

6.0 PUMPING AND DRAINAGE

Annual target production from Piparwar Project has been proposed to be enhanced from 6.5 MTY to 10 MTY. There will be two quarry viz. Quarry -I & Quarry - II. At present Quarry-II is in operation with targeted production of 6.5 MTY. In the proposal, a new mine (Quarry 1) has been planned for enhancement of production of additional 3.5 MTY.

The planning of dewatering the mine has been done in such a way that the working faces and haul roads will remain dry as far as possible. The layout of the quarry provides suitable gradient along the quarry floors and the benches to facilitate self drainage of water to the sump at the lowest level of the quarry. During the heavy monsoon period, the work in lower most bench may have to be stopped as it will not be possible to pump out the entire make of water on the wettest day. Therefore, it is proposed to draw a part of the lower-most bench which would then act as sump.

Water accumulated in the sump will be pumped out to the surface and discharged into the nallah. It is proposed to create a sedimentation lagoon by constructing a series of check dams across the nallah.

Since the proposed mine (Quarry-1) has been planned to outsource the production of coal and O.B both initially for initial eight years it is presumed that the pumping resources (pumps pipes & fittings) will also be outsourced simultaneously. Thus any pumping capital has not been provided for initial eight years of the proposed mining of Quarry-I.

However it is proposed that the existing asset (pumps ,pipes & fittings) of the present mine (Quarry-II) will be used for dewatering of the proposed mine (Quarry - I) when the production of this mine will be departmental after initial eight years and onwards. The existing resources will be sufficient to meet the requirement of the quarry -I pumping.

CHAPTER-VII

POWER SUPPLY, DISTRIBUTION, ILLUMINATION & COMMUNICATION

OPTION - I : Both coal & OB outsourced with CHP Departmental (FOR 3.5 MTY)

1. Existing Power Distribution Arrangement

The existing Piparwar project receives power at 33 kV from nearby 33 kV Piparwar Switching Station through two number 33 kV overhead transmission lines. The project has one number substation with 2X10 MVA, 33/11 kV transformer capacity and 5 nos, 1X5MVA, 33/6.6kV mobile substations. The 2X10 MVA, 33/11kVA substation feeds power to CHP and washery. CHP and washery have their own power distribution arrangements.

The above stated 2-no. 33kV overhead lines have been drawn along the quarry edge through which the mobile substations receive power for feeding the HEMMs, pumps, illuminations and other quarry transport loads of Quarry no. II (6.5 MTY production)

2. In proposed mining operation for Quarry no. I (3.5MTY) for initial eight years both coal & OB will be outsourced. Hence additional power for CHP and illumination has to be provided. Other existing power distribution network for Quarry no II will remain same.
3. Electrical indices for 10 MTY production (including additional 3.5 MTY with existing 6.5 MTY).
 - Connected load: 27244 kW
 - Load in operation: 24844 kW
 - Maximum power demand: 15.401 MVA
 - Annual power consumption: 80.73 MKWH.
 - Energy cost/tonnes coal: Rs 37.28

4. Proposed substation capacity:

It is proposed to establish one no. 2X5 MVA, 33/6.6 kV substation which will receive power through the existing 33 kV overhead lines coming from 33 kV Piparwar switching station. This substation will be located near the quarry entry of Quarry no I. 2 nos. 6.6 kV feeders will be provided for feeding power to CHP and also 3 nos. feeder will be provided for quarry illumination.

5 Illumination:

A. Substation illumination;

For substation and surface illumination, 1 no. of 100 kVA, 33/0.415 kV lighting transformer has been provided.

B. Quarry illumination:

Quarry illumination has been provided by groups of 400 Watts, 250 volts HPSV lamps mounted on 15m high towers distributed along the quarry edge. 10 kVA, 6.6/0.433-0.250 kV lighting transformer have been provided to feed power to lamps mounted o towers.

The haul roads of the mines is proposed to be illuminated by HPSV lamps of 250 watts mounted on poles of suitable heights. Adequate no of 50 kVA, 6.6/0.433-0.250 kV lighting transformer have been provided to facilitate haul road illumination. Provisions have been made in the estimate towards general and spoiled dump illumination of the mine and industrial area by providing 10 kVA, 6.6/0.415 kV transformer.

For emergency illuminations 10 kVA DG sets have been provided.

6. Colony Power Supply:

The existing system will remain same for power supply to colony. No additional load has been considered.

7. Power supply to CHP:

Provision has been made to feed power to CHP substation at 6.6 kV through 2 nos. feeder from the proposed 2X5 MVA, 33/6.6kV substation. The CHP will have its own distribution network.

8. Power supply to workshop:

The existing power distribution arrangement will remain same, as there is no scope of addition of workshop.

9. **System of power supply:**

For all the voltages in the project, the system of power supply shall be restricted earthed neutral.

10. **Improvement of power factor:**

Static capacitors have been provided in both the sections of 6.6 kV bus-bar of the proposed substation 2X5MVA, 33/6.6 kV to improve the power factor at 0.95 lagging.

11. **Communication:**

Some lump sum amount has been kept towards communication & EDP facilities in addition to existing system.

12. **Annual Power Bill:**

Based on current DVC tariff, the annual power bill would be of the order of Rs.25.833 Crores at the rated coal production (10MTY) in 8th year quarry operation.

13. **Capital Investment for P&M (Electrical):**

The total capital investment for electrical power supply and distribution has been given in **Appendix-A.3.1**

14. After initial eight years of mining operation of Quarry no. 1, the mining operation of the existing Quarry no. II will be completed and all-existing electricals P&Ms will be shifted in Quarry no. I for the operation of HEMMs, pumps and others.

OPTION - II: Both coal and OB outsourced, without CHP (for 3.5 MTY)

No additional load has been considered except quarry illumination of Quarry I. The illumination would be done through the existing power distribution network of Quarry -II.

Electrical indices :

- Connected load: 24244 kW
- Load in operation: 21844 kW
- Maximum power demand 13.578 MVA
- Annual power consumption 70.33 MKWH.
- Energy cost/tonnes coal: Rs 32.16

Annual Power Bill;

Based on current DVC tariff, the annual power bill would be of the order of Rs.22.507 Crores at the rated coal production (10MTY) in 8th year quarry operation.

Hence in this alternative no additional substation has been provided. The total capital investment for electrical power supply and distribution has been given in **Appendix-A.3.1**

OPTION - III : Both coal and OB outsourced, without CHP (for 3.5 MTY)

The existing sub station of this project will cater the load of quarry - I as no additional load has been considered except quarry illumination. The illumination will be done by the existing power distribution network of quarry -II.

Electrical indices :

- Connected load: 22924 kW
- Load in operation: 20524 kW
- Maximum power demand 12.833 MVA
- Annual power consumption 65.40 MKWH.
- Energy cost/tonnes coal: Rs 31.29

Annual Power Bill;

Based on current DVC tariff, the annual power bill would be of the order of Rs.20.928 Crores at the rated coal production (10MTY) in 8th year quarry operation.

Hence in this alternative no additional substation has been provided. The total capital investment for electrical power supply and distribution has been given in **Appendix-A.3.1**

PREPARATION OF 10 MTY. BOTH COAL & OB OUTSOURCED FOR 3.5 MTY WITH CHP DEPARTMENTAL OPTION - 1

STATEMENT SHOWING THE CONNECTED LOAD, MAXIMUM DEMAND AND ANNUAL ENERGY CONSUMPTION

SL. NO.	DESCRIPTION	VOLT	PHASE	SPEED	UNIT POWER KW	CONNECTED LOAD KW	LOAD OPERATION KW	ACTIVE REACTIVE KW KVAR	FULL KVA	P.F.	ANNUAL ENERGY CONSUMPTION kWh
OB EQUIPMENT											
1	ELECT ROPE SHOVEL 10 CUM	6.6 KV	3	3	660	1980	1900	0.65 1267	1313	0.70	7.40
2	ELECT RB- DRILL 250 MM	6.6 KV	4	4	386	1544	1544	0.50 772	788	0.70	1.63
COAL EQUIPMENT											
1	ELECT ROPE SHOVEL 10 CUM	6.6 KV	3	3	660	660	650	0.65 429	438	0.70	2.47
2	MG SHOV. 175/10 CUM	6.6 KV	1	1	900	660	660	0.65 429	438	0.70	3.47
3	ELECT ROPE SHOVEL 25 CUM	6.6 KV	1	1	2300	2300	2300	0.65 1495	1525	0.70	8.60
4	CHP					5000	4900	0.70 3220	3285	0.70	15.04
						3000	3000	0.70 2100	2142	0.70	10.40
4	PUMPING	6.6-44 KV				6000	5000	0.80 4000	3000	0.80	17.52
COMMON											
1	COLONY & GM OFFICE	6.6-44 KV				3000	2500	0.90 2250	1060	0.90	7.92
2	WORKSHOP	6.6 KV				1500	1200	0.50 600	612	0.70	1.61
3	ILLUMINATION	0.44-0.23 KV				1000	900	0.90 810	392	0.90	3.55
4	WATER SUPPLY & OTHERS	6.6-44 KV				900	500	0.70 350	357	0.70	1.23
TOTAL						27244	24944	17742 15388	23489	0.76	88.73

DIVERSITY FACTOR 1.2
 IMPROV. POWER FACTOR 1.0
 LOAD IN OPERATION (KW) 24844
 MAXIMUM DEMAND (KVA) 15401
 INITIAL P.F. 0.75
 ANNUAL ENERGY CONSUMPTION (MWh) 90.73

Required KVAR 8504

14785 12617 19567
 14785 4312 15401

NOTE: FOR 3.5 MTY IN QUARRY I, COAL, OB, WORKSHOP, PUMPING & COLONY LOAD HAVE NOT BEEN INCLUDED. ONLY CHP, QUARRY ILLUMINATION & OTHER MISCELLANEOUS LOADS HAVE BEEN TAKEN INTO ACCOUNT.

