पूर्ण प्रतिबन्धित
सिर्फ कम्पनी कार्य हेतु
प्रतिबन्धित

इस प्रतिवेदन में समाहित सूचनाओं को प्रत्यक्ष या परोक्ष रूप से प्रेस या अन्य किसी व्यक्ति जो कम्पनी/ सी.आई.एल./ सरकारी नहीं है, को किसी भी हालत में नहीं दिया जाय।

परियोजना प्रतिवेदन

बीना–ककरी एमेलगेमेशन खुली खान परियोजना

PROJECT REPORT

FOR

BINA-KAKRI AMALGAMATION OCP

(Normative Production - 10.00 Mtpa)

(Peak Production – 12.50 Mtpa)

नार्दर्न कोलफील्ड्स लिमिटेड

NORTHERN COALFIELDS LIMITED

GENERAL MANAGER
BINA PROJECT

AUGUST - 2011

क्षेत्रीय निदेशक
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cmpdi
A Mini Ratna Company

क्षेत्रीय संस्थान–6/Regional Institute-VI

P.O. Jayant Colliery, Dist-Singrauli (MP) – 486890

PROJECT REPORT
FOR
BINA-KAKRI AMALGAMATION OCP (10 Mtpa)

CONTENTS

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6,
सिंगरौली

PROJECT REPORT
FOR
BINA-KAKRI AMALGAMATION OCP (10 Mtpa)

LIST OF APPENDICES

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6,
सिंगरौली

PROJECT REPORT
FOR
BINA-KAKRI AMALGAMATION OCP (10 Mtpa)

LIST OF APPENDICES

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

PROJECT REPORT
FOR
BINA-KAKRI AMALGAMATION OCP (10 Mtpa)

LIST OF APPENDICES

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6,
सिंगरौली

PROJECT REPORT
FOR
BINA-KAKRI AMALGAMATION OCP (10 Mtpa)

LIST OF APPENDICES

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6,
सिंगरौली

PROJECT REPORT
FOR
BINA-KAKRI AMALGAMATION OCP (10 Mtpa)

LIST OF PLATES

Sl. No.	Description	Plate No.
1	Location Map of Singrauli	MIN-1
2	Plan showing Geological & Surface Features	MIN-2
3	Plan showing the existing mine position of Bina Extn. & Kakri OCP	MIN-3
4	Plan showing the floor contours, iso-chore and iso-grade lines of Turra seam	MIN-4
5	Plan showing the floor contours, iso-chore and iso-grade lines of Purewa Bottom seam	MIN-5
6	Plan showing the floor contours, iso-chore and iso-grade lines of Purewa Top seam	MIN-6
7	Plan showing the Final Quarry Layout	MIN-7
8	Plan showing the quarry cross-sections along I-I', 2-2', 3-3' and 4-4'	MIN-8
9	Plan showing the quarry cross-sections along 5-5', 6-6', 7-7' & 8-8'	MIN-9
10	Isopachytes of Total Excavation	MIN-10
11	Plan showing sector on the floor of Turra Seam	MIN-11
12	Alignment of Dragline cuts	MIN-12
13	Dragline balancing diagram for 10m3/70R & 24m3/96R	MIN-13
14	Dragline balancing diagram for 10m3/70R & 24m3/96R	MIN-14
15	Elements of Mining System	MIN-15
16	Plan showing the stage of mine operations for attaining the target capacity of 10 Mtpa	MIN-16
17	Final dump plan	MIN-17
18	Plan showing the different blocks	MIN-18
19	Plan showing the Additional Requirement of Land	MIN-19
20	Master Plan	MIN-20
21	Coal flow diagram	E&M-21
22	Single line power reception and distribution diagram (Coal)	E&M-22
23	Single line power reception and distribution diagram (OB)	E&M-23

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.स.–6,
सिंगरौली

PR FOR BINA-KAKRI AMALGAMATION OCP (10 Mtpa)

SUMMARIZED DATA

Sl. No.	Particulars	Unit	Value
A	**GENERAL**		
1	Name of the Project		**Bina-Kakri Amalgamation OCP**
2	Name of the Area/Company		Northern Coalfields Limited
3	Nearest Railway Station from the Project	Name	Krishnashila
		Km	2
4	Nearest National Highway/Approach Road	Name	Ranchi-Rewa Highway
		Km	2
B	GEOLOGICAL		
1	Name of the Geological Block considered	Name	Chandela, Tipa-Jharia, Ruhela, Marrak & UP Block Geological Blocks
2	Area of the Geological Block	Sq. Km	12.55 (Chandela -5.35, Tipa-Jharia- 1.44, Ruhela-1.19, Marrak-0.32 & UP Block-4.24
3	Borehole Density within Block	BH/Sq.Km	6

4 Description of all coal seams within the Block

Strategraphic Sequence	Thickness (m)		Geological Reserves (Mt)				
	Min.	Max.	Chandela Block	Tipa-Jharia Block	Ruhela Block	Marrak Block	Total
Purewa Top Seam	4.00	7.00	36.59	14.83	5.71	0.78	57.91
Purewa Bottom Seam	6.00	12.00	72.51	26.55	11.61	4.84	115.51
Turra Seam	12.00	18.00	126.14	33.77	27.56	7.62	195.09
Total			235.24	75.15	44.88	13.24	368.51

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6,
सिंगरौली

Sl. No.	Particulars	Unit	Value	
C	TECHNICAL			
1	Surface Area of proposed OCP	Sq. Km	12.55	
2	Borehole density within mine area	BH/Sq.Km	6	
3	Mine Parameters		South Section	North Section
	Maximum Strike length of quarry along Turra Seam Floor	Km	1.51	1.57
	Maximum Strike length of quarry along Surface	Km	1.91	1.84
	Dip-rise Length of the quarry on Turra Seam floor	Km	4.41	3.43
	Dip-rise Length of the quarry on Surface	Km	4.61	3.52
	Maximum depth of the quarry from surface	m	293	297
	Final quarry floor area	Sq. Km	9.40	

4 Description of Coal Seam proposed to be worked alongwith the parting details

Coal Seam	Seam Thick-ness Range (m)	Thick-ness/ parting Thick-ness (m)	Average Grade UHV (K.Cal/ Kg)	Ave-rage Gra-dient	Mine-able Reser-ves (Mt)	Volume of OBR (Mm3)	Av. S.R. (m3/t)
Purewa Top	4-7	35-158	3745	2°-3°	40.72	1395.38	5.78
Purewa Bottom	6-12	35-46	3550		79.33		
Turra	12-18	44-56	3620		121.4		
Total			E		241.45	1395.38	5.78

5	Method of Mining	Combined system of Mining deploying Dragline and Shovel-Dumper	
6	Target Output		
	Normative Production Capacity at 100%	Mtpa	10.00
7	Year of achieving target production (from Zero Date)	Year	4th Year (2014-15)

8 Production Phasing from Zero date upto target year

Year		2011-12	2012-13	2013-14	2014-15
Coal	Mt	6.00	6.00	8.00	10.00
OB	Mm3	31.40	31.40	55.10	59.82

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. बे.स.-6,
सिंगरौली

Sl. No.	Particulars		Unit		Value	
9	Total Mine life at nominal production capacity					
	Production Build-up period	Year	1-3			
	Production period at target rate	Year	4-24			
	Tapering Down period	Year	25-26			
10	Particulars	Cap/ Size	Option-I	Option-II	Option-III	Option-IV
	Major HEMM Deployed for Coal winning					
	- Hyd. Shovel	8-10 m3	2	2	2	2
	- Hyd. Shovel	4.5/5.5m3	4	4	4	4
	- Rear Dumper	100 T	28	28	28	28
	- RBH Drill	160 mm	7	7	7	7
	- Dozer	410 HP	6	6	6	6
	- Dozer with Ripper	410 HP	2	2	2	2
11	Major HEMM Deployed for OB Removal					
	- Dragline	24m3/88mR	2	4	2	4
	- Dragline	10m3/66mR	2	-	2	-
	- Elect. Rope Shovel	20 m3	8	8	-	-
	- Dumper	190 T	68	68	-	-
	- Elect. Rope Shovel	10 m3	5	4	5	4
	- Hyd. Shovel	10m3	2	2	2	2
	- Dumper	100 T	69	57	69	57
	- RBH Drill	311 mm	-	4	-	4
	- RBH Drill	250 mm	27	23	14	10
	- Dozer	770 HP	5	5	-	-
	- Dozer	410 HP	15	15	15	15
13	Weighted Average grade of ROM Coal (non-Coking/Coking)		Grade	Non-coking – 'E'		
14	Presence of major surface constraints (Nalla, road, power line etc.)			Power line		
15	Coal Transport within the mine		Type	Rear Dumper		
16	Surface coal transport to siding/ despatch point and mode of despatch			Coal Handling Plant/ Truck Loading Hopper/ Railway Siding		
17	Any railway siding & distance		Km	Bina Railway Siding		
18	Name of specific customer/ Industry		Anpara & Obra TPS of UPRVUNL			

