 - 24.05.16	86	46	9	12	16
JUNE.2016	02.06.16 - 03.06.16	162	58	10	11	-
JUNE.2016	21.06.16 - 22.06.16	111	82	9	13	58
Permissible Limits		**200**	**100**	**80**	**80**	**60**

3. Sinhala village : CDOA-3

(24 hourly values in µg/m³)

Month	Dates of Sampling	Parameters				
	From - To	TPM*	PM-10	NOx	SOX	PM-2.5*
APRIL.2016	04.04.16 - 05.04.16	287	122	9	11	50
APRIL.2016	25.04.16 - 26.04.16	233	163	12	16	57
MAY.2016	04.05.16 - 05.05.16	133	43	7	13	32
MAY.2016	17.05.16 - 18.05.16	62	38	9	17	27
JUNE.2016	02.06.16 - 03.06.16	129	58	9	17	36
JUNE.2016	20.06.16 - 21.06.16	214	95	10	10	25
Permissible Limits		**200**	**100**	**80**	**80**	**60**

4. Manager office-sector-V: CDOA-4

(24 hourly values in µg/m³)

Month	Dates of Sampling	Parameters				
	From - To	TPM*	PM-10	NOx	SOX	PM-2.5*
APRIL.2016	14.04.16 - 15.04.16	490	261	9	12	23
MAY.2016	04.05.16 - 05.05.16	111	41	7	9	36
MAY.2016	23.05.16 - 24.05.16	270	202	8	19	32
JUNE.2016	02.06.16 - 03.06.16	201	105	9	16	-
JUNE.2016	21.06.16 - 22.06.16	156	113	8	17	58
Permissible Limits		**600**	**300**	**120**	**120**	**60**

FUGITIVE DUST MONITORING DATA

1. CHP: CDOAF-1

(24 hourly values in µg/m^3)

Month	Dates of Sampling			Parameters		
	From	-	To	TPM	PM-10	PM-2.5*
MAY.2016	11.05.16	-	12.05.16	660	451	-

2. Check post /Ayyapa mandir: CDOAF-2

(24 hourly values in µg/m^3)

Month	Dates of Sampling			Parameters		
	From	-	To	TPM	PM-10	PM-2.5*
MAY.2016	11.05.16	-	12.05.16	2099	1604	-

Core zone (Mine Leasehold Boundary)

Most of the values are found to be well within the Standards for Coalmines stipulated by Ministry of Environment & Forests (MoEF). However some of the values were found to have exceeded permissible limits. Mine management were informed to take mitigative measures.

Buffer zone (10 km radius from ML Boundary

Values of $PM_{2.5}$, PM_{10}, and SO_2 and NO_X are within the CPCB norms. However some of the values were found to have exceeded permissible limits. Mine management were informed to take mitigative measures.

16.2.2 WATER QUALITY

Mine water discharge is collected on fortnightly basis in plastic zaricane and is transported to the laboratory for analysis. As per the Environment (Protection) Amendment Rules published vide Gazette dt. 25.9.2000, water samples are analysed fortnightly for the parameters - pH, TSS, Oil & Grease and COD and once in a year for all parameters as per General Standard for Discharge of Environment Pollutants, Schedule VI, Part A, Environment. Protection Act 1986, vide GSR-422(E) dt. 19.05.1993

1. Name of the Location : Mine water discharge Q-IV - CDOW-1					
Month	Date of Sample collection	Analysis Results			
		pH	COD (mg/l)	TSS (mg/l)	O & G (mg/l)
Below Detection Limit		0.2	4.0	10.0	2.0
April, 2016	14.04.16	4.44	16	20	<2
April, 2016	29.04.16	4.43	32	24	<2
May, 2016	12.05.16	4.79	28	30	<2
May, 2016	27.05.16	2.76	32	40	<2
June, 2016	10.06.16	5.11	32	36	<2
June, 2016	21.06.16	2.96	36	38	<2
TLV as per Env.(Protection) Amendment rule 2000		**5.5 - 9.0**	**250**	**100**	**10**
2. Name of the Location : Mine water discharge Q-II - CDOW-2					
Below Detection Limit		0.2	4.0	10.0	2.0
April, 2016	14.04.16	2.62	36	86	<2
April, 2016	29.04.16	2.31	28	36	<2
May, 2016	11 05.16	2.86	24	32	<2
May, 2016	27.05.16	4.74	36	24	<2
June, 2016	10.06.16	2.70	28	42	<2
June, 2016	21.06.16	4.35	36	40	<2
TLV as per Env.(Protection) Amendment rule 2000		**5.5 - 9.0**	**250**	**100**	**10**
3. Name of the Location : E.T.P (Workshop) Treated Water CD (ETP) W-3					
Below Detection Limit		0.2	4.0	10.0	2.0
April, 2016	14.04.16	6.77	36	22	<2
April, 2016	29.04.16	6.44	36	40	<2
May, 2016	12.05.16	6.69	28	36	<2
May, 2016	27.05.16	6.20	40	36	<2
June, 2016	10.06.16	5.87	36	32	<2
June, 2016	21.06.16	6.66	40	36	<2
TLV as per Env.(Protection) Amendment rule 2000		**5.5 - 9.0**	**250**	**100**	**10**