PIPARWAR OCP(10MTY)

OPTION - I

TABLE NO. VII-II

Annual power Bill

Tariff: Rs. 3.20/KWh

Sl.No.	Power Consumers	Annual Power consumption MKWh	KWh per tonne of coal production (KWh/te)	Power charges per tonne of coal production (Rs)
1.0	O.B.	9.03	1.390	4.45
2.0	Coal	57.39	8.629	28.25
3.0	Common	14.31	1.431	4.58
	Total	80.73	11.649	37.28

Annual power Cost (Rs) :

25.833 Crores

PIPARWAR OCP (10 MTP) : BOTH COAL & OB OUTSOURCED FOR 3.5 MTP WITH CHP DEPARTMENTAL
AFTER 8TH YEAR

230 Days working

TABLE NO. VI.1
STATEMENT SHOWING THE CONNECTED LOAD, MAXIMUM DEMAND AND ANNUAL ENERGY CONSUMPTION

Sl. No.	Description	Volt.	Population	Creep	Unit Power kW	Connected Load kW	Load Operation kW	D.F.	Active Power kW	Reactive Power kVAR	P.F.	Annual Energy Consumption (kWh)
OB EQUIPMENT												
1	ELECT. ROPE SHOVEL 10 CU.M	6.6 KV	3	3	660	1980	1800	0.65	1207	1313	0.70	7.40
2	ELECT. RDH DRILL 250 MM	6.6 KV	4	4	366	1544	1544	0.50	772	788	0.70	1.63
COAL EQUIPMENT												
1	ELECT. ROPE SHOVEL 10 CU.M	6.6 KV	1	1	660	660	660	0.65	429	438	0.70	2.47
2	HYD. SHOVEL 6.75 /10 CU.M	6.6 KV	1	1	660	660	660	0.65	429	438	0.70	2.47
4	CH.P.					3000	3000	0.70	2100	2142	0.70	10.40
4	PUMPING	6.6-44 KV				4000	3200	0.80	2560	1920	0.80	11.21
COMMON												
1	COLONY & GM OFFICE	6.6-44 KV				3000	2500	0.90	2250	1090	0.90	7.92
2	WORKSHOP	6.6 KV				1500	1200	0.90	900	612	0.70	1.61
3	ILLUMINATION	0.45-0.23 KV				600	500	0.90	450	216	0.90	1.97
4	WATER SUPPLY & OTHERS	6.6-44 KV				600	500	0.70	350	357	0.70	1.33
TOTAL						17544	15744		11227	9315	0.77	48.31

DIVERSITY FACTOR: 1.2
IMPROV. POWER FACTOR: 1.0
LOAD IN OPERATION (Kw): 15744
MAXIMUM DEMAND (KVA): 9746
INITIAL P.F.: 0.77
ANNUAL ENERGY CONSUMP (Mwh): 48.31

Required KVAR: 9356
9356
-5034

NOTE: FOR 3.5 MTP in Quarry I, Coal, OB, Workshop, Pumping & Colony Load Have Not Been Included. Only CHP, Quarry Illumination & Other Miscell. Loads Have Been Taken Into Account.

PIPARWAR OCP(10MTY)

OPTION - I AFTER 9 TH YEAR

TABLE NO. VII-II

Annual power Bill

Tariff: Rs. 3.20/KWh

No.	Power Consumers	Annual Power consumption MKWh	KWh per tonne of coal production (KWh/te)	Power charges per tonne of coal production (Rs)
1.0	O.B.	9.03	2.581	8.26
2.0	Coal	26.54	7.584	24.27
3.0	Common	12.73	3.637	11.64
	Total	48.31	13.802	44.17

Annual power Cost (Rs) :

15.458 Crores

PIPARWAR OCP(10.0MTY)

OPTION-I

Table No. VII-III

Tariff: Rs. 3.20/KWh
Amount in Rs, Lakhs

YEAR	O.B.	Coal	Common	Total
1	151.07	1667.97	371.49	2190.52
2	174.34	1667.97	371.49	2213.80
3	180.93	1724.03	412.13	2317.09
4	182.69	1724.03	412.13	2318.85
5	182.69	1724.03	423.49	2330.21
6	227.92	1780.10	457.92	2465.93
7	252.51	1836.16	457.92	2546.59
8	288.96	1836.16	457.92	2583.04
9	190.15	1363.24	457.92	2011.31
10	274.41	777.86	407.36	1459.62
11	269.21	813.73	407.36	1490.30
12	271.29	849.60	407.36	1528.25
13	276.49	849.60	407.36	1533.45
14	281.68	849.60	407.36	1538.64
15	288.96	849.60	407.36	1545.92
16	70.68	479.34	407.36	957.38

STATEMENT SHOWING THE CONNECTED LOAD, MAXIMUM DEMAND AND ANNUAL ENERGY CONSUMPTION

SL NO.	DESCRIPTION	VOLT	POPULATI-OPERATION ON	UNIT POWER KW	CONNECTED LOAD KW	LOAD IN OPERATION KW	D.F	ACTIVE KW	REACTIVE KVAR	FULL KVA	P F	ANNUAL ENERGY CONSUMPTION MWhr
A <u>SB EQUIPMENT</u>												
1	ELECT ROPE SHOVEL 10 CU.M	6.6 K V	3	550	1680	1080	0.65	1287	1313		0.70	7.40
2	ELECT RSH DRILL 250 MM	6.6 K V	4	308	1544	1544	0.50	772	755		0.70	1.63
B <u>COAL EQUIPMENT</u>												
1	ELECT ROPE SHOVEL 10 CU.M	6.6 K V	1	550	550	550	0.52	428	436		0.70	2.47
2	WHD SHOVEL 6.75/10 CU.M	6.6 K V	1	400	550	460	0.55	428	436		0.70	2.47
3	ELECT ROPE SHOVEL 25 CU.M	6.6 K V	1	2300	2300	2300	0.55	1485	1525		0.70	8.60
4	CHP				5000	4000	0.70	3720	3286		0.70	15.94
5	PUMPS	6.6-44 K V			6000	5000	0.90	4000	3000		0.80	17.52
C <u>COMMON</u>												
1	COLONY & GM OFFICE	6.6-44 K V			3000	2500	0.90	2750	1080		0.90	7.82
2	WORKSHOP	6.6 K V			1500	1300	0.50	600	612		0.70	1.61
3	ILLUMINATION	0.44-0.23 K V			1000	900	0.90	810	392		0.90	3.55
4	WATER SUPPLY & OTHERS	6.6-44 K V			600	500	0.70	350	387		0.70	1.23
TOTAL					34244	21844		15642	13337	20491	0.76	70.33

DIVERSITY FACTOR 1.2
 IMPROV POWER FACTOR 1.0
 LOAD IN OPERATION (KW) 21844
 MAXIMUM DEMAND (KVA) 13578
 INITIAL P.F 0.76
 ANNUAL ENERGY CONSUMPTION (MWH) 70.33

Required KVAR

13035
 13035
 3502
 -7229

PIPARWAR OCP(10MTY)

OPTION - II

TABLE NO. VII-II

Annual power Bill

Tariff: Rs. 3.20/KWh

Power Consumers	Annual Power consumption MKWh	KWh per tonne of coal production (KWh/te)	Power charges per tonne of coal production (Rs)
O.B.	9.03	1.390	4.45
Coal	46.99	7.230	23.14
Common	14.31	1.431	4.58
Total	70.33	10.050	32.16

Annual power Cost (Rs):

22.507 Crores

FOR ANNUAL COSTS (MAY); BOTH COAL & OIL OUTSOURCED FOR 50% FUEL WITHOUT COAL OPTION - B

230 Days working

TABLE NO. YB-1

STATEMENT SHOWING THE CONNECTED LOAD, MAXIMUM DEMAND AND ANNUAL ENERGY CONSUMPTION

S/L NO	DESCRIPTION	VOLT	POPULATION ON	OPERATION ON	UNIT POWER KW	CONNECTED LOAD KW	LOAD OPERATION KW	D.F.	ACTIVE KW	REACTIVE KVAR	FULL KVA	P.F.	ANNUAL ENERGY CONSUMPTION Mwhr
A	OB. EQUIPMENT												
1	ELECT ROPE SHOVEL 15 CU.M	6.6 K.V.	3	3	660	1980	1060	0.65	1287	1312		0.70	7.40
2	ELECT ROPE DRILL 200 MM	6.6 K.V.	4	4	366	1464	1544	0.70	772	765		0.70	1.63
B	COAL EQUIPMENT												
1.0	ELECT ROPE SHOVEL 15 CU.M	6.6 K.V.	1	1	660	660	660	0.65	429	438		0.70	2.47
2.0	ROPE SHOVEL 8.75/10 CU.M	6.6 K.V.	1	1	660	660	600	0.65	429	438		0.70	2.47
4.0	CHP					3000	3000	0.70	2100	2142		0.70	10.40
5.0	PUMPING					4000	3200	0.80	2560	1920		0.80	11.21
C	COMMON												
1	COLONY & GM OFFICE	5.5-6.6 K.V.				3000	2500	0.90	2250	1090		0.90	7.92
2	WORKSHOP	0.5 K.V.				1500	1200	0.80	600	672		0.70	1.61
3	ILLUMINATION	0.44-0.23 K.V.				800	500	0.90	450	278		0.90	1.97
4	WATER SUPPLY & OTHERS	5.5-6.6 K.V.				600	500	0.70	350	357		0.70	1.23
	TOTAL					17544	15744		11227	9315	14588	0.77	48.31

DIVERSITY FACTOR 1.2
 IMPROV POWER FACTOR 1.0
 LOAD IN OPERATION (KW) 15744
 MAXIMUM DEMAND (KVA) 9746
 INITIAL P.F. 0.77
 ANNUAL ENERGY CONSUMPTION (Mwhr) 48.31

Figured KVAR

9356
 9056
 2729
 -5034

PIPARWAR OCP(10MTY)