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.का.–6,
सिंगरौली

D	ENVIRONMENT & OTHERS					
1	Civil Construction					
	Particulars	Unit	Option-I	Option-II	Option-III	Option-IV
	- Residential Houses	No.	1842	1773	1394	1344
	- House Satisfaction	%	70			
2	Land to be acquired					
	- Govt. land	Ha	Nil			
	- Tenancy land	Ha	Nil			
	- Forest land	Ha	737			
3	NPV of forest land	₹ Lakhs	6780			
	Village Rehabilitation Cost	₹ Lakhs	57.00			
4	Particulars	Unit	Option-I	Option-II	Option-III	Option-IV
	Total land reclamation capital	₹ Lakhs	3953.71	3953.71	1737.05	1737.05
5	Make of Water	m3/day	269.006			
6	Total installed pumping capacity	m3/Hr	3164.78			
7	Drainage of the area		Tipa-Jharia Nalla			

E	FINANCIAL					
	Particulars	Unit	Option-I	Option-II	Option-III	Option-IV
1	Total Coal	Mt	241.45	241.45	241.45	241.45
2	Total OB	Mm3	1395.38	1395.38	1395.38	1395.38
2.1	Dragline		198.90	257.52	198.90	257.52
2.2	Shovel Dumper - Deptt.		1162.07	1103.44	358.25	299.64
2.3	Shovel Dumper - Outsourcing		-	-	803.81	803.81
2.4	Inseam Band		34.41	34.41	34.41	34.41
2.5	Average Stripping Ratio	m3/t	5.78	5.78	5.78	5.78
3	Coal Proudction	Mtpa	10.00	10.00	10.00	10.00
4	OB Removal (Peak)	Mm3	59.85	59.85	59.85	59.85
4.1	Dragline		7.93	11.04	7.93	11.04
4.2	Shovel Dumper - Deptt.		50.51	47.40	15.55	12.44
4.3	Shovel Dumper - Outsourcing		-	-	34.96	34.96
4.4	Inseam Band		1.42	1.42	1.42	1.42
5	Peak Stripping Ratio		5.99	5.99	5.99	5.99

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6,
सिंगरौली

Sl. No.	Particulars	Unit	Value			
6	Sanctioned Provision (6 Mtpa)	₹ Crores	545.94	545.94	545.94	545.94
7	Initial Capital	₹ Crores	414.68	414.68	414.68	414.68
8	Balance Capital	₹ Crores	131.26	131.26	131.26	131.26
9	Additional Capital from Initial	₹ Crores	3181.81	3371.69	877.30	1276.95
10	Total Capital	₹ Crores	3596.49	3786.38	1291.98	1691.63
11	Capital for sanction	₹ Crores	3050.55	3240.43	746.04	1145.69
12	Specific Investment	₹/t	3596.49	3786.38	1291.98	1691.63
13	Cost of Production					
	- 100% Production Level	₹/t	1044.70	1047.49	770.01	786.34
	- 85% Production Level		1150.05	1153.31	831.22	849.76
14	Weighted Average Selling Price	₹/t	821.00	821.00	821.00	821.00
15	Profitability					
	- 100% Production Level	₹/t	-223.70	-226.49	50.99	34.66
	- 85% Production Level		-329.05	-322.31	-10.22	-28.76
16	Financial IRR					
	- 100% Production Level	%	-	-	4.53%	3.70%
	- 85% Production Level		-	-	09.00%	-
17	Desired selling price to yield 12% FIRR	₹/t				
	- 100% Production Level		1271.91	1260.14	910.35	909.36
	- 85% Production Level		1420.70	1406.80	994.99	993.36
18	NPV at 12%					
	- 100% Production Level	₹ Lakhs	-316425.77	-308169.00	-62702.88	-62172.33
	- 85% Production Level		-357716.88	-349423.46	-103783.98	-102810.69
19	Manpower	No.	2631	2540	1992	1920
20	OMS	t	15.21	15.71	20.32	21.31
21	EMS	₹	1830.97	1825.76	1807.32	1815.82

Option-I :Departmental Variant with the existing Draglines
Option-II :Departmental Variant considering replacement of old 10m3/66mR Draglines with new 24m3/88mR Draglines;
Option-III :Partial OB outsourcing i.e. outsourcing of the total OB above Purewa Top Seam
Option-IV :Partial OB outsourcing i.e. outsourcing of the total OB above Purewa Top Seam considering replacement of old 10m3/66mR Draglines with new 24m3/88mR Draglines.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
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सिंगरौली

CHAPTER-I

INTRODUCTION

1.0 BACKGROUND

Bina-Kakri Amalgamation OCP envisages encompassing the part of existing Kakri Opencast Project area, a part of dip and south side blocks with Bina Extension OCP to augment the coal reserve for a targeted output of 10 Mtpa over the life of 25 years.

The proposed project, geologically, will include Chandela Block (existing Bina Extension OCP, Kakri OCP and part of remaining north-western portion), a part of Tipa-Jharia, a part of Ruhela Block and a very small part of Marrak Block of Moher Sub-basin of Singrauli Coalfields under jurisdiction of Northern Coalfields Limited(NCL).

The existing Bina Extension OCP with mineable reserve of 123.94 Mt was sanctioned for a targeted capacity of 6.00 Mt per annum vide letter No.43011-17-2003-CPAM, dated 22nd November 2006 at an additional capital investment of Rs.168.97 crores excluding Rs.366.99 Crores of then existing Bina OCP (4.5 Mtpa) with the option of outsourcing additional overburden removal. The project is being operated by Dragline and Shovel-dumper combination system of mining.

The existing Kakri Project (3 Mtpa), working under the Scheme for Maintenance of Coal Production at Kakri OCP prepared in December 2008 having a total mineable reserve of 23.59 Mt and a life of 8 years was approved by NCL board on 20.03.2009. The project has produced 3.70 Mt in the year 2010-11 and has been assigned a target of 4.00 Mt during the year 2011-12.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
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सिंगरौली

1.1 JUSTIFICATION FOR AMALGAMATION PROJECT

Bina Extension Project has reached a considerable depth and due to increasing barrier width and shape of the mine, the strike length is restricted. Due to half-basinal shape of Moher Sub-basin of the coalfield, future extension of Bina boundary will have to be done eventually towards northern side extending into the dip side of Kakri OCP. With the current rate of production, Kakri Project will exhaust within 3-4 years. Further, there is substantial boundary left between the Bina Extension OCP and Kakri OCP.

Under these circumstances, it is imperative that a higher capacity mine is planned to compensate the closure of Kakri mine and to be in line with the road map prepared to produce 100 Mt per annum of coal from Moher Sub-basin of Singrauli Coalfield of NCL.

The Kakri OCP is working with Shovel-Dumper combination due to steeper gradient of coal seam in northern part of the mine. The southern part of Kakri OCP has flatter gradient and can be worked economically by dragline system. However, such flatter area is available only in a small part and independent dragline can not be economically deployed there. By encompassing this area with existing Bina Extension OCP, it can be properly worked through dragline. Moreover, the coal blocked under common boundary could also be extracted. The remaining part i.e. the northern part could continue to be worked independently with the available shovel-dumper capacity and later integrated with virgin Kakri North Block to form an integrated mine of 4-5 Mt capacity.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.स.–6,
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1.2 PR OF BINA-KAKRI AMALGAMATION OCP

The PR for Bina-Kakri Amalgamation OCP has been prepared for a targeted capacity of 10.00 Mtpa with total mineable coal reserve of 241.45 Mt. All the assets of existing Bina Extension OCP have been considered in this project. The assets of Kakri OCP will remain with the Kakri OCP which would continue to work in the northern part of the left out area and would eventually be integrated with Kakri North Block. Any surplus capacity, if generated in Kakri OCP would be taken into account while deciding with the outsourcing volume of OBR.

The PR has been formulated for the following four options:

Option-I : Departmental Variant with the existing Draglines;

Option-II : Departmental Variant considering replacement of old 10m3/66mR Dragline with new 24m3/88mR Dragline;

Option-III : Partial OB outsourcing i.e. outsourcing of the total OB above Purewa Top Seam with existing draglines.

Option-IV : Partial OB outsourcing i.e. outsourcing of the total OB above Purewa Top Seam with replacing 10m3/66mR Dragline with new 24m3/88mR Dragline.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
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सिंगरौली

CHAPTER-II

MARKETABILITY & JUSTIFICATION

2.1 DEMAND & AVAILABILITY

The sector-wise coal demand up to the end of XII Project Plan period on Northern Coalfields Limited has been shown in Table No. 2.1. The mine-wise availability of coal up to the end of XII Plan period has been given in Table No 2.2.