4. Name of the Location: S.T.P. (Domestic Effluent) - Treated Water - CD(STP)W-4			
		TSS (mg/l)	BOD (3 days 27^{o}C) mg/l
Below Detection Limit		10.0	2.0
April, 2016	14.04.16	98	14
April, 2016	29.04.16	48	16
May, 2016	12.05.16	82	16
May, 2016	27.05.16	86	16
June, 2016	10.06.16	82	16
June, 2016	21.06.16	66	14
TLV as per Env.(Protection) Amendment rule 2000		**100**	**30**

DRINKING WATER QUALITY MONITORING DATA

NAME OF LOCATION : DRINKING WATER FROM FILTER PLANT

Sampling date – 14.04.2016

Sl. No	Parameters	Test Method	Limits of Detection	Analysis Result	Standard (IS : 10500 : 2012)	
					Desirable limit	PLV in the absence of alternate source
1	Colour (Hz)	APHA, 22nd Edition Platinum Cobalt	1	2	5	15
2	Odour	IS 3025 /05:1983, Physical, Qualitative	Qualitative	Unobjectio-nable	Unobjectio-nable	Unobjectio-nable
3	Turbidity (NTU)	IS-3025/10:1984 Nephelometric	1.0	2	1	5
4	pH Value	IS-3025/11:1983 Electrometric	0.2	7.78	6.5 to 8.5	No relaxation
5	Total Hardness as $CaCO_3$ -mg/l	IS-3025/21:1983 EDTA	4.0	184	200	600
6	Iron (as Fe) -mg/l	IS-3025/53:2003 AAS-Flame	0.06	<0.06	0.3	No relaxation
7	Chlorides (as Cl)- mg/l	IS-3025/32:1988, Argentometric	2.0	32	250	1000
8	Residual Chlorine -mg/l (min.)	APHA, 22nd Edition DPD	0.02	0.04	0.2	1
9	Fluoride (as F)- mg/l	APHA, 22nd Edition SPADNS	0.02	0.42	1.0	1.5
10	TDS -mg/l	IS-3025/16:1984 Gravimetric	25.0	290	500	2000
11	Calcium (as Ca) -mg/l	IS-3025/40:1991 EDTA	1.6	46.4	75	200
12	Magnesium (as Mg) -mg/l*	IS-3025/40:1991 EDTA	3	16.52	30	100
13	Copper as(Cu) -mg/l	IS-3025/42:1992 AAS-Flame	0.03	<0.03	0.05	1.5
14	Manganese as (Mn)- mg/l	APHA, 22nd Edition AAS-Flame	0.02	<0.02	0.1	0.3
15	Sulphate (as SO_4) -mg/l	APHA, 22nd Edition Turbidity	2.0	45.5	200	400
16	Nitrates (as NO_3) - mg/l	IS-3025/34:1988 Nesseler's	0.5	8.39	45	No relaxation
17	Cadmium as (Cd)- mg/l	APHA, 22nd Edition AAS-GTA	0.0005	<0.0005	0.003	No relaxation
18	Lead as (Pb) -mg/l	APHA, 22nd Edition AAS-GTA	0.005	<0.005	0.01	No relaxation
19	Selenium (Se) –mg/l*	APHA, 22nd Edition AAS-VGA	0.005	<0.005	0.01	No relaxation
20	Arsenic (Ar)-mg/l*	APHA, 22nd Edition AAS-VGA	0.005	<0.005	0.05	No relaxation
21	Zinc as (Zn) -mg/l	IS-3025/49:1994 AAS-Flame	0.01	<0.01	5	15
22	Total Chromium -mg/l	IS 3025 (Part 52) : 2003 AAS-Flame	0.01	<0.01	0.05	No relaxation
23	Boron as (B) -mg/l	APHA, 22nd Edition Carmine	0.2	<0.2	0.5	1.0
24	Alkalinity -mg/l	IS-3025/23:1986, Titration	4.0	80	200	600
25	Nickel-mg/l	IS 3025 (Part 54) : 2003, AAS-Flame	0.02	<0.02	0.02	No relaxation
26	Aluminum (Al)-mg/l*	APHA, 22nd Edition AAS-VGA	0.03	<0.03	0.1	0.2

16.2.3 NOISE LEVEL QUALITY

Day time and Night time Noise level data are recorded fortnightly on following locations.