OPTION - II
After 9th year
Annual power Bill

TABLE NO. VII-II

Tariff: Rs. 3.20/KWh

<i>Power Consumers</i>	<i>Annual Power consumption MKWh</i>	<i>KWh per tonne of coal production (KWh/te)</i>	<i>Power charges per tonne of coal production (Rs)</i>
O.B.	9.03	1.390	4.46
Coal	26.54	4.084	13.07
Common	12.73	1.273	4.07
Total	48.31	6.746	21.59

Annual power Cost (Rs) :

15.458 Crores

PJPARWAR OCP(10.0MTY)

OPTION- II

Table No VII-III

Tariff: Rs. 3.20/KWh
Amount In Rs. Lakhs

YEAR	O.B.	Coal	Common	Total
1	151.07	1335.49	371.49	1858.04
2	174.34	1335.49	371.49	1881.32
3	180.93	1391.55	412.13	1984.61
4	182.69	1391.55	412.13	1986.37
5	182.25	1391.55	423.49	1997.29
6	227.92	1447.62	457.92	2133.45
7	252.51	1503.68	457.92	2214.11
8	288.96	1503.68	457.92	2250.56
9	190.15	1154.03	457.92	1802.10
10	260.77	777.86	407.36	1445.98
11	263.79	813.73	407.36	1484.88
12	267.82	849.60	407.36	1524.78
13	275.87	849.60	407.36	1532.83
14	279.90	849.60	407.36	1536.86
15	288.96	849.60	407.36	1545.92
16	70.48	479.34	407.36	957.17

PIPANYAS (CONNECTIVITY) SOUTH COAL & OB OUTSOURCED FOR 3.5 MTY WITHOUT CHP OPTION - III

STATEMENT SHOWING THE CONNECTED LOAD, MAXIMUM DEMAND AND ANNUAL ENERGY CONSUMPTION
 230 Days working
 TABLE NO. Vb-1

SL. NO.	DESCRIPTION	VOLT.	POPULATION	OPER.	UNIT POWER KW	CONNECTED LOAD KW	LOAD OPERATION KW	D.F.	ACTIVE KW	REACTIVE KVAR	FULL KVA	P.F.	ANNUAL ENERGY CONSUMPTION Mwhr
A. EQUIPMENT													
1	ELECT ROPE SHOVEL 10 CLM	6.6 KV	2	2	660	1320	1320	0.85	818	875		0.70	4.84
2	ELECT REH. DRILL 150 MW	6.6 KV	4	4	368	1544	1544	0.50	772	788		0.70	1.83
B. COAL EQUIPMENT													
1	HYD SHOVEL 575 T CLM	6.6 KV	1	1	660	660	660	0.85	428	438		0.70	2.47
2	ELECT ROPE SHOVEL 25 CLM	6.6 KV	1	1	2300	2300	2300	0.85	1485	1828		0.70	8.60
3	CHP				6000	6000	4800	0.70	3220	3265		0.70	18.84
4	PUMPING	11.44 KV			8000	8000	5000	0.80	4000	5000		0.80	17.82
C. SCHEMATIC													
1	COLONY B. GEN. OFFICE	11.44 KV			3000	2500	2500	0.90	2250	1090		0.90	7.62
2	WORKSHOP	6.6 KV			1500	1200	1200	0.80	800	812		0.70	1.81
3	ILLUMINATION	0.44-0.23 KV			1000	900	900	0.90	810	392		0.90	3.55
4	WATER SUPPLY & OTHERS	11.44 KV			600	500	500	0.70	350	367		0.70	1.23
TOTAL					22824	20524	14784	12382	19271	0.77	88.40		

DIVERSITY FACTOR: 1.2
 IMPROV. POWER FACTOR: 1.0
 LOAD IN OPERATION (KW): 20524
 MAXIMUM DEMAND (KVA): 12833
 INITIAL P.F.: 0.77
 ANNUAL ENERGY CONSUMPTION (Mwhr): 88.40

 12320 10302 16080
 12320 3683 12833
 Required KVAR -6708

PIPARWAR OCP(10MTY)

OPTION - III

TABLE NO. VII-II

Annual power Bill

Tariff: Rs. 3.20/KWh

Sl.No.	Power Consumers	Annual Power consumption MKWh	KWh per tonne of coal production (KWh/te)	Power charges per tonne of coal production (Rs)
1.0	O.B.	6.57	1.073	3.43
2.0	Coal	44.53	7.275	23.28
3.0	Common	14.31	1.431	4.58
	Total	65.40	9.779	31.29

Annual power Cost (Rs) :

20.928 Crores

PIPARVIAR OGF (10 MTY); BOTH COAL & OB OUTSOURCED FOR 3.5 MTY WITHOUT CHP
 OPTION - III AFTER 9TH YEAR

OPTION - III

330 Days working

TABLE NO. VIII-1

STATEMENT SHOWING THE CONNECTED LOAD, MAXIMUM DEMAND AND ANNUAL ENERGY CONSUMPTION

Sl. NO	DESCRIPTION	VOLT	POPULATION	UNIT POWER KW	CONNECTED LOAD KW	LOAD IN OPERATION KW	D.F	ACTIVE KW	REACTIVE KVAR	FULL KVA	P.F	ANNUAL ENERGY CONSUMPTION Mwhr
C	COMMON											
1	COLONY & GM OFFICE	6.6-44 KV			3000	2500	0.90	2250	1090		0.90	7.92
2	WORKSHOP	6.6 KV			300	250	0.50	125	128		0.70	0.34
3	ILLUMINATION	0.44-0.23 KV			600	500	0.90	450	218		0.90	1.97
4	WATER SUPPLY & OTHERS	6.6-44 KV			600	500	0.70	350	357		0.70	1.23
TOTAL					4500	3750		3175	1792	3646	0.87	11.45

DIVERSITY FACTOR: 1.2
 IMPROV. POWER FACTOR: 1.0
 LOAD IN OPERATION (KW): 3750
 MAXIMUM DEMAND (KVA): 2756
 INITIAL P.F.: 0.67
 ANNUAL ENERGY CONSUMP (Mkwh): 11.45

Required KVAR

2646 1494 3038
 2646 772 2756
 -722

PIPARWAR OCP(10MTY)

OPTION - III
AFTER 9TH YEAR

Annual power Bill

TABLE NO VII-II

Tariff: Rs. 3.20/KWh

Sl.No.	Power Consumers	Annual Power consumption MKWh	KWh per tonne of coal production (KWh/te)	Power charges per tonne of coal production (Rs)
30	Common	11.45	2.291	7.33
	Total	11.45	2.29	7.33

Annual power Cost (Rs) :

3.665 Crores

PIPARWAR OCP(10.0MTY)

**BOTH OUTSOURCED
OPTION- III**

Table No. VII-III

Tariff: Rs. 3.20/KWh
Amount in Rs, Lakhs

YEAR	O.B.	Coal	Common	Total
1	167.03	1241.23	371.49	1779.75
2	187.42	1150.85	371.49	1709.75
3	172.85	1280.35	412.13	1865.33
4	162.66	1312.83	412.13	1887.62
5	160.71	1294.47	423.49	1878.67
6	183.54	1229.08	457.92	1870.53
7	196.64	1296.44	457.92	1951.01
8	194.70	1304.92	457.92	1957.54
9	210.24	1138.27	457.92	1806.43
10	0.00	0.00	366.72	366.72
11	0.00	0.00	366.72	366.72
12	0.00	0.00	366.72	366.72
13	0.00	0.00	366.72	366.72

CHAPTER – VIII

COAL HANDLING PLANT

Introduction

Annual target production from Piparwar Project has been proposed to be enhanced from 6.5 MTY to 10 MTY. Present production from the lower benches are being crushed to (-)200 mm by an In-pit crusher and the production from upper benches are being fed to a dump hopper circuit having facilities of Primary Crushing (-)1200 to (-) 200 mm by a sizer. Both the coal from In-pit crushing and dump hopper circuit have been fed to secondary sizer for crushing coal to (-) 100mm and transported to Existing CPP by conveyors. Washed coal from the CPP is transported to nearby railway siding by trucks and dispatched to the customers through railway wagons.

Mine Proposal

In the proposal, a new mine (Quarry 1) has been planned to work simultaneously with quarry-II for enhancement of production of 3.5 MTY. It is found that existing dump hopper circuit (ramp) and one conveyor (No.1003) are lying within the quarry area of quarry-I.

As such two alternatives of coal transport system have been envisaged in the report which are as follows: -

8.3.1 OPTION – I:

Considering all the above points, modification of the existing coal transport system has been planned and some additional conveyors with some infrastructures have been envisaged for smooth handling of coal.

8.3.2 Proposed Scheme for OPTION – I (Ref. drg. No 002326)

(a) Modification of CHP envisage the following:

- i) Shifting & reinstallation of conveyor 1002.
- ii) Addl. Conveyor of 500m length in extension of the conveyor 1002.
- iii) Shifting & reinstallation of conveyor No. 1003 .
- iv) Addl. Conveyor of 400 m length
- v) Addl. Conveyor of 100m length
- vi) Truck unloading hoppers 4 nos. of 200 Te cap. Each.

During shifting of the conveyors crushed coal from Quarry II will be dumped in the quarry at a suitable location and transported to truck-unloading hoppers by trucks/dumpers for onward transportation of coal to CPP through secondary crushing system.

After shifting is completed, coal from quarry No. II shall be transported through modified conveyors and fed to secondary Crushing circuit of CPP.

(b) Shifting of Existing Dump Hopper Circuit

The existing dump hopper circuit along with the ramp and receiving platform has been proposed to be shifted outside the boundary of the proposed Quarry No.1 for crushing to (-) 200 mm and fed to the secondary crushing circuit of the existing CHP / CPP.