2.2. GAP IN DEMAND & AVAILABILITY

The year-wise position of coal demand and availability when compared together has been given in Table No. 2.3. It may be seen from the table that there is shortage of 9.636 Mt and 23.316 Mt of coal in the terminal year of coal XI and XII plan period respectively.

2.3 LINKAGE

Bina-Kakri amalgamation project will have linkage with Anpara TPS, Obra TPS of UPRVUNL as well as basket linkage to meet the overall demand of coal on NCL.

2.4 JUSTIFICATION

It may be seen from the Table No.2.3 that there will be a shortfall in coal supply from NCL during XI and XII plan period even after considering the projects under approval. Further, Kakri Opencast Mine is getting exhausted and replacement of this mine will be required to maintain coal supply to Anpara TPS.

The amalgamation of the mines with increased targeted capacity of 10.00 Mtpa is, therefore, fully justified.

GENERAL MANAGER

क्षेत्रीय निदेशक
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Table No.2.1

Demand Projection on NCL
(Consumer-wise Coal Demand as per LT/CEA Projection)

(Fig. in Mt.)

Sl No	Name of Power House	Capacity (MW)	LT/CEA Qty (Mtpa)	XI Plan		XII Plan				
				2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
1	SSTPS	2000	11.00	12.100	12.100	12.100	12.100	12.100	12.100	12.100
2	VSTPS	3260	17.200	18.920	18.920	18.920	18.920	18.920	18.920	18.920
3	RhSTPS	2000	10.500	11.550	11.550	11.550	11.550	11.550	11.550	11.550
	Badarpur TPS (Addl. From NCL)			1.500	1.500	1.500	1.500	1.500	1.500	1.500
	Sub-Total NTPC		**38.700**	**44.070**	**44.070**	**44.070**	**44.070**	**44.070**	**44.070**	**44.070**
4	OTPS	1282	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000
5	ATPS	1630	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
6	Paricha	540	1.141	1.141	1.141	1.141	1.141	1.141	1.141	1.141
	Sub-Total UPRVUNL		**14.641**	**14.641**	**14.641**	**14.641**	**14.641**	**14.641**	**14.641**	**14.641**
7	**Rajghat TPS**	**135**	**0.800**	**0.940**	**0.940**	**0.940**	**0.940**	**0.940**	**0.940**	**0.940**
8	Kota TPS	1045	1.650	1.740	1.740	1.740	1.740	1.740	1.740	1.740
9	Suratgarh TPS	1250	2.000	2.110	2.110	2.110	2.110	2.110	2.110	2.110
	Sub-Total RRVUNL		**3.650**	**3.850**	**3.850**	**3.850**	**3.850**	**3.850**	**3.850**	**3.850**
10	TDL TPS	1360	1.600	1.880	1.880	1.880	1.880	1.880	1.880	1.880
	Total Power Utility - Existing		**59.391**	**65.381**	**65.381**	**65.381**	**65.381**	**65.381**	**65.381**	**65.381**
	PU/IPP through LoA route									
11	Lanco Anpara TPS	1200	4.150	2.091	4.182	4.182	4.182	4.182	4.182	4.182
12	Anpara D	1000	3.370		1.680	3.370	3.370	3.370	3.370	3.370
13	Prayagraj Power(Bara)	1980	7.020			3.510	7.020	7.020	7.020	7.020
14	Sangam Power(Karchana)	1320	4.680			2.340	4.680	4.680	4.680	4.680
15	VSTPS(Stage-IV)	1000	3.190				1.600	3.190	3.190	3.190
16	Obra Extn(Phase-II)	500	1.770			0.885	1.770	1.770	1.770	1.770
17	RhSTPS (Stage-III)	1000	3.370		1.680	3.370	3.370	3.370	3.370	3.370
18	DB Power Ltd., Deosar	1320	2.100				1.050	2.100	2.100	2.100
19	VSTPS(Stage-V)	500	1.770						1.770	1.770
20	SSTPS (Stage-II)	500	1.770						1.770	1.770
	Sub-Total		**33.220**	**2.091**	**7.542**	**17.652**	**27.042**	**29.682**	**33.222**	**33.222**
	Total Power		**92.611**	**67.472**	**72.923**	**83.043**	**92.423**	**95.063**	**98.603**	**98.603**
	Power Captive - Existing									
21	HIL (RPD) 1-8 Units		2.700	2.700	2.500	2.500	2.500	2.500	2.500	2.500
22	HIL Co-Gen		0.236	0.236	0.236	0.236	0.236	0.236	0.236	0.236
23	Kanoria Chemicals(St-I & II)		0.252	0.252	0.252	0.252	0.252	0.252	0.252	0.252
24	HIL (9th & 10th) Units		1.250	0.710 +	0.710	0.710	0.710	0.710	0.710	0.710
25	HIL Co-Gen Expn	40	0.194	0.180	0.180	0.180	0.180	0.180	0.180	0.180
	Total CPP - Existing		**4.632**	**4.078**	**3.878**	**3.878**	**3.878**	**3.878**	**3.878**	**3.878**
	New CPP through LoA route									
26	JP Associates(Dalla Cement)		0.1220	0.1220	0.1220	0.1220	0.1220	0.1220	0.1220	0.1220
27	JP Associates(Churar Cement)		0.1640	0.1640	0.1640	0.1640	0.1640	0.1640	0.1640	0.1640
28	JP Associates(Sidhi)		0.1510	0.1510	0.1510	0.1510	0.1510	0.1510	0.1510	0.1510
	Sub-Total		**0.4370**	**0.4370**	**0.4370**	**0.4370**	**0.4370**	**0.4370**	**0.4370**	**0.4370**
	New Sponge Iron Units - LoA route									
29	Shri Baba Vishwanath Pvt Ltd. VNS		0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
30	Shri Baba Vishwanath Pvt Ltd. VNS		0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
31	Trimula Industries Ltd. Sidhi		0.126	0.126	0.126	0.126	0.126	0.126	0.126	0.126
32	Shri Shanti Gopal Concast Mirzapur		0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072
	Sub-Total		**0.216**	**0.216**	**0.216**	**0.216**	**0.216**	**0.216**	**0.216**	**0.216**
	Aluminium Priority									
33	HIL Aluminium		0.252	0.252	0.252	0.252	0.252	0.252	0.252	0.252
34	Linked Insumes		0.433	0.433	0.433	0.433	0.433	0.433	0.433	0.433
	Sub-Total		0.685	0.685	0.685	0.685	0.685	0.685	0.685	0.685
	Total Allocation		58.68	72.89	78.14	88.26	97.64	100.28	103.82	103.82

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. बी.सी.एल.
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Table No. 2.2

AVAILABILITY OF COAL FROM NCL

(Figs in Mt)

SL NO	NAME OF MINE / PROJECTS	TYPE OF MINE (UG/OC)	TYPE OF COAL	SANC. CAP.(Mt y)	PROJ. XI PLAN		PROJ. XII PLAN				
					2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
A	EXISTING / COMPLETED PROJECTS										
1	Jhingurdah	OC		3.00	1.60	0.50					
2	Jayant	OC	Non Coking	10.00	13.60	12.00	12.00	12.00	0.00	0.00	0.00
3	Kakri	OC		3.00	4.00	3.00	3.00	3.00	3.00	2.50	0.00
5	Khadia	OC		4.00	4.00	4.00	4.00	0.00	0.00	0.00	0.00
	SUB-TOTAL			20.00	23.20	19.50	19.00	15.00	3.00	2.50	0.00
B	ON GOING PROJECTS										
1	Krishnashila	OC		4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
2	Bina Extn.	OC		6.00	6.00	6.00	6.00	6.00	6.00	6.00	7.00
3	Amlohri Expn.	OC		10.00	6.50	8.00	9.00	10.00	10.00	10.00	10.00
4	Nigahi Expn.	OC	Non Coking	15.00	14.00	15.00	15.00	15.00	15.00	15.00	15.00
5	Block-B	OC		3.50	4.00	4.00	4.00	4.00	4.00	4.00	4.30
6	Dudhichua Expn.	OC		15.00	10.00	12.00	12.00	12.00	13.50	14.00	15.50
	SUB-TOTAL			53.50	44.50	49.00	50.00	51.00	52.50	53.00	55.80
C	FUTURE / NEW PROJECTS										
C1	IDENTIFIED - UNDER APPROVAL / FORMULATION										
1	Jayant Expn.	OC		5.00	0.00	0.00	0.00	0.00	13.00	14.50	15.50
3	Khadia Expn.	OC		6.00		0.00	0.00	5.00	5.50	7.00	9.00
4	Jhingurdah Bottom Seam	OC	Non Coking	2.00			0.00	0.00	0.00	0.00	0.00
5	Semaria	OC		1.50					0.00	0.00	0.20
	SUB-TOTAL			14.50	0.00	0.00	0.00	5.00	18.50	21.50	24.70
C2	YET TO BE TAKEN-UP FOR SUSTAINING PRODUCTION										
1	Kakri North	OC		4.00					0.00	0.00	0.00
2	Block-B Extn.	OC		3.50					0.00	0.00	0.00
	SUB-TOTAL			7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	GRAND TOTAL			95.50	67.70	68.50	69.00	71.00	74.00	77.00	80.50