Name of the Location : CHP			**CDON 1**
Month	Date of Data collection	Noise Level in dB(A)	
		Day Time	Night Time
April, 2016	15.04.16	64.7	63.2
April, 2016	29.04.16	64.2	63.8
May, 2016	11.05.16	65.8	63.2
May, 2016	27.05.16	64.7	62.9
June, 2016	10.06.16	66.4	62.3
June, 2016	25.06.16	62.4	61.2
Noise Level Standard as per Env. (Protection) Amendment rule 2000		**75**	**70**

Name of the Location : Durgapur Colony			**CDON-2**
Month	Date of Data collection	Noise Level in dB(A)	
		Day Time	Night Time
April, 016	15.04.16	43.9	42.8
April, 2016	29.04.16	43.5	42.7
May, 2016	11.05.16	52.9	42.7
May, 2016	27.05.16	45.5	42.1
June, 2016	10.06.16	43.9	41.6
June, 2016	25.06.16	45.9	43.7
Permissible Limit		**55**	**45**

16.2.4 FLORA AND FAUNA

Baseline survey has been carried out w.r.t. flora & fauna for EIA/EMP of Durgapur Expansion Deep Open Cast Project (Capacity - 3.00 MTPA; Land Area – 1186.54ha)

No endangered flora & fauna were found in the Core & Buffer Zone of the project.

16.2.5 SOCIOECONOMIC STATUS

Socioeconomic survey has been carried out for EIA/EMP of Durgapur Expansion Deep Open Cast Project (Capacity - 3.00 MTPA; Land Area – 1186.54ha).

For all the above parameters Base line data will be generated in post monsoon season to assess the existing Environment Quality for **Environmental Impact Assessment** study.

16.2.6 LAND RESOURCE

The existing scenario of the land required for the proposed project is summarized in the following table as:-

Sl. No.	Particulars	Land Already Acquired under Durgapur OC (ha)	Existing Land in leasehold area under Durgapur OC (ha)	Balance Land to be acquired as per proposed PR (ha)	Total Land (Existing+ Balance Land to be acquired) (ha)
1.	Tenancy land	872.14	785.11	260.09	1045.20
2.	Government land	157.93	143.66	29.29	172.95
3.	Forest land (Protected forest)	324.57	257.77	121.58	379.35
	Total land	**1354.64**	**1186.54**	**410.96**	**1597.50***

* In addition to 1597.50 Ha land within project boundary, 25 ha land has been proposed for acquisition for village rehabilitation making total land as 1622.50 ha.

16.3 ENVIRONMENTAL IMPACT

16.3.1 AIR QUALITY IMPACT

Due to coal transportation, wind erosion of OB dumps, and coal handling dust is likely to be generated. Conc. of NO_X may likely to increase due to the increased vehicular movement.

16.3.2 WATER QUALITY IMPACT

Analysis of water pumped out from existing mines around the proposed project shows that even untreated water meets the acceptable limits, so quality of water pumped out from the proposed project will be less likely to have any significant pollution load even in untreated condition.

16.3.3 GROUND WATER IMPACT

A project titled “Modeling and Control of Water System in Coal Mining Environment, Chandrapur project area, Maharashtra (Dec. 1998)” under United Nations Development Programme was carried out for opencast mines. An inference can be made on the above study that due to proposed project, it is

anticipated that the effect on ground water regime will be pronounced upto around 500 m from mine edge and effect will be pronounced in the down-dip side and milder in the up-dip side. But this effect will be temporary in nature and once the project is over, after 2 – 3 rains, the regime will regain its almost original status.

16.3.4 NOISE IMPACT

Existing noise level at the mine site is likely to increase due to the increased number of vehicular movement and deployment of additional HEMM.

16.3.5 FLORA AND FAUNA

No changes in the diversity of species or number of any species of animal are anticipated.

16.3.6 SOCIO-ECONOMIC STATUS

Rehabilitation of four nos. of villages namely Sinhala, Navegaon, Masala Tukum and old Masala has been envisaged in the PR. Impacts on Socio-Economic status would be most likely observed as change in standard of living of the project affected people. Shift in means of livelihood is also expected to occur as impact of the proposed project.

16.3.7 LAND USE

Regarding land use during mining, in addition to excavation of quarry for coal, overburden dump will be created along with development of other mine related infrastructure.

16.4 ENVIRONMENT MANAGEMENT

16.4.1 AIR QUALITY MANAGEMENT

Ambient Air quality of the existing Durgapur Extension (Deep) OC Project is being regularly monitored as per Environmental Protection Amendment Rules 2000, and the same would be continued for the proposed project after getting statutory clearances.

Ambient Air Quality will be controlled by black topping of roads, water spraying on roads, biological reclamation of OB dumps, green belt around CHP, OB dump and along coal transportation roads on both sides etc.

16.4.2 WATER QUALITY

Durgapur Extension (Deep) OC Project is an existing mine. The control measures like provision of settling tank for mine water discharge; Effluent Treatment Plant, etc. will be constructed, as is being done in the nearby existing projects of WCL. The regular Water Quality Monitoring as per Environment Protection Amendment Rules, 2000 is being undertaken, and the same would be carried out for the proposed project after getting statutory clearances.