(c) Proposed new CHP of 3.5 MTY (CHP – 2)

A CHP having facilities of Primary crushing (-) 1200 to (-)200mm and secondary crushing (-)200 to (-) 50mm has been envisaged afresh for handling enhanced production of 3.5 MTY. After crushing, the coal will be stored in 4 nos. of truck loading hoppers of 100 Te capacity each. From the truck loading hopper coal will be loaded into the trucks and spread over throughout a proposed railway siding (spur taken off from Piparwar Rly. Siding). Wharf wall loading has been envisaged for dispatch of coal through railway wagons. However this Rly. siding may be constructed only after completion of the MGR siding earmarked for Piperwar CPP.

8.4.1 OPTION - II :

It is proposed to mine out the quarry-I in such a way that the alignment of conveyor No.1002 & Conveyor No.1003 are not disturbed. As such modification of the present coal transport system (conveyor alignment) is not required. However modification of the existing dump hopper ramp will be required and provision for the same has been envisaged to locate the ramp outside the proposed mine / quarry -I boundary.

For the enhanced coal production (3.5 MTY), no crushing arrangement has been envisaged presuming that the coal available from outsource agency will be of (-) 50 / 100 mm size. However two nos. truck loading hoppers of 200 te capacity each along with the ramp and unloading arrangement have been proposed on the surface for dispatch of the coal to nearby rly. siding.

8.4.2 Proposed Scheme for OPTION- II (Ref. drg. No 002328)

(a) Two nos. unloading hoppers with truck loading arrangement :

Coal produced from the quarry No.-I of (-) 50 /100 mm size transported by rear discharge dumpers from the face to the surface and discharged into the unloading hoppers of 2 x 200 Te capacity. These coal will be loaded into trucks for transportation of the same to the nearby railway siding (KDH old /

CHAPTER - IX
RAILWAY SIDING

9.1 Introduction

Piparwar opencast project in North Karanpura Coalfield, is a running Project of 6.5 MTY coal production. Coal production has been proposed to be enhanced from 6.5 MTY to 10 MTY. Existing production of 6.5 MTY has been linked to CPP and washed coal was proposed to dispatch by MGR railway siding as proposed to be taken-off from Mcluskiganj to Piparwar project. The length of siding from Mcluskiganj to Piparwar project is 30.5 km approximately. Since the MGR railway siding is not completed yet so the present practice of coal dispatch of this project is taken to Bachra Siding for onward dispatch to customer by wagons.

The additional coal production of 3.5 MTY will also have to be dispatched through a nearby railway siding (Dakra/ K.D.Hesalong manual), due to limitation of the capacity of the existing Bachra Siding.

9.2 Present Status

A part of siding has been completed and some work related to construction of Piparwar Railway Siding from Mcluskieganj Railway Station to Piparwar Project is yet to be done.

9.5 Estimated Cost of the Railway Siding →

The estimated cost of proposed Rly. Siding has been updated for balance work and has been given in Appendix -A.5.

CHAPTER - X

upencast mine of Central Coalfields Limited with a
TY. In this Expansion Project Report, a targeted
been envisaged considering outsourced option for coal

workshop is existing in Piparwar OCP, which is sufficient to
maintenance need of HEMM deployed for departmental Coal &
workshop facilities have been provided for outsourced HEMM for
removal.

ing capital expenditure is shown in Appendix-A.3.2.

CHAPTER -XI

OPTION - I

11.0 Manpower & Productivity

11.1 The optimum manpower requirement for production of 6.5 MTY of coal from Quarry No-II has been estimated as 855, which includes 5 persons to be engaged for land reclamation and supervisory manpower for Quarry-I which is proposed to be outsourced for initial eight years. The OMS (out put per manshift) of the mine has been estimated as 45.53 EMS (earning per manshift) has been calculated as Rs 841.04

11.2 The breakup of the total manpower required in various groups is given in table 11.1

Table - 11.1

Sl. No.	Group	Number	% of Total Manpower
1	Executive	48	5.62
2	Monthly Paid Staff	190	22.22
3	Workers	617	72.16
	TOTAL	855	100.00

11.3 The breakup of the skill wise manpower is given in table no.11.2

Table no.11.2

Sl. No.	Group	Category	Number	%age of Total Manpower
1	Highly Skilled	Spl. A, B	160	25.93
2	Skilled	C, D, VI, V, IV, III	209	33.87
3	Semi-skilled	E, II	116	18.81
4	Unskilled	I	132	21.39
	TOTAL		617	100.00

Note - The manpower requirement of the target year of production of coal (10Mty) is 832 where as the existing manpower is 825.

OPTION - II

11.4 Manpower & Productivity

11.5 The optimum manpower requirement for production of 6.5 MTY of coal from Quarry No-II has been estimated as 841, which includes 5 persons to be engaged for land reclamation and supervisory manpower for Quarry-I which is proposed to be outsourced for initial eight years. The OMS (out put per manshift) of the mine has been estimated as 46.31 EMS (earning per manshift) has been calculated as Rs 837.34

11.6 The breakup of the total manpower required in various groups is given in table 11.1a

Table – 11.1a

Sl. No.	Group	Number	% of Total Manpower
1	Executive	45	5.35
2	Monthly Paid Staff	181	21.52
3	Workers	615	73.13
	TOTAL	841	100.00

11.7 The breakup of the skill wise manpower is given in table no. 11.2a

11.8

Table no. 11.2a

Sl. No.	Group	Category	Number	%age of Total Manpower
1	Highly Skilled	Spl. A, B	160	26.02
2	Skilled	C, D, VI, V, IV, III	200	32.52
3	Semi-skilled	E, II	111	18.05
4	Unskilled	I	144	23.41
	TOTAL		615	100.00

Note: - The manpower requirement of the target year of production of coal (10Mty) is 818 where as the existing manpower is 825. Surplus manpower is proposed to be diverted in other mines of C.C.L for their gainful use.

OPTION - III

11.4 Manpower & Productivity

11.5 The optimum manpower requirement for production of 6.5 MTY of coal from Quarry No-II has been estimated as 743, which includes 5 persons to be engaged for land reclamation and supervisory manpower for Quarry-I which is proposed to be outsourced for its total life. The OMS (out put per manshift) of the mine has been estimated as 50.98 EMS (earning per manshift) has been calculated as Rs 842.96.

11.6 The breakup of the total manpower required in various groups is given in table 11.1a

Table – 11.1b

Sl. No.	Group	Number	% of Total Manpower
1	Executive	45	6.1
2	Monthly Paid Staff	168	22.61
3	Workers	530	71.33
	TOTAL	743	100.00

11.7 The breakup of the skill wise manpower is given in table no.11.2a

Table no.11.2b

Sl. No.	Group	Category	Number	%age of Total Manpower
1	Highly Skilled	Spl. A, B	114	26.02
2	Skilled	C, D, VI, V, IV, III	186	32.52
3	Semi-skilled	E, II	101	18.05
4	Unskilled	I	129	23.41
	TOTAL		530	100.00

Note: - The manpower requirement of the target year of production of coal (10Mty) is 743 where as the existing manpower is 825. Surplus manpower is proposed to be diverted in other mines of C.C.L for their gainful use.

CHAPTER - XII

Civil Construction

12.0 Piparwar OCP is an on-going project, so almost all infrastructural facilities are available there.

12.1 Building

12.1.1 Residential Buildings

The manpower requirement for Piparwar (10 MTY) Project is 855 for option I, 841 for option II & 743 for option-III. Only 470 no. of quarters are required at 55% housing satisfaction for option-I. There already 763 nos. of quarters are existing. So, no additional capital is being provided in this Report. Details are being shown in Appendix-A.2.1.

12.1.2 Service Building

Required Service Buildings like Project Office, Workshop, Canteen, Dispensary, Pit Office, Excavation Office, view tower, Magazine, Rest Shelter, VTC, Children's Park, Shopping Centre etc. are existing. So, no additional capital has been provided in this head.

12.2 Roads & Culverts

Approach Road, Colony Road, Haul Road and Coal Transportation Road are existing there. Haul road of 0.5 km length will be required for all three options & approach road of 0.4km length to railway siding will be required for option-I only. Capital provision for the roads mentioned above has been made. Details are given in Appendix-A.8.2.1 & A.8.2.2 respectively.

CHAPTER - XIII

Water Supply & Sewerage

Present system of water supply and sewerage is functioning very well, so no additional capital in this head is being provided.

CHAPTER - XIV

Land

Total land requirement for piparwar open cast project was estimated to be 1120.25 Ha. Comprising of 186.5 Ha of forestland 933.75 Ha of non-forestland. Non-forestland further classified into G.M.K. land and tenancy land. Out of 933.75 ha of non forest land, 279.35 Ha. is G.M.K. land and 654.4 Ha. is tenancy land.

Classification of land

Total Land 1120.25 Ha	Forest land -- 186.5Ha.		
	Nonforest land 933.75 Ha.	G.M.K. land - 279.35 Ha.	
		Tenancy land - 654.40 Ha.	Paddy land- 163.6 Ha
			Tanr land- 490.80 Ha

Break-up of land

The total lease area of land is 1120.25 hectares, out of which 186.50 ha. is forest land and 933.75 Ha. is non-forest land. 540 hectares of land would be utilized for quarry. Details of land use is given in following table

**Table -
Details of land**

Sl.no.	Particular	Land requirment		
		Forest	Non forest	Total
1	Quarry	130.5	409.5	540
2	External dump	--	25	25
3	Coal preparation plant	53	316.90	372.9
4	Workshop			
5	Industrial site, road, etc			
6	Safety zone		182.35	182.35
7	Total	186.5	933.75	1120.25

All land (1120.25 Ha) has been acquired by CCL for the project.

CHAPTER-XV

15.0

SAFETY & CONSERVATION

15.1 Outside agency deploying HEMM or any equipment in the mine for excavation of coal shall plan their activities in confirmation 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 outside agency shall have to be adhered to. Rules if any imposed by local/State/Central authorities should also be complied by leaser of HEMM /equipment and then shall have to supply various protective equipments viz. helmet, shoes etc. to the workmen at their cost.

All the regulations & schedules of coal mines Regulations 1957 relating to opencast mining have to be adhered to and implemented in order to maintain day to day safety precautions as per stature.