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6,
सिंगरौली

Table No. 2.3

DEMAND VIS-À-VIS AVAILABILITY ON NCL

(Figs in Mt)

Sl. No.	Details	PROJ. XI Plan		PROJ. XII Plan				
		2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
1	Production	67.70	68.50	69.00	71.00	74.00	77.00	80.50
2	Total Demand	72.89	78.14	88.25	97.64	100.28	103.82	103.82
3	Surplus/ Deficit	-5.19	-9.64	-19.25	-26.64	-26.28	-26.82	-23.32

GENERAL MANAGER
BINA PROJECT

CHAPTER-III

PROJECT SITE INFORMATION

3.1 LOCATION

The Bina-Kakri Amalgamation Project, consisting of mainly Chandela Block, some part of Tipa-Jharia, Marrak and Ruhela Bock is located in the North-eastern part of Moher Sub-basin of Singrauli Coalfield. The area is covered under Topo-sheet No. 631/12 and L/16 of the Survey of India on 1:50000 (1976). The State Boundary between Madhya Pradesh (Singrauli district) and Uttar Pradesh (Sonebhadra district) passes through the proposed mining block.

3.2 COMMUNICATION

The Singrauli and Krishnashila railway station on Singrauli-Obra and Shaktinagar-Karaila rail links of East-Central Railway are located at a distance of 11 Km North-west and 3 Km east of Bina-Kakri amalgamation Project. The project is connected with all weather metalled road to Shaktinagar and Renukut. The project is also approachable from the area headquarters at Singrauli by a fair-weather road. The nearest air-strip is at Myorpur, located at a distance of about 80 Km from Singrauli. A helipad exists at Shaktinagar which is about 12 Km from the project.

3.3 PHYSIOGRAPHY

The Bina-Kakri Amalgamation Project is situated on the eastern fringe of Moher plateau. The plateau top is more or less flat with a gentle slope towards west and south and a steep escarpment in the east. The escarpment in the east roughly corresponds to incrop position of the top most workable coal horizon. The general elevation of the area above mean sea level varies from 300m along the escarpment to over 400m on plateau.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

3.4 DRAINAGE

The coalfield is located in the drainage area of Son-Rihand river system. The prominent drainage channels of the area are the north flowing Bijul nala, a tributary of Son River and the south flowing Kachni nala, a tributary of Rihand River. Other water drainages are Ballia nala, Mehrauli nala,Turra nala, Pararwar and Bandha nalla.

Recently a drainage trench has been made in the dip side of existing Bina-Kakri Amalgamation Project along the eastern escarpment by Tipa-Jharia Nalla which discharges into GBP Sagar.

3.5 CLIMATE

The climate of the area is tropical with three typical seasons i.e. winter, summer and rainy. The temperature in summer rises as high as 48° C in May-June and minimum summer temperature is 21° C. In winter (Nov-Feb.), the minimum temperature is around 4° C.

The rainy season is generally from July to Sept. with average annual rainfall around 1000mm. The maximum rainfall in 24 hrs is recorded as 225mm on 20.08.1975 at Jhingurdah Rain gauge Station. The Jhingurdah rain gauge station is situated at a distance of 5 Km from the project. The rainfall data measured at Jhingurdah rain gauge station is given in Table No.3.1.

3.6 PRESENT LAND USE PATTERN

The total land requirement for Bina-Kakri Amalgamation Project has been considered as 2348 Ha which includes 1757 Ha of forest land and 591 Ha of non-forest land.

This land requirement broadly includes provision of mining area, external dumping, infrastructural facilities colony etc.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6.
सिंगरौली

The detail of the land is given in the table below:

Table No.3.2

Type of Land	Total requirement (Ha)	Possessed as on 31.3.05(Ha)	Balance to be acquired (Ha)
Forest Land			
UP Side	1004	920	84
MP Side	753	100	653
	1757	1020	737
Non-Forest Land			
UP Side			
Tenancy Land	546	546	
Govt Land			
	546	546	
MP Side			
Tenancy Land	17	17	
Govt Land	28	28	
	45	45	
	2348	1611	737

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

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Table No. 3.1

PR FOR KHADIA OPENCAST PROJECT EXPANSION (10.0 Mtpa)

MONTHLY & ANNAUL RAINFALL DATA OF JHINGURDAH RAINGAUGE STATION (IN MM)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
1972	11.20	38.00		1.60		41.40	100.30		313.20	136.80	62.90	38.90	744.30
No. of Days	1	5		1		3	8	0	9	15	6	2	50
1973	1.40	32.30			14.60	25.50	131.90	190.90	265.60	98.30			760.90
No. of Days	2	4			1	4	13	11	18	7			60
1974	2.40	7.50		11.00	13.10	25.00	320.80	236.00	238.10	22.40	3.70	5.60	885.60
No. of Days	1	1		2	2	4	20	14	4	2	1	1	52
1975	21.30		17.60			107.10	400.00	739.20	137.30	118.30			1540.80
No. of Days	0		5			9	18	23	13	9			85
1976	9.00	17.10	6.80	31.10		64.00	369.60	421.80	319.90	0.00			1239.30
No. of Days	1	1	1	4		4	21	21	11				64
1977	7.20	5.50		27.20	8.20	417.00	573.40	282.00	443.60	61.10	23.00		1848.20
No. of Days	2	1		3	3	12	23	14	15	3	4		80
1978	20.10	130.50	63.20			299.10	455.90	336.00	765.50	36.00	14.00	12.70	2193.10
No. of Days	1	7	4			10	21	23	16	2	1	1	85
1979	47.00	88.40	1.50	4.60		96.60	171.00	227.00	46.60		26.80		711.90
No. of Days	6	4	1	2		5	16	12	8		3		56
1980	1.60	10.40	24.40		2.20	568.60	323.40	417.80	233.70			19.00	1601.10
No. of Days	1	2	3		1	12	23	20	13			2	85
1981	25.40		27.10	57.60	6.40	180.60	321.00	178.50	145.90		2.30		944.80
No. of Days	1		2	2	1	4	22	14	9		1		56
1982	69.30	14.20	55.40			90.20	236.50	456.50	43.20		4.60	21.80	991.70
No. of Days	3	2	4			4	16	28	10		2	1	70
1983	1.50				49.90	66.80	268.30	203.00	324.60	46.20			960.30
No. of Days	1				2	2	19	15	20	3			62
1984	50.10	81.20			16.70	156.20	324.60	533.30	119.00	27.50		18.30	1326.90
No. of Days	4	7			2	11	14	21	10	5		1	75
1985	89.50		9.80	4.00	3.20	101.20	331.50	490.10	238.20	33.30			1279.40
No. of Days	2		2	1	1	7	21	16	13	3			66
1986		87.50	31.10	15.50	2.80	138.70	148.90	277.10	68.50	41.70		74.20	866.00
No. of Days		5	1	1	2	10	14	16	7	2		4	61
1987	14.40		25.40			10.80	311.90	456.80	550.80	97.00			1467.10
No. of Days	2		1			3	10	10	15	4			45
1988		27.70	4.80	4.00		376.00	493.00	117.00	85.00	28.00			1135.50
No. of Days		3	1	1		10	10	13	4	1			42
1989			31.00			291.00	338.40	242.10	176.90		33.80	8.60	1122.00
No. of Days			8			15	16	12	10		1	2	64
1990		64.90	29.40		51.20	227.00	260.60	173.00	207.70	5.20			1023.00
No. of Days		3	1		3	18	18	18	15	1			77
1991	11.00	31.00	52.50		26.00	141.90	141.00	666.00	250.00	17.00			1344.00
No. of Days	2	2	4		2	5	7	22	15	3			62
1992						25.70	270.40	573.40	91.50	59.60			1021.50
No. of Days						4	17	19	10	3			53
1993					3.20	217.10	297.80	297.10	394.30				1109.50
No. of Days					1	19	18	19	12				59
1994				6.80	12.60	936.80	220.40	340.60	220.30				1107.50
No. of Days				1	1	21	16	24	15				78
1995													

CHAPTER-IV

GEOLOGY

4.0 INTRODUCTION

The Singrauli Coalfield, the northern extremity of Son-Mahanadi Master Gondwana Basin, is located between latitudes 23°47' N and 24°12' N and longitudes 81°48' and 82°52' cutting across state boundaries of Madhya Pradesh and Uttar Pradesh and covering an area of about 2202 sq. km. The coalfield is largely located in the Singrauli district of Madhya Pradesh; a small area of 80 sq. km in the extreme north-east also lies in the Sonebhadra district of Uttar Pradesh.