Mine pumped out water, after sedimentation, will be utilized within mine premises and balance will be used for supplementing any shortage of water in the nearby villages. Effluent from workshop will be treated in ETP & thereafter recycled. Similarly, water from CHP, after sedimentation will also be recycled.

16.4.3 NOISE MANAGEMENT

The noise control measures will be undertaken as is being done in the nearby existing projects of WCL. The worker exposed to high noise level will be provided with earplugs & ear muffs. Proper enclosure and regular maintenance of equipment will be done. Plantation along road and around industrial & service building will be done to reduce the noise level.

The regular Ambient Noise Quality monitoring as per Environment Protection Amendment Rules, 2000 is being undertaken and the same would be carried out for the proposed project after getting statutory clearances.

16.4.4 FLORA AND FAUNA MANAGEMENT

Adequate plantation has been proposed with native species to maintain the diversity and also to attract the fauna.

16.4.5 SOCIO-ECONOMIC STATUS

The eligible land losers will be suitably rehabilitated. Rehabilitation package for four nos. of villages namely Sinhala, Navegaon, Masala Tukum and old Masala is being envisaged in this RPR. Suitable changes would be made in accordance with applicable regulatory requirements in vogue.

16.5 ENVIRONMENT MANAGEMENT SYSTEM

To have a close watch on the environmental condition and implementation of the various measures suggested, a multi- disciplinary approach is essential. At present WCL headquarter acts as apex body which supervises the activities relating to environment at project level through the General Manager. General Manager of the area coordinates the activities of various disciplines in the area to render all necessary assistance at the implementing level i.e. the project. Area Nodal Officer (Environment) monitors all aspects of environment on behalf of the General Manager. He also takes suitable steps for generation of environment data along with its analysis and interpretations.

As far as plantation is concerned horticulturist with suitable backup staff is provided in the area for undertaking the plantation jobs including rising of a nursery. Sub-Area Manager is responsible for mechanical reclamation of the area. He is also responsible for biological reclamation with the assistance of GM's office.

16.6 CAPITAL PROVISION

The capital provision for environmental pollution control measures has been made in proposed Durgapur Extension Deep OC mine which are tabulated below :

(Rs in ,000)

Sl. No.	Particulars	Total Capital	Year-I	Year-II
1	Sedimentation pond for treatment of mine waste water	1500	1500	0
2	Effluent treatment plant for treatment of workshop effluent	1000	1000	0
3	Base line Env. data generation(as per new guidelines) and scientific studies related to environment	1000	1000	0
4	Installation of fixed type sprinklers for dust control (including water reservoir, pump, pipeline etc.)	3500	1600	1900
5	Plantation during First three years	1500	700	800
6	Digital Mapping for land use plan	1009	200	809
7	Air Monitoring (CAMS)	6000	2000	4000
	TOTAL	**15709**	**8000**	**7509**

17.0 LAND REQUIREMENT

Total requirement of land for Durgapur Extension (Deep) OC Project is 1597.50 Ha excluding 25 Ha land required for rehabilitation of four nos. of villages namely Sinhala, Navegaon, Masala Tukum and old Masala. Out of this land, 1186.54 Ha land is already in possession of existing Durgapur Extension (Deep) OC mine. Remaining 410.96 Ha land is to be acquired for proposed Durgapur Extension (Deep) OC project. The break-up of type of land required for Durgapur Extension (Deep) OC Project is as follows :

Sl. No.	Particulars	Land (Ha)			
		Tenancy Land	Govt. Land	Forest Land	Total
1	Existing Land of Durgapur Extension (Deep) OC Mine	785.11	143.66	257.77	1186.54
2	Additional land to be acquired	260.09	29.29	121.58	410.96
	Total (For Project)	**1045.20**	**172.95**	**379.35**	**1597.50**
3	Land for Village Rehabilitation				**25.00**
	Total (Including village rehabilitation)				**1622.50**

As per land data provided by mine officials, Rs. 52.5340 crores @ Rs 20.20 lakhs/ha has been considered as land cost for 260.09 ha tenancy land. For Govt. land Rs 2.9104 crores @ Rs 9.94 lakhs/ha has been considered. For forest land Rs 33.00 crores @ Rs 27.1426 lakhs/ha has been considered. In addition to this provision, 1.25% of total value of tenancy land cost is proposed for stamp duty, lawyer's fee and registration charges. For rehabilitation of four nos. of villages, a provision of 25 Ha land has been made for which a capital provision of Rs. 3.7050 crores @ Rs. 14.82 lakhs/ha has been considered.

17.1 COMPENSATION & REHABILITATION

Payment of compensation for land losers has been estimated as per compensation package of R&R policy of CIL. In this RPR, one time monetary compensation in lieu of employment is proposed to be paid for 50% of tenancy land which works out to Rs. 16.0606 crores @ Rs. 12.35 lakhs per ha. However for actual balance land, employment in lieu of monetary compensation may be considered by WCL as per revised CIL R&R policy. Rehabilitation of four nos. of

villages namely Sinhala, Navegaon, Masala Tukum and old Masala having about 1275 houses is involved in the Durgapur Extension (Deep) OC for which capital provision of Rs. 126.4425 crores including capital provision for 25 ha land has been made in this report.