15.2 SAFETY ASPECTS FOR OUTSOURCING/HIRING OF HEMM / EQUIPMENT

Special precaution should be taken while deploying workers in the mine. Before employing any labour to the mine proper vocational training should be imparted and recommendations of VIII Safety Conference should be strictly followed. Terms and conditions shall be fixed by management for deployment of labours by outside agency. Some of the major aspects are as follows :-

- A) For persons :
 - i) No persons shall be deployed unless he is trained at VTC
 - ii) Records in Form-B Form-D shall be maintained.
 - iii) Records of Vocational training Certificate and driving licence of operators shall be kept by HEMM outsourcing agency and shall be made readily available for inspection by management.

- iv) No person shall be employed unless person holds VTC certificate and Management is informed. A record of it shall be maintained.
- v) Adequate supervision shall be maintained by qualified competent persons
- vi) Outside agency shall follow safety guidelines and safety instructions from Project Authorities.

B) For Machineries as recommended by DGMS Cir. (Tech.) 1 of 1999:

- i) All the machineries to be deployed in mines should be checked before deployment by competent authority.
- ii) Regular checking of m/c deployed by outside agency shall be done. No unfit machine shall be deployed before the defect is rectified.
- iii) A proper record of repair and maintenance along with inspection done by management and defect pointed out shall be maintained and signed by authorized person.
- iv) The trucks deployed by the outside agency shall be provided with audiovisual alarms, proper light for use at night and in the period. When natural light is not sufficient. Audio-visual alarms for reversing on trucks shall also be provided.

C) Precaution against inundation: As per statute, proper embankments should be made against the River/ Nala & maintained throughout the life of the Mine

Other Procautions for machines

- i) RTO certificates photo copies of all vehicles shall be submitted to management
- ii) Daily welding, monitoring, inspection shall be done by the agency's mechanic as directed by management.
- iii) Machine manufacturers should be asked to give risk analysis details in respect machines deployed by outside agencies.

iv) Suitable type of the fire extinguishers shall be provided in every machines.

C) General :

- i) No person/vehicle shall be deployed at any place other than authorized place.
- ii) All workers should obey lawful instruction of mine management.
- iii) Risk Management Plan of tipper/pay loader shall be made and implemented.
- iv) All drivers shall obey systematic traffics rules prepared by management
- v) Before deploying workers they must be trained and briefed about safety aspects in opencast mine. However during course of execution of the work, if any accident occurs whether major or minor, the matter shall have to be immediately informed to mine management i.e. Colliery Manager/Agent/GM of Area so that Notices of accidents in a accordance of (Reg.9 of CMR 1957) and Section 23 of Mines Act 1952 may be given and other necessary steps may be taken in accordance with the Mines Act 1952.
- vi) Outside Agency shall operate transport system in such a way so as to minimize pollution in the mine.

Stability of Benches, Quarry Highwalls and Spoil Dumps :

During quarry operations, it is necessary to adopt required mining parameters for the stability of benches, highwalls and spoil dumps. It is also mandatory to examine systematically the fencing of mine workings, land slides and cracks between benches. It is required to maintain well graded and wide roads on benches keeping the width of working areas sufficient for spreading of blasted rock and movement of the mining and transport equipment.

During actual mining operation, systematic observations of the condition of benches, highwall slopes and spoil dumps should be carried out and the dimensions be modified if necessary to suit the local conditions.

Precautions Against Danger of Inundation from Surface Water.

- 1) A careful assessment is to be made against the danger from surface water before the onset of rainy season. The necessary precautions should be clearly laid down and implemented. A garland drain needs to be provided to drain away the surface rain water from coming into the mine.
- 2) Inspections for any accumulation of rain water, obstruction in normal drainage and weakening in embankment.
- 3) Standing order; for withdrawal of working persons in case of apprehended danger.
- 4) During heavy rain inspection of vulnerable points is essential. In case of any danger persons are to be withdrawn to safer places.
- 5) Nallah or water inlets may be diverted or isolated by embankments if so required.

Protection of Equipment Deployed at Bottom Horizons from flooding:

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

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

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

Prevention of Electric Shocks:

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

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

Dust Suppression & Dilution of Exhaust Fumes:

The following measures should be adopted for dust suppression at all quarry working places, dumps, haul roads, CHP and near other auxiliary mining operations.

- 1) Spraying with water on all working faces & haul roads, by special spraying machines or water-sprinkler.
- 2) While drilling holes, it is necessary to use dust extraction devices.
- 3) Installation of local dust suppression and air conditioning devices in cabins of excavators and drilling rigs may be considered.
- 4) Levelling of spoil dump surface.
- 5) Separate dust suppression arrangement should be provided for CHP.

To prevent collection of harmful mixtures in the atmosphere, from the different sections of quarry workings, it is recommended:-

- 1) To spread out the sources of dust formation and omission of harmful gases throughout the working area of the quarry.

- 2) Drilling & Blasting operations should be timed for periods of maximum wind activity during the day.
- 3) Dumpers may be provided with purifiers for exhaust gases.

Measures to be taken for Fire Fighting and Fire Prevention:

In addition to statutory provisions, the measures for fire fighting and prevention of fires are as follows :

- 1) Organisation of special cell for systematic observations to examine and prevent fire.
- 2) Removal of spillage of coal on benches and cleaning of coal horizons to prevent cases of coal heating.
- 3) Storage of lubricants and cotton waste in enclosed fire proof containers in working places.
- 4) Provision of fire extinguishers

Measures to be taken while Drilling Blasting:

Following measures should be taken while drilling and blasting operations in the quarry:

- 1) Drilling and Blasting in quarry should be done in accordance with the provisions of Mines Safety Act, rules and regulations.
- 2) Adequate safety measures as per coal mines act, regulation & its related circulars should be taken while blasting near conveyor 1002 & 1003 so that no damage to the conveyors is caused.

Conservation:

The project considers exploitation of all the seams as per calendar plan

Chapter – XVI
ECONOMICS

16.0 For this expansion proposal of Piparwar OCP, the estimated economics (June'06) of the proposed expansion project from 6.5 MTY to 10 MTY, have been worked out considering **OUTSOURCING** of Coal and corresponding Overburden for the additional output of 3.50 mty, simultaneously with 6.5 Mty of Coal & corresponding OB (during first 9 years of operation). The entire Coal production and OB removal during the remaining years of mine life will be done departmentally with provision for **additional CHP** in option I. The outsourced coal production in option II will be extracted by surface miner & hence no additional CHP has been provided. Details of economics of option-I with CHP and Option-II without CHP has been discussed in the subsequent paragraphs.

Another Option-III, envisaging **PARTIAL OUTSOURCING** of Coal and corresponding Overburden in the existing operations in Quarry 2 and complete outsourcing (both Coal & OB) in Quarry-1 has also been worked out and shown in subsequent paragraphs.

16.1 Total Capital Investment

Initial capital investment has been provided in the proposal till the year of achieving rated coal production of 10 MTY. The capital requirement both initial as well as beyond target year, have been proposed to be met from the own resources of the Company. The capital requirement is given below:

Sl.	Particulars	Capital Requirement in Rs. Crs.		
		Partial outsourcing in Quarry-1		Complete outsourcing in Quarry 1
		Option-I With CHP	Option-II Without CHP	Option-III (Without CHP)
1	Initial Capital (Up to target year)	819.47	776.27	775.91
1a	Specific Investment Rs./te	819.47	776.27	775.91
2	Additional Capital for expansion	65.43	22.23	21.87

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

16.2 Capital Investments for P&M

Capital investment on P&M is given in Appendix-A.3. The detailed break-up for HEMM, Electrical, Pump & Pipes, Workshop and Other P&M etc. are given in Appendix-A.3.1 to A.3.5. The capital requirement on P&M and its specific capital investment is given below:

Particulars		Option-I With CHP	Option-II Without CHP	Option-III Without CHP
A	Investment on P&M (Rs. Crs.)	408.34	365.48	365.13
B	Investment on HEMM (Rs. Crs.)	230.74	230.74	230.74
C	Specific investment in Rs./tne of coal			
1	P&M	408.34	365.48	365.13
2	HEMM alone	230.74	230.74	230.74
D	Additional Capital for P&M	44.49	1.63	1.27

Method of Estimation of Capital Cost

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

Prices of Plant & Machinery

For the plant and machinery, the prices have been taken from the Standard Price-List of Mining Equipment published by CMPDI.

16.3 Estimated Cost of Civil Construction

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

16.4 Capital Investment on Vehicles

For the Vehicles, the prices have been taken from the Standard Price List of Mining Equipment published by CMPDI. The total capital investment on

vehicles is estimated as Rs.195.26 Lakhs. The details are given in Appendix- A.5.

16.5 Development

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

16.6 Opening of Revenue Account

The proposed expansion of Piparwar OCP to 10 MTY is expansion of the existing Piparwar OCP.

16.7 Estimates of Operating Cost

Appendix-C gives the details of average cost and profitability for the target production of 10.0 MTY. The method adopted in estimating the costs are briefly explained as follows:

(a) Wages

The requirement of manpower for the targeted production of 10.0 MTY of coal is estimated category wise/ scale wise and details of manpower are given in Appendix - B1.

Prevalent pay scales for executives and non- executives (NCWA-VII) are adopted. Mid points of the relevant pay scales of executives & non-executives have been considered in estimating the salary and wages cost.