4.1 Regional Geology

The Singrauli coal field is the northern extremity of Son-Mahanadi Master Gondwana Basin. It lies at the junction of E-W trending Damodar-Koel-Tatapani graben and NW-SE trending rift zone of the Son-Mahanadi valley. Therefore the basin shows characteristics of both the above said regions.

The northern limit of the coal field is defined by a prominent E-W trending boundary fault, probably the offshoot of Son-Narmada lineament. Its southern boundary is marked along 23°47'N latitude.

The coal field composed of two distinct tectono-sedimentary domains separated by NW-SE trending basement high, located roughly along Kachni River having longitude of 82°32'.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6.
सिंगरौली

The western domain spread over an area of 1890 Sq. Km known as **Main Basin**, is yet to be explored in detail for its western and south-western part. The eastern and presently coal producing domain is named **Moher-Sub-basin** (because of its structure)covers an area of 312 Sq. Km shows spectacular development of thick coal seams including more than 130 m thick Jhingurdah coal seam.

The coal field exhibits development of six series of rock formations comprising various lithofacies of Gondowana Sediments , namely, Talchir, Barakar, Barren-Measure, Raniganj, Panchet, Mahadeva and Intrusives.

A. Generalized stratigraphic sequence of rocks, Singrauli coal field

Age	Group	Formation	Lithology
Cretaceous		Intrusives	Dolerite dykes and sills
Upper Triassic	Upper Gondowana	Mahadeva	Coarse grained ferruginous sandstone with bands of shale, clay and conglomerate
Lower Triassic	Lower Gondowana	Panchet(?) (Nidpur bed)	White, greenish white and pink micaceous,medium to coarse grained sandstone with red beds, greenish brown silty shales and conglomerates.
Upper Permian	Lower Gondowana	Raniganj	Fine grained sandstones and shales with coal seams including 134 m Jhingurdah seams.
Middle Permian	Lower Gondowana	Barren measures	Very coarse grained to coarse grained ferruginous sandstone, green shales and clay.
Lower Permian	Lower Gondowana	Barakars	Medium grained to coarse grained ferruginous sandstone, shales and clay
Upper carboniferous	Lower Gondowana	Talchir	Tillite, sandstone, siltstones, needle shales.
---------- Unconformity ----------			
Pre-cambrian		-	Phyllites, quartzites, schists and gneisses

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

4.1.1 **Moher Sub-basin**- The Moher sub-basin shows a broad basinal structure truncated against the east-west trending boundary fault in the north. The bed exhibits a gentle up-warp in the central part of its southern stretch of occurrence. In conformity to above the beds have a general NW-SE trend in the western part which gently veers to nearly east-west along Amlohri-Nigahi blocks. The stretch between Nigahi and Dudhichua exhibits a gentle anticlinal flexure. To the east of Dudhichua, strike shows a gradual variation from NW-SE to NE-SW.

The strike further swerves in the eastern part of Khadia and assumes a N-S trend in Bina and Kakri blocks. The beds have a corresponding centripetal dip. The amount of dip in general is about 2 to 3 degree. However, high dips of about 8-10° have been observed in Kakri and in area further north of it.

The proposed mining blocks located in the eastern part of Moher Sub-basin, is covered by rocks of upper Barakar with a thin cover of soil and alluvium at places. The Barakar sequence mainly consists of medium to coarse grained. Light grey, open textured felsphatic sandstone, shale, clay and coal seams.

4.1.2 **Different Geological Reports Prepared for the area under reference:**

Present Geological description is based on following reports:

i) Geological Report on North and Central Part U.P. Block, Singrauli Coal Field, CMPDIL, December, 1973.
ii) Geological Report on Chandela Block, CMPDIL, January,1999.
iii) GeologicaLReport on Marrak Block, CMPDIL, November, 1999.
iv) Monthly reports, unpublished borehole data drilled in Ruhela Block and Tipa-Jharia Block.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6,
सिंगरौली

4.1.3 **Boundaries of proposed area:**

Proposed project boundary covers an area of 12.55 sq km.

The areas which are being considered for present Project Report is an amalgamation of following Geological Blocks.

Name of the block	Area within concerned Project boundary
i) Almost the whole of Chandela Block	5.35 sq. km
ii) The eastern part of Ruhela Block	1.19 sq. km
iii) The south –eastern part the Tipa-Jharia Block	1.44 sq. km
iv) North eastern part of Marrak Block.	0.32 sq. km
v) Area falling in erstwhile North and central Part of U.P. Block (mostly existing BINA and small area in Kakri Project.)	4.24 sq. km

The Ruhela Block is under exploration and the Tipa-Jharia Block has been identified as future exploration block. Hence, the spatial disposition and chemical characteristics of the coal seams for the part of area, falling in these blocks are mostly extrapolated from Chandela Block data.

4.1.4 **Miscellaneous**

Present exercise is a preparation of project report which will amalgamate existing BINA PROJECT and KAKRI PROJECT.

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. के.सं.-6.
सिंगरौली

GENERAL MANAGER
BINA PROJECT

4.2 STATUS OF EXPLORATION

The exploration activities in the present area (the amalgamation project) is summarized below in chronological order:

i) The exploration started with the notification by NCDC, for an area of about 54.00 sq. km in U.P. vide act no S.O. 997 dated 29.03.1962.
ii) IBM drilled 22 Bore holes in a part.
iii) In December 1969 GSI conducted regional drilling which was intensified after finding of mineable coal within 1:3 coals: OB ratio. Consequently GSI drilled 37 boreholes in process.
iv) NCDC prepared a Geological Report in April 1972 on the basis of these bore holes.
v) NCDC took up detailed drilling in June 1972.
vi) The area was notified under S.O. 812 dated 7.3.1973 for acquisition of land for mining.
vii) NCDC drilled 147 bore holes in and around the area.
viii) CMPDI drilled bore holes as a part of exploration of CHANDELLA EXPLORATION during the period 1996-98. Total borehole drilled in this phase was 42.
ix) Geological Report submitted in January 1999.
x) CMPDI drilled bore holes as a part of exploration of MARRAK BLOCK EXPLORATION. Some bore holes fall within the project boundary. Geological Report submitted in December 1999.
xi) CMPDI drilled bore holes as a part of exploration of RUHELA BLOCK EXPLORATION. Some bore holes fall within the project boundary. Geological Report to be submitted in 2012 February.

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6.
सिंगरौली

GENERAL MANAGER
BINA PROJECT

4.2.1 Details of boreholes

Table below shows the details of bore holes drilled in the area concerned (Project Boundary).

	GSI	NCDC	CMPDIL	TOTAL
No. of bore hole	13	19	37	68
Meterage	2429.63	2026.98	8355	12811.61

4.2.2 Density of Boreholes

Density of bore hole in the effective area of 8.30 sq. km (excluding old Bina Mine and Kakri Project worked out area) is around 6 (six) only. However, barring northern portion of the concerned area, overseeing the simplicity of structure if seems that borehole density is sufficient.

4.2.3 Analysis Details

No of bore holes analyzed for different parameters in the project area

PARTICULARS	PUREWA TOP	PUREWA BOTTOM	TURRA
Band by band	35	36	32
Overall	32	28	27
Gross Calorific value	16	17	10
Ultimate analysis	14	12	10
Ash fusion temp	5	6	4
Ash analysis	7	8	6
HGI	5	8	5

4.3 GEOLOGY OF THE PRESENT AREA

The area is located in the eastern part of Moher Sub-basin and covered entirely by rocks of Upper Barakar Formation with a thin cover of soil and alluvium. The barakar sequence is mainly composed of coarse grained, light grey feldspathic sandstone, shale clay and coal seams.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

The cementing material is usually kaolinised feldspar. As usual the in the out crop the sandstone is ferruginous. Between sandstones thick clay bands are also very common. The shale occurs both in between two sandstones and also inter-banded with coal.

A. Generalized stratigraphy of the area concerned is as follows:

Lithology	Thickness range
Soil/sand	0—2 m
Sandstone with clay bands, few impersistent carbonaceous bands	20—155 m
COAL: PUREWA TOP SEAM	3.5- 11 m
Sandstone and shale	36—48 m
COAL: PUREWA BOTTOM SEAM	7—13 m
Sandstone with carbonaceous shale	40—57 m
COAL: TURRA SEAM	12—23 m
Sandstone with minor shale .	+ 35 m

4.4 GEOLOGICAL STRUCTURE

Structural interpretation the area is completely based on the information gathered through drilling of bore holes. The altitude of the strata varies from ENE-WSW in south to NE-SW in the eastern part, with a general dip of 2-3^0 North-westerly. The area is devoid of any fault and intrusive.