17.2 LAND USE PATTERN

The land use pattern for different activities are as follows:

Sl. No.	Particulars	Total Area (ha)
1.	Quarry Area	660.68
2.	External OB dump	461.38
3.	Infrastructure	100.00
4	Area needed for rationalization and blasting zone	345.44
5	Colony land	20.00
6	Road	10.00
	Total Land (Project area)	**1597.50**
7	For village Rehabilitation	25.00
	Total (Including village rehabilitation)	**1622.50**

18.0 MINE CLOSURE PLANNING

Mine closure planning has to be carried out at the starting of the mine and needs periodic reviewing and revision during its life cycle to cope with the geo-technical constraints, safety and economic risks, social & environmental challenges. For the Mine Closure activities, a corpus fund is created by opening an escrow account with the Coal Controller Organization in nationalised bank. An amount @ Rs 6.00 lakhs per Ha of the project area is required to be deposited in this account for final mine closure. Progressive mine closure is done with the fund provided in approved report. The above rate has been adopted as per Circular No. 55011-01-2009-CPAM, Government of India, Ministry of Coal, dated 27 August 2009.

In Durgapur Extension (Deep) OC necessary provision has been kept towards mine closure based on latest guidelines of MOEF. **The mine closure plan for Durgapur Extension (Deep) OC mine for 1186.54 ha land has already been approved by WCL Board in 244th meeting held on 28th January, 2013.**

18.2 CLOSURE COST

The corpus fund already deposited in the Escrow account during 2012-13 to 2015-16 for 1186.54 ha is tabulated below :

Year	Actual payment for Corpus fund as per Mine Closure Plan approved by WCL Board in 244th meeting held on 28th January, 2013
2012-13	Rs. 1005.87 Lakhs
2013-14	Rs. 1056.16 Lakhs
2014-15	Rs. 1108.97 Lakhs
2015-16	Rs. 1164.42 Lakhs
Total	**Rs. 4335.42 Lakhs**

In this RPR of Durgapur Extension Deep OC mine, the total land requirement works out to 1622.50 ha including 25 ha land for rehabilitation of four nos. of villages namely Sinhala, Navegaon, Masala Tukum and old Masala. The calculation of closure cost for the proposed Durgapur extension Deep OC mine for 1622.50 ha land after adjusting the corpus amount already deposited in the escrow a/c from 2012-13 to 2015-16 are tabulated below :

CALCULATION OF CLOSURE COST

Sl. No.	Particulars	Quantity
1	WPI for All Commodities for August, 2009	129.6
2	WPI for All Commodities for July, 2016 (provisional)	183.9
3	Ratio of WPI =(2) / (1)	**1.418981**
4	Total land area requirement for the project (ha) (including 25 ha land for village rehabilitation)	1622.50
5	Mine closure cost @ Rs 6 lacs/ha (Rs in Lakhs)	9735.00
6	Mine closure cost after indexing from Aug'09 to July,2016 (Rs. In Lakhs) = (5) x (3)	**13813.78**
7	Corpus fund already deposited from 2012-13 to 2015-16 as per Mine Closure Plan approved by WCL Board in 244th meeting held on 28th January, 2013.	**4335.42**
8	Net amount of Corpus Fund in 2016-17 (Rs. In lakhs)	9478.36
9	Life of the mine in years	17
10	Annual Contribution to Escrow fund as on 2016-17 (Rs in Lakhs)= (8) / (9)	**557.55**

The annual Mine Closure Cost in 2016-17 and in subsequent years with 5% escalation is tabulated below :

Year		Annual Production (Mty)	Corpus Fund (Rs. in Lakhs)	Mine Closure Cost (Rs /t)
1	2016-17	1.60	557.55	34.85
2	2017-18	2.00	585.43	29.27
3	2018-19	2.50	614.70	24.59
4	2019-20	3.00	645.43	21.51
5	2020-21	3.00	677.71	22.59
6	2021-22	3.00	711.59	23.72
7	2022-23	3.00	747.17	24.91
8	2023-24	3.00	784.53	26.15
9	2024-25	3.00	823.76	27.46
10	2025-26	3.00	864.94	28.83
11	2026-27	3.00	908.19	30.27
12	2027-28	3.00	953.60	31.79
13	2028-29	3.00	1001.28	33.38
14	2029-30	3.00	1051.34	35.04
15	2030-31	3.00	1103.91	36.80
16	2031-32	3.00	1159.11	38.64
17	2032-33	2.17	1217.06	56.09
Total		**47.27**	**14407.30**	**30.48**

Thus the mine closure cost adopted in Unit Cost Estimates (Appendix-C) is **Rs. 30.48 /t.**

18.3 BREAK-UP OF CLOSURE FUND FOR VARIOUS CLOSURE ACTIVITIES

1. Mining is to be carried out in a phased manner initiating afforestation / reclamation work in the mined out area of first phase while commencing mining in the 2nd phase.