Sl.	Particulars	Option-I With CHP	Option-II Without CHP	Option-III (Without CHP)
1	Wages cost Rs./te	25.67	25.16	15.38
2	Manpower (Target)	832	818	743

(b) Stores

Stores cost consists (1) diesel and lubricants, (2) explosives and detonator, (3) spares for routine repairs etc. Prevalent norms have been followed in estimating stores cost. The average stores cost at 100% capacity level is estimated as :

Sl.	Particulars	Option-I With CHP	Option-II Without CHP	Option-III (Without CHP)
1	Stores cost, Rs./te	81.43	78.15	45.83

(c) Power

The average power cost at 100% capacity level is estimated as:

Sl.	Particulars	Option-I With CHP	Option-II Without CHP	Option-III (Without CHP)
1	Power cost Rs./te	29.29	26.55	17.15

(d) Miscellaneous Expenditure

This covers the expenditure on printing & stationery, postages, telephone, repairs and maintenance of assets other than P&M, workshop debits for annual servicing and overhauling of HEMM, insurance and taxes for vehicles, normative contractual cost of major maintenance of HEMM. The average misc. cost at 100% capacity level is estimated as

Sl.	Particulars	Option-I With CHP	Option-II Without CHP	Option-III (Without CHP)
1	Miscellaneous cost Rs./te	26.18	25.70	23.06

(e) Administrative Charges

This includes area overhead, apex overhead etc. and the cost has been taken as per the actual administration cost of CCL, which works out to Rs. 54.46 per tonne.

(f) Cost of Coal & OB Outsourcing

The normative cost of OB removal, as per recent agreement in CCL is Rs. 54.37 per cum for a lead of 1.83 Kms with provision for escalation in the prices of Diesel and explosives. The above price included cost of explosives as well. Based on the above-agreed price, the OB cost works to Rs. 68.50 per cum (excluding explosives), for an average lead of 3 KMs after making suitable adjustments to account for subsequent escalation in Diesel prices. The above-agreed price of CCL has been considered for calculation of normative cost of coal outsourcing as well. The volume is

converted into tonnes, which work out to Rs. 45.70/t. This has been considered in the Option with departmental CHP, where mining will be done by shovel-dumper combination.-

For the other two Options without departmental CHP, where coal mining will be done by Surface miner, the normative cost of coal removal has been taken to be Rs. 49.25/te as per recent estimate of CCL which is in the process of approval. The outsourced OB cost has been provided @ Rs. 68.50/Cu.m as the OB removal will be done by Shovel-Dumper combination, and this rate is based on recent agreement with contractors by CCL.

(g) Interest on Working Capital

Rate of the interest on working capital is taken as 12.50% per annum.

Sl.	Particulars	Option-I With CHP	Option-II Without CHP	Option-III (Without CHP)
1	Interest on Working Capital Rs./te	10.05	9.80	8.59

(h) Interest on Loan Capital:

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

(i) Depreciation

Depreciation on assets is computed as per the prevalent norms. The straight-line method of charging depreciation has been adopted. The average depreciation cost per tonne at 100% level is estimated as :

Sl.	Particulars	Option-I With CHP	Option-II Without CHP	Option-III (Without CHP)
1	Depreciation Rs./te	75.94	72.11	51.41

(i) Cost & Profitability

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

Sl.	Particulars	Option-I With CHP	Option-II Without CHP	Option-III (Without CHP)
1	Cost of Production Rs./te			
	At 100% Capacity	393.42	385.87	305.66
	At 85% Capacity	436.89	427.84	337.64
2	Weighted Average Selling Price Rs./te	602.91	593.03	593.05
3	Profit Rs./te			
	At 100% Capacity	209.49	207.16	287.39
	At 85% Capacity	166.02	165.19	255.41

16.8 Financial Analysis

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

Sl.	Particulars	Option-I With CHP	Option-II Without CHP	Option-III (Without CHP)
1	Internal Rate of return			
	a) at 100% Capacity	34.83	36.01	38.62
	b) at 85% Capacity	25.56	26.67	29.90

16.9 ECONOMIC ANALYSIS

The year wise cash flow for the economic analysis at 100% and 85% capacity utilization have been estimated and are detailed in Appendix- D2 and D.3, respectively. In estimating the economic prices, all taxes, duties and levies have been excluded from cost of inputs. The economic price of coal has been assumed to be same as its ruling price. Based on the above methodology, the economic IRR of the project, at 100% and 85% rated output, has been summarised in the table below:

Sl.	Particulars	Option-I With CHP	Option-II Without CHP	Option-III (Without CHP)
1	Economic Internal Rate of return			
	a) at 100% Capacity	38.48	39.42	41.58
	b) at 85% Capacity	29.28	30.16	32.81

16.10 SENSITIVITY ANALYSIS

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

- a) Capital investment
- b) Operating cost
- c) Capacity utilisation
- d) Selling price of coal

The above parameters have been increased / decreased in Steps of 5% to a maximum of 25% over the base case and the IRR have been computed.

The following table summarises the results of sensitivity analysis:

Option-I With Departmental CHP

Variable Parameter	IRR at different stages of					
		5%	10%	15%	20%	25%
1 Increase in Capital	34.83	34.46	34.09	33.72	33.35	32.98
2 Increase in Cost of Production	34.83	33.55	32.24	30.92	29.57	28.20
3 Decrease in Capacity	34.83	31.83	28.74	25.56	22.25	18.79
4 Decrease in Selling Price	34.83	31.39	27.82	24.11	20.21	16.05

Option-II Without Departmental CHP

Variable Parameter	IRR at different stages of					
		5%	10%	15%	20%	25%
1 Increase in Capital	36.01	35.70	35.38	35.07	34.75	36.01
2 Increase in Cost of Production	36.01	34.73	33.44	32.13	30.80	36.01
3 Decrease in Capacity	36.01	32.98	29.88	26.67	23.34	36.01
4 Decrease in Selling Price	36.01	32.54	28.95	25.22	21.30	36.01

Option-III Without Departmental CHP

Variable Parameter	IRR at different stages of					
		5%	10%	15%	20%	25%
1 Increase in Capital	38.62	38.39	38.17	37.94	37.72	37.50
2 Increase in Cost of Production	38.62	37.43	36.22	35.01	33.79	32.56
3 Decrease in Capacity	38.62	35.76	32.86	29.90	26.68	23.77
4 Decrease in Selling Price	38.62	35.31	31.93	28.45	24.87	21.14

16.11 Completion cost of the project

Completion cost of the project is up to targeted year and is given at Annexure-I. The completion cost has been worked out based on the guidelines of PIB dated 6.8.97, whereby the Labour component of the investment has been escalated based on the ruling Consumer Price Index, and Other than Labour components of the investment has been escalated based on the ruling Whole Sale Price Index. Financial and Economic IRR of the project, based on the estimated completion capital is given in Appendix- D.4, D.5, D.6 & D.7, respectively for both 100% and 85% capacity utilization.

Sl.	Particulars	Option-I With CHP	Option-II Without CHP	Option-III (Without CHP)
1	Completion Capital Rs. Crores	824.13	778.29	777.91
2	Internal Rate of return			
	a) at 100% Capacity	34.71	35.96	38.62
	b) at 85% Capacity	25.44	26.62	29.90
3	Economic Internal Rate of return			
	a) at 100% Capacity	38.37	39.37	41.58
	b) at 85% Capacity	29.17	30.28	32.81

16.12 Economics of project considering Coal Preparation Plant (CPP)

Economics of the project for a target production of 10 MTY along with investment on CPP has also been worked out, which has been detailed below: The existing capital investment on CPP at Piparwar as on 31.3.05 has been shown as Rs. 317.38 crores, which works out to Rs. 493.13/te for RAW coal feed of 6.436 Mty during 2005-06, and Rs. 602.70/te based on clean coal as specific investment of CPP. The economics of the project along with CPP operating at 85% capacity for an average yield of 81.83% has been worked out and shown in table below. The weighted average

selling price of clean coal i.e. Rs. 1045/te is based on the sale value of clean coal of this CPP during the year 2005-06.

Sl.	Particulars	Option-I With CHP	Option-II Without CHP	Option-III (Without CHP)
1	Capital investment Rs. Crores	1136.86	1093.65	1093.29
2	Cost of production Rs./te at 100%	606.70	598.41	513.04
3	Weighted Average Selling Price Rs./te	919.96	901.21	901.21
4	Profit/ Loss Rs./te	313.26	302.80	388.17
3	Internal Rate of return %	28.39	29.02	31.21

CHAPTER-XVII

17.0 ENERGY CONSERVATION

17.1 Introduction

Conservation of energy in any form is assuming greater importance in mechanical mines with rapid industrialization and increase in per capita consumption of energy resulting in unmanageable demand of energy. The time is not far off when with the existing quantum of energy, the coal mining industry would be facing a bleak future. Hence, it is of paramount importance that the existing quantum of energy is put to optimal and economical use with a high degree of conservation. Special emphasis is laid at the project formulation stage to take all steps for conservation of electrical energy including power consumption and power demand or fuel consumption. All efforts have been made to incorporate energy conservation system and equipment to achieve this in the planning and installation stage itself. At the stage of planning of the equipment of the opencast mine, a careful study has been made with regard to location of power sub-station for the mine, selection of equipment, conductor size, operating power factor with special reference to the conservation of energy.

17.2 Managerial control

To reduce occurrence of maximum power demand of certain group of equipment at a time and improve the effective load factor, demand meters have been proposed in each circuit breaker controlling the feeders.

This would reduce power demand of the project at the same level of power consumption and also relieve the system of transmitting useless power.

17.3 Energy Audit

It is suggested that energy audit in the mine would be done regularly to even out maximum demand, as far as possible. Such an energy audit would not only pin

Point the defined areas but also would highlight the areas so that improvement can be implemented immediately.

18.0 Maintenance

A special emphasis would be laid on the preventive maintenance of all electrical, mechanical and HEMM equipment. Energy conservation is very much related to preventive maintenance. Therefore the preventive maintenance would never be overlooked.

As part of management system, a feedback is necessary for better performance of equipment and statistical information of breakdowns would help in upgrading maintenance practices, after meaningful and purposeful analysis resulting in saving of diesel and power.

15.5 Distribution Network

In the power distribution network, care has been taken to select suitable size of conductors and cables to minimize losses and voltage drop. It is suggested that the conductor sizes recommended in the PR are drawn at the construction stage of the project itself to avoid duplication of work later on. The size should not be changed either with higher or lower size of the conductor.