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BINA PROJECT

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सिंगरौली

4.5 DESCRIPTION OF COAL SEAM

Presence of four coal seams has been deciphered in the present area. The seams from bottom to top are Kota, Turra, Purewa Bottom & Purewa Top. The bottom most Kota Seam is impersistent in both physical and chemical characteristics. Therefore, the seam is not considered for present exercise.

The seams overlying Kota seam after a parting of 70-75 m namely Turra, Purewa Bottom and Purewa Top were explored in detail and their various characteristics are furnished below:

4.5.1.1 Depth of occurrence, Thickness, Parting with seam below and above of the Seams:

SEAM	DEPTH OF FLOOR	THICKNESS	PARTING
Purewa Top	Incrop – 150m	3.75—8.00m (3.6—6.75m)	35—50m
Purewa Bottom	60-180m	9.00—13.00m (6—12.5m)	42—55m
Turra	100-210m	12.00-22.00m (8—18 m)	

(Figures in bracket show effective thickness)

4.5.2 **Dirt Bands**

Seam	Dirt Bands					
	<1m thickness				>1m thickness	
	Combustible		Non-combustible			
	No.	Thickness (m)	No.	Thickness (m)	No.	Thickness (m)
Purewa Top	0-3	0.15-0.37	0-2	0.15-0.82	0-1	1.10-3.22
Purewa Bottom	0-3	0.15—1.00	0-4	0.3-1.60	0-2	1.00-3.55
Turra	0-5	0.1—1.95	0--3	0.1—0.98	1-3	1.45-7.8

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सिंगरौली

4.5.3 Coal Quality

4.5.3.1 Overall Analysis of Seams

Analysis	Turra seam			Purewa bottom			Purewa top		
	Ex band	Excl. band >=1m	Inclu-ding all bands	Ex band	Excl. band >=1m	Include-ing all bands	Ex band	Excl. band >=1 m	Inclu-ding all bands
M%	6.0-8.5	6.3-7.9	5.8-7.3	6.5-10.4	6.0-9.8	5.6-7.5	7.2-11.5	7.1-10.5	5.2-9.4
Ash%	20.9-31.3	28.4-35.2	33.8-45.0	18.4-26.8	27.3-45.2	35.1-40.2	22.8-29.8	25.0-32.4	38.0-49.9
VM%	23.5-27.9	23.6-26.5	21.9-253.1	26.1-31.8	21.8-29.1	23.0-26.2	26.7-29.5	26.7-26.8	21.4-24.0
CV (K.Cal/Kg)	4940-5325	4424-4964	3998-4238	4605-5446	3700-5250	3814-4151	4460-4730	4235-4620	----
UHV (K.Cal/Kg)	3755-4815	3380-4055	2030-3435	3890-4925	3490-4825	2015-3020	3740-4690	3435-3930	1300-2655
GRADE	D-E	E	F-G	D-E	D-G	F-G	D-E	E	F-G

4.5.3.2 Ultimate Analysis

Components	Turra	Purewa Bottom	Purewa Top
C%	48.4-55.5	49.7-55.9	49.7-55.9
H%	3.0-3.2	2.9-3.6	2.9-3.6
N%	1.0-1.1	0.9-1.1	0.9-1.1
S%	0.3-0.5	0.3-0.5	0.3-0.5
O%	7.4-8.0	7.9-9.1	7.9-9.1
CO_2	0.1-0.8	0.1-0.5	0.1-0.5

4.5.3.3 Pure Coal Characteristics

On unit coal basis the seams in this area shows following variations in their character.

Components	Turra	Purewa Bottom	Purewa Top
V.M.%	34.7-39.5	38.2-44.6	38.8-43.5
CV K.Cal/Kg	7590-7920	7550-7925	7195-7460
C%	80.0-82.8	78.7-82.4	79.1-81.8
H%	4.7-5.4	4.7-5.3	4.6-5.2
N%	1.6-1.8	1.4-1.7	1.4-1.7
S%	0.4-0.6	0.4-0.6	0.4-0.8
O%	10.3-13.0	10.3-14.1	11.0-17.0

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BINA PROJECT

क्षेत्रीय निदेशक
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सिंगरौली

4.5.3.4 Total Sulfur

Total sulfur on unit coal basis in Turra and Purewa Bottom Seam varies between 0.4 to 0.6% where as that in Purewa Top varies between 0.4 to 0.8%.

4.5.3.5 Ash Fusion Characteristics

Ash fusion temperature °C	Turra		Purewa Bottom		Purewa Top	
	Ex band	Excl. >=1m band	Ex band	Excl. >=1m band	Ex band	Excl. >=1m band
Softening Temp °C	1340-1450	1375-1446	1360-1398	1370-1400	1298-1380	1299-1400
Hemispherical Temp°C	1396-1450	1400-1450	1399-1400	1400 - >1400	1352-1427	1366-1450

4.5.3.6 HGI

Analysis nature	Turra	Purewa Bottom	Purewa Top
Ex band	52-60	47-52	56-59
Excl. >=1m band	54-63	55-67	59-64

4.5.3.7 Physico-mechanical Properties

Rocks of Bore hole number CMCH -37 falling in Bina Extension Block has been analyzed for physic-mechanical properties of different rock types. The result tabulated below:

Rock type	Density (T/m^3)	Compressive strength (Kg/cm^2)	Tensile strength (Kg/cm^2)	Shear Strength (Kg/cm^2)
Very coarse Grained Sandstone	2.035-2.368	44.24-132.20	13.63-21.40	12.84-13.27
coarse Grained Sandstone	2.078-2.296	28.86-253.25	7.02-34.94	13.31-35.19
Medium Grained Sandstone	2.033-2.267	24.79-166.19	7.02-34.94	8.81-35.46
Fine Grained Sandstone	2.050-2.582	61.21-337.78	9.39-41.31	16.11-32.97
Shale	1.625-2.324	114.88-279.12	24.46-46.28	24.31
Carb. Shale	1.473-1.996	404.05	43.94-59.19	15.03
Coal/Shaly Coal	1.150-1.455	318.05	34.86-36.36	12.54-25.64

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BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6.
सिंगरौली

Angle **of Internal Friction** and **Cohesion** for Overburden Rocks vary from 6^0 to 46.5^0 and 12-37 kg/cm^2 respectively. Whereas those of coal/shaly coal varies between 18-33^0 and 50-80 kg/cm^2 respectively.

4.6 RESERVES

Net reserve available in the area concerned from the three seams together is as given below:

Chandela Block	-	235.24 Mt
Ruhela block	-	44.88 Mt
Marrak Block	-	13.25 Mt
Tipa-Jharia Block	-	75.15 Mt
TOTAL	-	368.51 Mt

Reserve shown against Tipa-Jharia block and Ruhela block are tentative as exploration in these blocks is yet to be completed.

4.7 RECOMMENDATIONS

Five to Six bore holes should be drilled in the Tipa-Jharia part of the Project for assessment of physical characteristics, exact deciphering of spatial disposition and quality of coal seams more precisely. This will involve approximately 1500 m of drilling meterage.

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सिंगरौली

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BINA PROJECT

CHAPTER-V

MINE BOUNDARY, RESERVES AND MINE LIFE

5.1 INTRODUCTION

The present Bina Extension Project (6.00 Mtpa) and Kakri Project (3.00 Mtpa) are working in the Southern and northern part of Chandela block respectively which is located in the north eastern part of Moher Sub-Basin of Singrauli Coalfield.

The proposed Bina-Kakri amalgamation project comprises mainly Chandela block, a part of Tipa-Jharia block in dip side and in south side a small part of Ruhela and Marrak block.

The area is situated on the eastern fringe of Moher plateau. The plateau top is more or less flat with gentle slope towards west and south and steep escarpment in the east. The altitude varies from300m, at the base of escarpment, to over 400m on the plateau. The project area falls mainly in Singrauli district of MP and in Sonebhadra district of UP.

Three coal seams viz. Purewa Top, Purewa Bottom & Turra seams in descending order are proposed to be mined. The average effective thickness, of the seams excluding bands of more than one meter in thickness, is 5.42m for Purewa top, 8.27m for Purewa Bottom and 15.42m for Turra seam.

Coal seams have a general dip of about 2^0 towards north and north-west. A gradual steepening of dip to about $8\text{-}10^0$ is observed in the north-eastern part of the area.

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5.2 PIT FORMULATION STRATEGY

The proposed pit has been formulated based on following considerations:

i) The central entry of existing Bina Extension Mine along the floor of Turra seam will continue to exist as central entry of proposed mine.

ii) In the north-eastern part of existing Kakri mine the seam gradient has increased to $8\text{-}10^0$. This part of the mine is not suitable for dragline mining. As such the flatter suitable for dragline mining has been considered for amalgamation with adjacent Bina Extension Mine.

iii) The length of flank on either side of central entry has been considered in deciding the extent in south side in Ruhela block and also towards the north side in Kakri Mine.

iv) In the dip side the extent of pit has been considered based upon alignment of dragline cut and a cut-off ratio of 1:8 of coal to OB which correspond to a maximum depth of 295m and would provide sufficient reserve for project life of 25 years with the increased target capacity.

v) Further a safe distance from Tipa-Jharia dam in north-west part has also been considered in limiting the extent of proposed pit.

vi) The dip side area (Tipa-Jharia block) has not yet been explored in detail.