2. Upto 80% of the total deposited amount including interest accrued in the ECSROW account may be released after every 5 years. The amount released should be equal to expenditure incurred on Progressive Mine closure in past 5 years or 80% whichever is less.

BREAK-UP OF CLOSURE FUND

Total Corpus Fund = Rs. 14407.30 Lakhs + Rs. 4335.42 Lakhs (upto 2015-16)

= Rs. 18742.72 Lakhs

Sl. No.	Activity	% of Total Mine closure Cost	Amount (Rs.in Lakhs)	Remarks
A	**Dismantling of structures**			To be included in final mine closure plan.
	Service Building	0.2	37.49	
	Residential Building	2.67	500.43	
	Industrial Structures like, Workshop, Field substation, etc.	0.3	56.23	
B	**Permanent Fencing of mine void and other dangerous area**			To be included in final mine closure plan.
	Random rubble masonry of height 1.2 meter including leveling up in cement concrete 1:6:12 in mud mortar	1.5	281.14	
C	**Grading of highwall slopes**			To be included in final mine closure plan.
	Levelling and grading of highwall slopes	1.77	331.74	
D	**OB Dump Reclamation**			
	Handling/Dozing of OB Dump into mine void and preparation of Internal dump for reclamation.	88.66	16617.30	71% for progressive and 17.66% for final mine closure.
	Technical and Bio-reclamation including plantation and post care.	0.4	74.97	Equal Weightage throughout the life of the mine.
E	**Landscaping**			
	Landscaping of the open space in leasehold area for improving its aesthetic and eco value.	0.3	56.23	Equal Weightage throughout the life of the mine.
F	**Plantation**			
	Plantation over cleared area obtained after dismantling.	0.5	93.71	To be included in final mine closure plan.
	Plantation around the quarry area and in safety zone.	0.2	37.49	Equal Weightage throughout the life of the mine.
	Plantation over the external OB Dump	0.02	3.75	Equal Weightage throughout the life of the mine.
G	**Post Closure Env Monitoring/Testing of Parameters for three years.**			For three years after mine closure
	Air Quality	0.22	41.23	
	Water Quality	0.2	37.49	
H	**Entrepreneurship development (vocational/ skill development) Training for sustainable income of affected people**.	0.26	48.73	Equal Weightage throughout the life of the mine.
I	**Miscellaneous and other mitigative measures.**	2	374.85	Equal Weightage throughout the life of the mine.
J	**Post Closure Man power cost for supervision**	0.8	149.94	To be included in final mine closure plan.
TOTAL		**100%**	**18742.72**	

3. The above cost/expenditure will be met from the corpus fund deposited in the escrow account by the mine operator. However, the additional amount beyond the escrow account will be provided by the mine operator after estimating the final mine closure cost (as per the mine closure guideline).

4. The amount indicated separately under each head in the above table is indicative only and based on actual expenditure the amount may change.

19.0 MANPOWER AND PRODUCTIVITY

19.1 Manpower

The manpower requirement for Durgapur Extension (Deep) OC project has been summarised as follows:

Sl. No.	Particulars	Nos.
1.	Executives	43
2.	Non-executives:	
i)	Monthly rated staff	134
ii)	Daily rated staff	530
3.	**Total Requirement**	**707**
4.	**Existing Manpower as on 01..04.2016**	**972**
5.	**Manpower Absorbed**	**265**

The total requirement of manpower for the proposed Durgapur Extension Deep OC mine has been estimated as 707 whereas the existing manpower in existing Durgapur OC mine as on 01.04.2016 is 972. The remaining 265 manpower (972 – 707) have been absorbed in proposed RPR of Durgapur Extension (Deep) OC mine.

19.2 MANPOWER PHASING

The manpower phasing considering year-wise retirement of 265 surplus manpower upto 9th year is tabulated below. Thereafter required 707 manpower will have to be maintained.

Sl. No.	Strength (Nos.)	Years								
		I	II	III	IV	V	VI	VII	VIII	IX and Onwards
1.	972	972	932	892	856	821	788	757	727	707

19.3 PRODUCTIVITY

The annual capacity of the proposed Durgapur Extension (Deep) OC mine has been rated as 3.00 Mt of coal and 21.50 Mm^3 of peak OB. The productivity calculated on the basis of only departmental manpower for Partial hiring option including and excluding the welfare manpower are tabulated below:

Sl. No.	Particulars	Strength	Manshift	O.M.S.(t)
Partial Hiring Option				
1.	Including Welfare Manpower	707	186648	16.073
2.	Excluding Welfare Manpower	679	179256	16.736