The transformer has been selected to cater to the total load. However, all the transformers under normal conditions would share the load of the mine.

15.6 Lighting

For the purpose of illumination in mine and dump areas, provision of groups 400 watts, 250 volts HPSV lamps mounted on 15 m high towers along quarry edge have been recommended to reduce the energy consumption and to achieve the desired Lux level.

15.7 Haul Road

Dumpers used for transportation of OB and Coal, consume lot of energy in the form of consumption of diesel. For effective fuel conservation, it is suggested that haul roads, which play an important role in the use of dumpers and fuel consumption are made better to reduce group resistance. To save energy, therefore, it is absolutely necessary to maintain good haul roads specially at ramps and turnings.

15.8 The important areas in the opencast mine working where there is scope of energy saving, have been indicated above. This emphasizes the following: -

- (a) The necessity for going in new system technology and equipment
- (b) Even during planning, the aspect of energy conservation with respect to equipment size is considered.
- (c) During operation, it is imperative to conduct an energy audit just time preventive maintenance.
- (d) Complete monitoring by proper communication and instrumentation would identify the areas, where there is energy wastage so that corrective measures are taken.
- (e) If it deviates from the standards, causes should be identified and corrective action may be taken.
- (f) Maximisation of utilization within the load allocated by supply agencies by flattening the peak demand.
- (g) Provision of adequate size of pumps in the mine especially during monsoon.
- (h) Staggering of mining activities during usual peak hours.

CHAPTER - XVIII

Environment

Introduction

Piparwar open cut coal mine cum coal beneficiation plant was initially planned, designed and implemented for target capacity of 6.5 MTY of Raw Coal and 5.85 MTY of beneficiated coal with an ash content of < 34%. The product (beneficiated coal) is being supplied to NTPC Power House Dadri near Delhi. It was an Indo-Australian collaboration project.

The EIA / EMP prepared by CMPDI in March '93 had been approved by MOEF vide their letter No. J/11015/12/85- Env.5/IA.II (M) dt. 29.10.93.

Now it is planned to increase the annual production of the project to fulfill the demand of power grade coal. As per guide line of MoEF, a revised environmental impact assessment and management plan (10.00 mty) has been prepared and submitted to fulfill the statutory requirement. As we know open cast mining completely change the topography of the area i.e. create large open deep excavation pit and huge high O.B. dumps and also damaged the ecological and environmental balance. So efforts has been made to minimise the above effect as much as possible.

Source of Data

To know the present environmental scenario in base line data have been generated in core zone (comprising the area of 1120.Ha., part of 8 villages) and as well as in buffer zone (comprising the area within a radial distance of 10 km. from Core zone having 73 villages and covering a total area about 314Sq.Km).

Following are the various agencies who generated the data.-

- (A) Operational stage project specific air, water and noise quality monitoring data of 2004-2005 and fresh data of April 2005, have been generated by PDIL Dhanbad, Jharkhand.
- (B) Hydro-geological study was done by the Exploration Department of RI-3 CMPDI.

- (C) Ranchi university, Ranchi, has conducted the socio-economic survey.
- (D) The land use pattern was done through remote sensing by CMPDI (HQ), Ranchi.
- (E) Mining related data is based on the Piparwar project report (6.5Mty) prepared by White industries Australia and RI-3 CMPDI,Ranchi in 1993.
- (F) Study for flora and fauna has been done by University Department of Zoology,Ranchi University, Ranchi in May,2005.

I. **Present Environment scenario**

The present environmental scenario, as described below, reflect the residual impact on environmental attributes due to mining operations and control measures are corresponding to 6.50 Mty coal production.

Summarised data of base line have been tabulated below.-

(A) Micro-meteorology:

i Predominant Wind Direction the frequency	:	From south quadrant with 5.54%.
ii Temperature Ranging	:	Temperature values are from 290 ⁰ to 317.2 ⁰ K.
iii Relative humidity are	:	Relative humidity values ranging from 46.20% to 66.16%.
iv Rainfall region is 0.9mm	:	Total rainfall of the during the
v Cloud cover Oktas	:	Varies from 0 to 2

(B) Air quality:-

Sl.no.	Sampling station	Maximum Concentration in $\mu\text{g}/\text{m}^3$			
		SPM	RPM	SO ₂	NO _x
1	Core zone	240	68	19.4	23.8
2	Benti Rehab. site	197	61	20.8	24.3
3	Kalyanpur village	197	42	17.8	19.6
4	Koilarih village	199	45	17.3	18.4
5	Bachra village	198	58	17.8	19.4

(C) Water quality

Sl.No	Sampling location	pH	Turbidity NTU	TDS mg/l	Oil & Grease mg/l	D.O mg/l	BOD mg/l
1	<u>Bore Well, Core Zone (SW₁):</u>	7.46	4	642	NIL	-	-
2	<u>Open Well, Sidalli Village (SW₂):</u>	7.48	3	408	NIL	-	-
3	Workshop discharge (SW ₃)	7.75	-	-	3.50	-	5.0
4	Lagoon discharge (SW ₄)	7.21	-	-	BDL	-	7
5	Damodar U/S (SW ₅)	7.09	14	497	-	5.3	3.0
6	Damodar D/S (SW ₆)	7.82	17	560	-	5.2	3.0

(D) Noise Level (Leq Noise-Level)

Sl. No.	Location Code	Location Zone	Noise level	
			Max. L _{eq} Noise Level dB(A)	Max .Peak Noise Level dB(A)
01.	SN ₁	Core Zone	47.1	49.0
02.	SN ₂	Benti Rehabilitation Site	49.8	51.7
03.	SN ₃	Kalyanpur Village	46.1	48.2
04.	SN ₄	Koilarih Village	46.2	49.8
05.	SN ₅	Bachra Village	43.5	47.0

(E) Land

Land requirement:- Total land requirement for the Piparwar OCP is 1120.25 Ha. Including the safety zone, nala diversion, haul road and etc.

Land requirment

Forest land,Ha	Non forest land,Ha	Total,Ha
186.5	933.75	1120.25

(F) Population Composition: As per Cencus 2001 & 1991

Sl No.	Particulars	As Per Cencus	Coree Zone	Buffer Zone			Sex Ratio / Ratio
				Total Men	Total Women	Total population	
1	Population	2001	NIL	38345(52.88)	34166(47.11)	72511	-
		1991	-	-	-	36287	-
	Sex Ratio-	2001	NIL	-	-	-	891
2	S.C. population	2001	NIL	9202(51.15)	8432(48.85)	17634	-
	S.C Sex Ratio	2001	NIL	-	-	-	916
	S.C Ratio	2001	NIL	-	-	-	24.32 %
3	S.T. Population	2001	NIL	7791(51.50)	7338(48.50)	15129	
	S.T. Ratio	2001	NIL	-	-	-	20.86 %
	S.T. Sex Ratio	2001	NIL	-	-	-	941
4	Total No. of house hold	2001	NIL	-	-	13373	-

(G) Soil Quality

Sl No.	Parameters	Ranges	Sl No.	Parameters	Ranges
1	Texture	Sandy to clay Loam	5	Organic Carbon	0.49 to 0.90
2	Plastic limit	9.0 to 12.7	6	Phosphorus	0.046 to 0.065
3	PH	6.9 to 7.8	7	Potassium	0.013 to 0.026
4	Elect. Conductive	0.31 to 1.20	8	Nitrogen	0.049 to 0.094

IMPACT ASSESSMENT

The increased level of production would increase the frequency of various activities and will impact on the quality of environmental parameters, that are likely to go-up from present level.

An attempt has been made in the EMP report to identify the impacts of mining & allied activities on the various environment attributes.

Air - In the following table, resultant impact assessment for the various air pollutant have been computed.

All the parameter have been found well within the stipulated limit.

Table

<u>Sl. No.</u>	<u>Pollutant</u>	<u>Present status</u> $\mu\text{g}/\text{m}^3$ *	<u>Assessment</u> $\mu\text{g}/\text{m}^3$	<u>Resultant</u> $\mu\text{g}/\text{m}^3$
1.	SO _x	9.7	28.08	37.78
2.	NO _x	13.8	94.10	107.9
3.	SPM	145	323.5	468.5

*Max. Value taken

Water – The operation of the mines and preparation plant is affecting water resources in the project and surrounding area in the various ways that are discussed in detailed EMP report.

Sources for waste water, sewage including industrial and domestic, surface water quality & effluent being released are monitored regularly. The quality has been found to be complying to prescribed standards.

Base line data show the pollution levels in the water are well within the prescribed limits & water environment has the capacity to take additional pollution load may cause by increased capacity of the project.

So, there is no serious impact on the water pollution have been envisaged.

Noise- Noise is usually defined as unwanted sound or undesirable sound in the society's normal day to day activities. Modern mining involves large-scale utilization of high power machinery operation. These machine involve in generation of structural and aerodynamic noise. Such a noise raises the sound pressure level within the mine and neighboring area. Often these high level noises prone to cause psychological harm to the people. Many psycho- somatic diseases have relationship such a high noise level.

It is also evident that when a combination of these equipments will work at

various mining activity centers, the net noise level will be slightly higher than the noise level generated by any individual equipment. Thus noise level at and in immediate vicinity of activity centers would be above the prescribed tolerance level and limited to operational area within the active mining area around the mine pit. The distance of villages/ settlements around the mine are away from active mining areas. Hence these activities have negligible impact on noise level in ambient scenario.

Land - As we know open cast mining completely change the topography of the area i.s. Create large open deep excavation pit and huge high O.B. dumps. The proposed mine and allied activities would alter the land use pattern of 1120.25Ha. of land which include 186.5 Ha. of forest land, 933.75 Ha. of non-forest land. This change will be for doing quarry operation, O.B. dumping, infrastructure and haul road and etc.

CONTROL MEASURES

Air- Mitigation measures are broadly divided into two categories namely preventive measures and suppressing measures. Stress has been laid down on adoption of mitigation measures, which are more effective and economical. Detailed description of some of mitigation measures being taken in the various activities are described in EMP report.