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5.3 MINE BOUNDARIES

The mine boundaries of the proposed mining block have been fixed as follows:

i) **Eastern Boundary**: The eastern boundary i.e. the rise side has been fixed considering the working limit of the Bina Opencast Mine (4.50Mtpa);

ii) **Western Boundary**: The western boundary has been fixed considering the alignment of cut, drainage of water towards central sump and sufficient reserve for project life of 25 years.

iii) **Northern Boundary**: The northern boundary has been fixed considering the alignment of dragline cut, length of flank and suitable gradient of the seam;

iv) **Southern Boundary**: The southern boundary has been fixed considering alignment of dragline cut, length of flank about 100m inside Ruhela block.

A part of Tipa-Jharia block has been considered in proposed block. This block lies mainly in the western side. A small part of remaining Chandela block also forms the north-western corner. Ruhela block lies in the south side. The block-wise distribution of the proposed mining block has been given vide Plate No. MIN-18.

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5.4 MINEABLE RESERVES

As the seams are free from faults or any other major geological disturbances, total geological loss of only 5% has been considered. This loss leads to a net geological reserve of 368.51 Mt of coal in the proposed mining block. In computation of mineable reserves, further losses due to mining operations have been considered which are given as under:

i) At the surface of contact of coal seam with rock body;
ii) Due to left out coal in every dragline cut;
iii) Due to blasting, loading and transportation of coal.

Altogether a total of 5% further loss has been taken into account of above mining losses from the net geological reserves to arrive at the mineable reserves.

A total of 114.36 Mt (approx.) of net geological reserve has been blocked in the batter due to high depth of the mine which shall be subsequently mined while further development of the mine in the dip side and also barrier mining when planned with Krishnashila mine in the south side.

The seam-wise break-up of coal reserves considered in the PR of Bina-Kakri Amalgamation project is given in the table below:

Table No. 5.1

Name of seam	Area considered (Ha)	Thickness variation (m)	Geological Reserve (Mt)	Mineable reserve (Mt)
Turra	862	12-18	195.09	121.40
Purewa Bottom	789	6-12	115.52	79.33
Purewa Top	715	4-7	57.90	40.72
Total	2366		368.51	241.45

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BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. के.स.–6.
सिंगरौली

The break-up of coal reserves mine-wise and block-wise is given in the table below:

Table No. 5.2

Name of block	Name of mine	Geological Reserve (Mt)	Mineable reserve (My)
Chandela	Bina Extn. OCP	114.33	110.88
	Kakri OCP	12.27	5.96
	Boundary between Bina Extn.& Kakri OCP	15.99	11.52
	Part of remaining Chandela	92.64	55.63
Ruhela(part)		44.88	15.55
Tipa-Jharia (part)		75.15	39.63
Marrak(part)		13.25	2.26
Total		368.51	241.45

The seam-wise reserve, specific gravity, volume, of OB and average stripping ratio is given in the table below:

Table No.5.3

Name of seam	Specific Gravity (t/cum)	Volume of OB (Mm3)	Stripping Ratio (m3/t)
Turra	1.59	1395.38	5.78
Purewa Bottom	1.57		
Purewa Top	1.56		

Section-wise & sector-wise mineable reserves: The mine has been divided in two sections along strike viz. south section and north section. Further each section has been divided into five sectors. The mineable coal reserves, volume of overburden and in-seam bands have been calculated for each sector. Volume of overburden has been computed by both cross-section method and by iso-depth method. The part of Ruhela Block in the southern part and the part of Tipa-Jharia Block included in the dip side of the proposed mining block have not been explored in detail.

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BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6,
सिंगरौली

The coal seams for these parts of the area have been extrapolated from the Chandela Block data. The surface contours of the dip side area have been taken from the Toposheet of the area. The details have been given in the table below:

Table No.5.4

South Section

Particular	Seam	Sector-1	Sector-2	Sector-3	Sector-4	Sector-5	Total
Coal	Turra	9.71	11.09	11.43	11.49	20.89	64.61
	Purewa Bottom	6.65	7.12	7.98	9.23	15.41	46.59
	Purewa Top	3.30	4.57	3.98	4.28	6.35	22.48
	Total	19.66	22.78	23.39	25.00	42.65	133.68
OB	Between Turra & PB	27.98	26.05	26.66	29.26	57.52	167.47
	Between PB & PT	25.87	22.61	21.91	23.53	38.24	132.16
	Above PT seam	65.00	76.97	81.57	92.70	111.53	427.77
	Inseam band	2.86	3.42	3.39	3.55	6.01	19.23
	Total	121.71	129.05	133.53	149.04	213.29	746.63
SR		6.13	5.66	5.71	5.96	5.00	5.58

Table No.5.5

North Section

Particular	Seam	Sector-1	Sector-2	Sector-3	Sector-4	Sector-5	Total
Coal	Turra	5.13	12.10	10.10	11.45	18.01	56.79
	Purewa Bottom	4.15	7.04	6.04	6.92	8.59	32.74
	Purewa Top	2.77	3.38	3.92	4.21	3.96	18.24
	Total	12.05	22.52	20.06	22.58	30.56	107.77
OB	Between Turra & PB	9.81	23.04	21.15	29.58	77.44	128.02
	Between PB & PT	16.20	29.92	22.71	27.66	33.02	129.51
	Above PT Seam	38.28	65.77	78.61	100.32	93.05	376.04
	Inseam band	1.66	3.14	2.84	3.18	4.35	15.18
	Total	65.96	121.87	125.32	160.74	174.86	648.75
SR		5.47	5.41	6.24	7.12	5.72	6.02

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BINA PROJECT

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सिंगरौली

Table No.5.6

Total mine

Particular	Seam	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
Coal	Turra	14.84	23.19	21.53	22.94	38.90	121.40
	Purewa Bottom	11.00	14.16	14.02	16.15	24.00	79.33
	Purewa Top	6.07	7.95	7.9	8.49	10.31	40.72
	Total	31.91	45.30	43.45	47.58	73.21	241.45
OB	Between Turra & PB	37.79	49.09	47.81	58.84	101.97	295.49
	Between PB & PT	42.07	52.54	44.62	51.19	71.25	261.67
	Above PT seam	103.28	142.75	160.18	193.03	204.58	803.81
	Inseam band	4.52	6.56	6.23	6.73	10.36	34.41
	Total	187.67	250.93	258.85	309.78	388.15	1395.38
SR		5.88	5.54	5.96	6.51	5.30	5.78

5.5 The section-wise, sector-wise and seam-wise break-up of the grade of the above reserve is given in table No.5.7 below:

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BINA PROJECT

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सिंगरौली

Table No.5.7

PR for Bina-Kakri Amalgamation OCP (10 Mtpa)
Section-wise, Sector-wise, Seam-wise Grade of the Mineable Reserves

Grade	Sector-1			Sector-2			Sector-3			Sector-4			Sector-5			Total		
	Turra	PB	PT	Tura	PB	PT	Turra	PB	PT	Turra	PB	PT	Turra	PB	PT	Turra	PB	PT
SOUTH SECTION																		
D		5.08	3.30		0.71									0.02		0.00	5.82	3.30
E	9.71	0.92	0.01	7.39	4.70	2.92	9.41	0.55	1.04	11.49		0.83	20.88	2.49	0.78	58.89	8.66	5.59
F		0.85		3.70	1.71	1.66	2.02	7.21	2.94		7.17	3.45		12.47	5.54	5.73	29.41	13.59
G								0.22			2.07			0.41		0.00	2.70	0.00
Total	**9.71**	**6.86**	**3.31**	**11.10**	**7.12**	**4.58**	**11.43**	**7.99**	**3.98**	**11.49**	**9.24**	**4.29**	**0.88**	**15.39**	**6.32**	**64.61**	**46.59**	**22.48**
NORTH SECTION																		
D											0.48			1.42		0.00	1.90	0.00
E	5.14	3.55	2.78	12.11	6.79	3.38	10.10	5.37	3.30	11.45	5.12	3.30	16.50	5.51	3.53	55.30	26.35	16.29
F		0.60			0.26			0.62	0.92		1.10	0.92	1.49	1.63	0.11	1.49	4.20	1.95
G								0.05			0.23					0.00	0.28	0.00
Total	**5.14**	**4.15**	**2.78**	**12.11**	**7.05**	**3.38**	**10.10**	**6.05**	**4.22**	**11.45**	**6.92**	**4.22**	**17.99**	**8.57**	**3.65**	**56.79**	**32.74**	**18.24**
TOTAL MINE																		
D	0.00	5.08	3.30	0	0.71	0	0	0	0	0	0.48	0	0	1.44	0	0.00	7.72	3.30
E	14.85	4.48	2.79	19.50	11.49	6.30	19.51	5.93	4.35	22.95	5.12	4.13	37.38	8.00	4.32	114.19	35.01	21.88
F	0.00	1.45	0.00	3.70	1.97	1.56	2.02	7.83	3.86	0	8.27	4.37	1.49	14.10	5.65	7.21	33.61	15.54
G	0.00	0.00	0.00	0	0.00	0.00	0	0.26	0.00	0	2.30	0	0	0.41	0	0.00	2.99	0.00
Total	**14.85**	**11.01**	**6.08**	**23.20**	**14.17**	**7.96**	**21.53**	**14.03**	**8.20**	**22.95**	**16.16**	**8.51**	**38.87**	**23.95**	**9.97**	**121.40**	**79.33**	**40.72**