20.0 PROJECT IMPLEMENTATION SCHEDULE

This Revised Project Report has been prepared after amalgamating the balance reserves of Durgapur Extension (Deep) OC (Sector – IC, II, III & IV) and Durgapur OC (Sector-V) in Motaghat block as on 01.04.2016. Presently, Durgapur OC (Sector-V) is being worked as per the approved scheme (August, 2014). The PR of Durgapur Extension (Deep) OC (Sector – IC, II, III & IV) was prepared in April, 2007 and was approved by WCL Board on Cost plus basis in May, 2007. This PR was not implemented due to non availability of forest land for mining and tenancy land for OB dumping. Due to increase in land cost & New R&R policy of CIL, this RPR has been made to complete various activities including acquisition of additional land for Durgapur Extension (Deep) OC mine. The major project implementation activities and their schedule of completion are detailed below:

Sl. No.	**Activities**	**Completion Schedule**
1.	Acquisition of Tenancy, Govt. and Forest Land	1st year to 3rd year
2.	Construction of Service Buildings, Roads and Culverts and water supply & sewerage etc.	1st year to 4th year
3.	Procurement and Commissioning of Common HEMM	1st year
4.	Procurement, Erection and Commissioning of Electrical and Power Supply equipment	1st year to 3rd year

Sl. No.	Activities	Completion Schedule
5.	Procurement and Commissioning of CHP	1st year
6.	Procurement and Commissioning of Pumps & Pipes and Fittings	1st year to 5th year
7.	Diversion of 220 kV and 11 kV overhead line	2nd year to 3rd year
8.	Realignment of Nalla	1st year to 4th year
9.	Construction of haul Road	1st year to 4th year
10	Construction of Sedimentation Pnd, Effluent treatment plant, installation of fixed type sprinkler for Dust control, Air Monitoring station etc.	2nd year to 3rd year
11	Scientific Study on Slope Stability, Hydro-geology, Drilling and Blasting and Other Scientific Studies	2nd year to 4th year

21.1 CAPITAL INVESTMENT

The proposed Durgapur Extension (Deep) OC Project envisages to mine out 47.27 Mt mineable reserves (as on 01.04.2016) with a target production of 3.00 Mty. The total life works out to 17 years. The mine would produce Processed ROM Coal of weighted average GCV of 4581 k Cal/kg (Grade G-10).

The total estimated capital for the proposed Durgapur Extension (Deep) OC mine works out to **Rs. 378.8711 crores (Additional Capital of Rs. 328.0078 crores + WDV of existing assets as on 01.04.2016 of Rs. 50.8633 crores).** The additional capital outlay per tonne of annual target production works out to Rs.1093.36 /t.

The summarized form of Appendix-A is given in following table. As per the Asset Register supplied by WCL, existing expenditure till 31/03/2016 was Rs. 244.5128 crores and W.D.V. works out to Rs. 50.8633 Crores as on 01.04. 2016.

Capital Investment

(Amt. in Rs.crores)

A/c Head	Particulars	Additional Capital Provisions	WDV of existing capital (as on 1.4.2016)	Total Capital (WDV+ Additional)
01	Land	231.6042	1.9813	233.5855
02	Service & Residential Buildings	4.4730	4.8926	9.3656
03	Plant & Machinery	41.7308	41.4718	83.2026
04	Furniture & Fittings	0.7000	0.2153	0.9153
05	Railway siding	0.0000	0.0000	0.0000
06	Vehicles	0.1867	0.7231	0.9098
07	Prospecting & Boring	1.0000	0.0000	1.0000
08	Mine Development	48.3131	1.5792	49.8923
09	Revenue Expenditure Capitalised	0.0000	0.0000	0.0000
	Total Capital	**328.0078**	**50.8633**	**378.8711**

21.2 PRICING OF PLANT AND MACHINERY, CIVIL WORKS

The pricing of P&M is based on the standard price list of June 2015 (updated for August, 2016) circulated by the specialist cell of CMPDI, Ranchi. There is no requirement of foreign exchange for this project. The cost of civil works has been estimated on the basis of Cost Index of 597 at Maharashtra as on 2nd half of the year 2016 with a base of 100 in Nagpur on 1.1.1992.

21.3 OPENING OF REVENUE ACCOUNT

Durgapur Extension (Deep) OC mine is an operating mine and is already in revenue.

21.4 MANPOWER AND OMS

The total requirement of manpower for the proposed Durgapur Extension Deep OC mine has been estimated as 707 whereas the existing manpower in existing Durgapur OC mine as on 01.04.2016 is 972. The remaining 265 (972 – 707) manpower have been absorbed in this RPR of Durgapur Extension (Deep) OC.

The OMS calculated on the basis of required 707 manpower works out to 16.073 t.

21.5 EMS AND WAGES

The overall EMS works out to Rs. 2535.65 based on CIL norms. The salary & wages at 100 % capacity works out to Rs. 185.63/t.