Water- To prevent the Water being polluted, the control measures have been envisaged right from the planning stage. That are based on following four assumptions: -

- i) Mine lay out has been so planned as to prevent water pollution as much as possible
- ii) it has been decided to recycle the polluted water as much as possible
- iii) Surface run-off is being differentiated into clean area and dirty area run off.
- iv) No dry weather waste effluent would be discharge into natural watercourse without treatment

Detailed description for water pollution measures the various activities are described in EMP

Noise- Detailed description of noise mitigation measures of the various activities are described in EMP. Some the mitigation measures are listed below -

- In work zone, noise protective outfits are supplied to workmen operating under high noise zone.
- Operators working in HEMMs, which are source for high noise, are supplied with above equipments. Moreover, the cabins in HEMMs are sound proof & Air conditioned.
- All HEMMs are source for high noise are regularly serviced so that they operate smoothly & unnecessary noise is not generated.
- In the workshop, the high noise producing equipments are enclosed to prevent propagation of noise.

In addition to above mitigation measure, green belt should be developed around the quarry area, workshop, Along the haul road, coal preparation unit, along the safety zone and along the all others noise generation zone.

Land reclamation.- As we know open cast mining completely change the topography of the area i.s. Create large open deep excavation pit and huge high O.B. dumps. As the dump materials are in loose state and surface do not conforms to natural angle of repose. So in this conditions, unless they are treated, are venerable to erosion caused by blowing wind and surface run-off. Continuous erosion of deep slope may lead to slope failure causing loss of property and life. Such a untreated dumps constitute a potential source air and water pollution and safety hazard for employee. So it is necessary to reclaim the degraded land both **Physically** and **biological**. Reclamation of land is based on following principles,-

- Conservation & Reclamation of top soil
- Reclamation of O.B. dumps (external & Internal)
- Reclamation of degraded land, quarry pits and etc.

Detailed description about the land reclamation of the various activities are explained in EMP report.

CHAPTER- XIX

19.0 MINE CLOSURE

Mine closure operations is proposed to be undertaken after examination and detailed study that there is no further expansion possibility of the mine and the void is to be suitably filled up so that the land is utilized gainfully by the society. Intermediate stoppages of operations due to any reasons for a period of time do not come under the proposed scheme of mine closure. This chapter proposes following aspects:-

- A. Technical Aspects
- B. Environmental Aspects
- C. Social Aspects
- D. Financial Aspects

19.1 TECHNICAL ASPECTS

- ✓ Safety aspects.
- ✓ Pit slopes and waste dumps.
- ✓ Hydrology and hydrogeology.
- ✓ Details of decommissioning of the infrastructures.
- ✓ Closure of entries like pits and entry to the mine.

19.1.1 Safety

After attaining the final stage dump the remaining portion between dump toe and final stage Quarry floor should be fenced properly so that no human being or stray animals should be trapped within. Internal dumps are proposed to be suitably re-graded to avoid deep trenches.

19.1.2 Pit Slopes and waste dumps

The final pit slopes are designed to avoid any slope failure. Technical study is proposed to be conducted before deciding upon the final slope. Both the external and internal Dumps are designed in such a way that there are minimal chances

of slope failure. The internal dump slopes are designed at milder gradient so that even with the percolation of water in the dip side of the quarry, the dumps remain stable. It is proposed that the internal dump must be provided with toe walls/ silt arrestors and garland drains. Vegetation cover on surface of these dumps is proposed to be ensured as a final closing operation.

19.1.3 Hydrology and Hydrogeology

In the mine closure plan, the surface flow pattern of precipitation and mine water drainage is envisaged to be examined and the water channel suitably laid down so that this is acceptable to the local community and it do not disturb the general hydrology of the area. Efforts are proposed to be made to regenerate the ground water resources.

19.1.4 Decommissioning of the infrastructure-

The coal project develops lot of infrastructure for sustaining their operations. These include Workshop, Coal Handling Plant, Railway Siding, Office Complex, Residential Complex, Roads, Pipe Lines and Transmission Line. Decommissioning of the infrastructure should be planned in such a way that the Land occupied by these infrastructures is released. However these infrastructure is proposed to be reused for the neighboring projects /mine.

19.1.5 Closure of entry to the mine-

All entries to the mine must be effectively sealed. This will prevent illegal mining, entry of fire and water etc.

19.2 ENVIRONMENTAL ASPECTS

- ✓ Air, water, dust.
- ✓ Reclamation of forest/vegetation.
- ✓ Management of recharge areas.
- ✓ Acceptable surface and ground water flows.
- ✓ Alternative use of land

19.2.1 Air, water, dust

It is proposed that air quality, water quality and dust level is to be monitored. Necessary actions to check the pollution from the closed mine, if any, in respect of air, water and dust is to be taken after examining the local site conditions then prevailing.

19.2.2 Reclamation of Forests/vegetation:

It is proposed that major portion of the project area is covered with vegetation. This will involve both forest land as well as non-forest land. Certain areas, mostly industrial areas, where service building are proposed to be located and to be used are not proposed for plantation.

19.2.3 Management of recharge areas:

It is proposed that the recharge areas are fully utilized and sufficient availability of water, if feasible, is ensured to enhance ground water availability.

19.2.4 Surface and ground water flows

In the final stage, wherever the mine water is likely to flow out to surface and meet the natural drainage system, the quality of water is proposed to be assessed and flow pattern for mine water be properly modified/ redesigned. Alternately, the water treatment arrangements may be considered depending upon the local site conditions.

19.2.5 Alternative use of land

During the mining operation, the land usage changes from its pre-mining scenario. The final stage land use plan shows the use of land in a post-mining scenario when coal-mining operations have completed. Alternative use of land, specially released from infrastructure areas and vacant areas, as proposed to be planned and properly designated for post-mining land uses depending on the existing conditions prevailing at that point of time. While for OB dumps and acquired forest areas, vegetation and afforestation has been proposed as a final land use. While agriculture

may be the best land use, if feasible, and if it is supported by some irrigation facilities.

19.3 SOCIAL ASPECTS

- ✓ Re-deployment of work force.
- ✓ Management of community facilities
- ✓ Canalization of available water

19.3.1 Re-deployment of work force

The peak work force required for mine operations is in the first few years of the mine when construction activities as well as operational activities achieved their peak.

This work force slowly goes down with completion of development and when only the operational work remains. Again near the end of the mine life, say 4-5 years before closure, the activity of the mine starts getting reduced and therefore management gets opportunity to taper the operational manpower. After closure, skeleton service people are proposed to be left for continuing with the actual closure operations. The reduction of manpower could be done as per the following options:

- Natural retirement.
- Implementation of VRS schemes for age group of +50.
- Retraining and redeployment of younger groups – 40.
- Transfer of experienced middle-aged groups between 40-50 years to other projects.

Retrenchment of people with suitable compensation after exhausting all the above options.

19.3.2 Management of Community Facilities

The community facilities are proposed to be developed by coal projects for betterment of the neighboring community. The project management provides or assists in developing educational facilities, health facilities, community halls and also some communication facilities. After the mine closure, these facilities are to be continued for the neighboring

communities to the possible extent. The closure plan will envisage interaction of mining company with the state or local bodies who will take over these facilities and run the same for the community. A onetime payment may be made by the coal companies towards running these facilities, which is proposed to be taken care of by the local/state bodies.

19.3.3 Canalization of available water

If it is found that the mine is having sufficient water and on closure, the mine water flows into the surface watercourses, canalizing this water for surrounding community for their irrigational/domestic uses may be taken up.

19.4 FINANCIAL ASPECTS:

- ✓ Creation of a corpus fund for the final mine closure
- ✓ Cost of closure activities.
- ✓ Cost towards organization for executing the closure activities.
- ✓ Cost of the post project monitoring
- ✓ Bond/insurance for the closure cost

19.4.1 Creation of a corpus fund for the final mine closure

It is proposed that a corpus fund for final mine closure be created from the retain earnings of the project. The fund creation is proposed to be started after the project earns revenue, which is in surplus, after deducting all the negative cash flows. Preferably the corpus fund should be created after the mine comes under revenue. However, in case of shortage of funds, corpus fund creation may be deferred till the mine attains target production. This fund should be judiciously created so that the objective of the final mine closure can be smoothly met. This will depend on the local site conditions, requirement of mine closure, mine closure plan. Site specific mine closure plan is proposed to be prepared and approval of the company board may be obtained. It is proposed that 10% of annual OB removal would need to be regarded at the end of the mine. A Corpus fund @ Rs.2/- per cum of the OB to be finally re-graded is envisaged to be created and kept under separate head with the project. This fund will not only cater for re-grading but will also cover other ancilliary expenditure.

19.4.2 Cost of Closure Activities

As proposed above, many activities are proposed to be undertaken after the closure of the mines, which naturally will involve expenditure. Some of the closure activities will, in fact, form part of normal mining operations. However, some activities are proposed to be addressed only after completion of the coal mining operations. The cost for all those activities, which are to be executed after coal winning, is proposed from the retained earning of the project for meeting the expenses.

19.4.3 Cost of Organization for executing the closure activities

After the completion of the coal mining, an organization consisting of persons of different disciplines is proposed to be maintained to undertake and implement the closure activities. The organization may be provided with a vehicle for discharging day-to-day duties. Maintenance cost of this organization is proposed from the retain earnings of the project. A small team consisting of 2-3 technical people may be required to oversee the efficacy of the closure activities. This monitoring may be conducted for 4-5 years after the mine closure activities

19.4.4 Cost of the post project monitoring

After the closure activities have been implemented the project is proposed to be monitored regularly for 4 to 5 years. During this period of 4-5 years, cost towards project monitoring is proposed from the retain earnings of the project.

Funding for mine closure

Provision of a corpus fund is made for a few years (upto 5 years) in the mine so that the reclamation equipment alongwith its manpower & a few other necessary manpower can perform reclamation work as well as other mine closure activities is completed without any difficulty. →