21.6 COST OF PRODUCTION

The cost of production works out to Rs. 1380.52 /t and Rs 1509.27/t at 100 % and 85 % of production capacity respectively.

The break-up of total cost of production at 100% and 85% capacity are tabulated below :

Sl. No.	Particulars	Cost of Production (Rs./t)	
		100% Cap.	85% Cap.
1	Wages & Salaries	185.63	218.39
2	Stores		
	(a) Explosives	90.78	90.78
	(b) POL	193.65	214.15
	(c) Rep & Maint	6.43	7.11
	Total of Stores	**290.86**	**312.04**
3	Power	59.28	67.96
4	EMP	6.00	7.06
5	Misc Exp Incl W.D.	51.49	54.82
6	Mine Closure Exp.	30.48	35.86
7	Administrative Charges	187.22	220.26
8	Outsoursing Charges	407.40	407.40
9	Depreciation	83.27	97.97
10	Interest on Working Cap. @ 14.5%	58.89	63.98
11	Interest on Loan Capital @ 11.5%	20.00	23.53
	Total Cost of Production	**1380.52**	**1509.27**

21.7 GRADE OF COAL AND WEIGHTED AVERAGE SELLING PRICE

The Weighted average GCV of coal of Durgapur Extension (Deep) OC Mine works out to be 4581 kCal/kg which is in the range of G-10 Grade. The Weighted average Selling price of coal for (-) 100mm size (95% of notified price + Rs. 79/t Processing charge) works out to Rs 1200/t for Power Sector.

21.8 PROFIT(+) AND LOSS (-)

The loss with average notified sale value of coal for G-10 grade of coal (Rs. 1200.00/t) works out to Rs. (-) 180.52/t and Rs (-) 309.27/t at 100 % and 85 % of target capacity for Power Sector.

21.9 IRR

The IRR of the project works out to **negative** at both 100% and 85% of target capacity for Power sector.

21.10 DESIRED SELLING PRICE TO YIELD 12% IRR

The desired selling price to yield 12% IRR works out to Rs. 1418.20/t and Rs. **1550.05/t** at 100 % and 85% capacity utilization respectively.

21.11 COMPLETION COST

Capital expenditure has been estimated / increased for forward escalation on the phasing of initial estimated capital. The escalation rate is based on W.P.I. / Civil Index of preceding 36 months. The total completion cost has been estimated as **Rs. 438.9590 crores** including WDV of existing assets of Rs. 50.8633 crores.

21.12 RISK ANALYSIS

Risk analysis has been evaluated for the proposed RPR of Durgapur Extension (Deep) OC Mine to analyse the impact of variation in parameters like increase in land and rehabilitation expenditure, mine development expenditure, total capital expenditure, salary and wages, store cost, power cost, operating cost, sales realization as well as decrease in capacity utilization and sales realization on IRR, NPV @12% and Desired Selling Price for 12% IRR and the details are given in Appendix – C.3 & C.4 of this PR.

21.13 CONCLUSION

This Revised Project Report of Durgapur Extension Deep OC mine has been prepared in Partial Hiring option for target production of 3.0 Mty. The existing departmental capacity of the mine has been maintained to extract the entire coal and part of Top OB.

The cost of production works out to Rs. 1509.27/t at 85% of target capacity as against Average Notified Sale Price of Rs.1200.00/t for Power Sector. The IRR works out to negative at 100% and 85% of target capacity for Power sector. The selling price to yield 12% IRR @ 85% capacity works out to **Rs.1550.05/t**. The difference between average notified sale price of coal and selling price to yield 12% IRR @ 85% capacity works out to Rs. (-) 350.05/t. **This option may be considered for approval on cost plus, if customer agrees to pay the desired selling price to yield 12% IRR at 85% capacity (Rs. 1550.05/t)**

The other related mining and financial parameters are as tabulated below:-

Sl. No.	**Particulars**	**Proposed RPR (August, 2016)**
		Partial Hiring
01	Mineable Reserves (Mt)	47.27
02	Grade of coal GCV (kCal/kg)	G-10 (4581)
03	Volume of OB (Mm^3)	311.00
04	Average S/R (m^3/t)	6.58
05	Mine Capacity (Mty)	**3.00**
06	Manpower Requirement (Nos.)	Existing-972 Required-707 Absorbed-265
07	Overall OMS (t)	16.073
8	Capital required (Rs. In Crores) c) Additional Capital d) WDV of Existing assets	378.8711 328.0078 50.8633
09	Cost of Production (Rs./t) c) At 100% capacity d) At 85% capacity	 1380.52 1509.27
10	Av. Selling Price (Notified) (Rs./t) For Power sectors	1200.00
11	Profit/Loss (Rs./t) for Power sector c) At 100% capacity d) At 85% capacity	 (-) 180.52 (-) 309.27
12	Financial IRR (%) for Power sector a) At 100% capacity b) At 85% capacity	 Negative Negative
13	Price to yield 12 % IRR @ 85% capacity (Rs./t)	**1550.05**

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