GENERAL MANAGER
BINA PROJECT

Jnb.No.810886

5.6 TARGET OUTPUT AND MINELIFE

5.6.1 TARGET OUTPUT

5.6.1.1 **Normative Production**: Considering the available mine able coal reserve within the proposed minefield, geo-mining characteristics of the deposit, deployment of HEMM, equipment life and overall the demand of coal on NCL the normative production target has been fixed at 10.00 Mt per year.

5.6.1.2 **Peak Production**: The Project is having variable geo-mining characteristics such as seam thickness, parting and overburden thickness etc. resulting into favorable conditions for enhancement of production during the course of mining. Such increase in production would be achieved by enhancing the utilization of existing machineries and equipments, working on Sundays and holidays and by augmenting capacity through outsourcing.

There is a spurt in demand of coal. In order to cope up with fluctuation in coal production of other mine of NCL, it is imperative that production from Bina-Kakri amalgamation project is increased as and when required.

The mine may achieve the peak production level of 12.50 Mtpa. Infrastructures cab cater 12.50 Mtpa production level and provisions for environment management has also been made considering the peak production.

5.6.2 **ZERO DATE**: Bina-Kakri amalgamation project is an amalgamation of existing Bina Extension Project with Kakri project, the zero date has been considered as Stage-II clearance of the PR by Competent Authority.

GENERAL MANAGER

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. के.सं.–6,
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5.6.3 **MINELIFE:** Considering the total mineable reserve of 241.45 Mt and rated capacity of 10.00Mtpa, the break-up of mine life is given in table as under:

Table No.5.8

Sl. No.	particulars	Project year	value
1	Mineable reserve(Mt)		241.45
2	Production build-up	1-3	3 years
3	Normative production	4-24	21 years
4	Tapering down period	25-26	2 years
5	Total	1-26	26 years

5.7 FUTURE EXPANSION POTENTIAL

After the detail exploration of Tipa-Jharia block and abandoning of Tipa-Jharia Dam, considering the economic viability of working at high stripping ratio, further expansion or extension of proposed mine may be considered.

5.8 FURTHER EXPLORATION

The Ruhela Block, a part of which has been included in the proposed mining block is under exploration. Though there has been some boreholes in the boundary area as such the geo-mining conditions are almost confirmed. The Tipa-Jharia Block which is in the dip side of Chandela Block has been identified as future exploration block. Hence, the spatial disposition and chemical characteristics of the coal seams for the part of the area are mostly extrapolated from the Chandela Block data.

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CHAPTER-VI

METHOD OF MINING

6.1 GENERAL

The irreplenishable deposits of fossil fuel require proper methodology for successful exploitation with minimum loss. However, the selection between underground and opencast methodology are based mainly on economic and geo-mining criteria i.e. extent of mineable area, grade of coal and depth of coal seam (i.e. incroping/outcropping or occurs at depth), their disposition, thickness range of seam, presence of geological disturbances, stripping ratio etc. The other criteria for selection of mining method of the proposed block are as follows:

i) The occurrence of moderately thick coal seams i.e. Turra Seam (12-18m) Purewa Top Seam (6-12m) and Purewa Bottom Seam (4-7m) leads to a stripping ratio of 5.78 m3/t in the entire quarry area;

ii) The average parting between Turra and Purewa Bottom seam varies from 44m-56m.This makes suitable condition for proper utilization of dragline;

iii) The proposed project is an amalgamation of existing Bina exten. OCP and kakri OCP.

The deposit is, therefore, proposed for mining by opencast method. The selection of technology, equipments and layout for this project are based on geo-mining conditions, assessed workload and site conditions.

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6.2 GEO-MINING CHARACTERISTICS

The salient geo-mining characteristics of chandela block which forms the major part of proposed mining block are given below:

Table No.6.1

Sl. No.	Description	Unit	Value
1	Thickness (total) of coal seam		
	Name	Unit	Value
	i) Purewa Top	m	4-8
	ii) Purewa Bottom	m	8-11
	iii) Turra	m	14-21
2	Thickness of bands (>1m)		
	Description	Nos.	Thickness (m)
	i) Purewa Top	0-1	1.10-3.22
	ii) Purewa Bottom	0-2	1.00-3.55
	iii) Turra	1-3	1.45-7.8
	Thickness of Partings		
	Name	Unit	Value
	i) Parting between Turra and Purewa Bottom	m	44-56
	ii) Parting between Purewa Bottom and Purewa Top	m	35-46
	iii) Above Purewa Top	m	35-158
4	Mine floor gradient	deg.	2-3
5	Volume weight of coal		
	Name	Unit	Value
	i) Purewa Top	t/m3	1.56
	ii) Purewa Bottom	t/m3	1.57
	iii) Turra	t/m3	1.59
6	Volume weight of OB	t/m3	2.35
7	Excavation category of coal	Cat.	Cat-III : 100%
	Excavation category of rock	Cat.	Cat-III : 90% Cat-IV : 10%
8	Mineable Coal Reserve	Mt.	241.45
9	Total volume of overburden	Mm3	1395.38
10	Stripping Ratio	M3/t	5.78

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CHAPTER-VI

METHOD OF MINING

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i) The occurrence of moderately thick coal seams i.e. Turra Seam (12-18m) Purewa Top Seam (6-12m) and Purewa Bottom Seam (4-7m) leads to a stripping ratio of 5.78 m3/t in the entire quarry area;

ii) The average parting between Turra and Purewa Bottom seam varies from 44m-56m.This makes suitable condition for proper utilization of dragline;

iii) The proposed project is an amalgamation of existing Bina exten. OCP and kakri OCP.

The deposit is, therefore, proposed for mining by opencast method. The selection of technology, equipments and layout for this project are based on geo-mining conditions, assessed workload and site conditions.

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6.2.1 MINE PARAMETERS

The main mine parameters are given in the table below:

Table No.6.2

Sl. No.	Particulars	Unit	South section	North section
1	Maximum length of quarry along turra floor (dip-rise)	m	4416	3427
2	Maximum length of quarry along surface (dip-rise)	m	4814	3516
3	Maximum strike of quarry along turra floor	m	1510	1576
4	Maximum strike of quarry along surface	m	1914	1845
5	Maximum depth of excavation	m	293	297
6	Hauling depth of coal	m	165	165
7	Surface area along floor of quarry	Sq. Km	9.40	
8	Surface area along surface of quarry	Sq. Km	12.55	
9	Mineable Coal Reserve	Mt.	241.45	
10	Total volume of overburden	Mm3	1395.38	
11	Stripping Ratio	M3/t	5.78	

6.2.2 CHOICE OF TECHNOLOGY

In view of the following facts:

i) flat gradient of 2^0-3^0 of coal seams;

ii) parting of 44m-56m between Turra the bottom most mineable seam and Purewa Bottom seam;

iii) high volume of material handling i.e 10Mt. of coal and about 60Mm3 of OB per year;

iv) existing system of dragline and shovel-dumper combination in Bina Extension OCP;

it is proposed to continue with existing combined system of mining by Dragline and Shovel- Dumper combination.

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6.2.3 EQUIPMENT SELECTION

A combined system of mining by dragline and shovel-dumper combination has been considered most suitable for the project. Three options have been considered as given below:

Option-I : Departmental Variant with the existing Draglines

Option-II : Departmental Variant with replacing 10m3/66mR Dragline with 24m3/88mR Dragline

Option-III : Partial OB outsourcing i.e. outsourcing of the total OB above Purewa Top Seam

Option-IV : Partial OB outsourcing i.e. outsourcing of the total OB above Purewa Top Seam with replacing 10m3/66mR Dragline with new 24m3/88mR Dragline.

In all the above options, coal winning has been proposed to be done departmentally. In selecting the type, size and population of equipments due consideration has been given the existing equipments and practice, annual workload calculated parting wise and section wise in case of OB, annual workload and presence of inseam bands in case of coal, safety consideration, ease of working, general technology culture prevailing in NCL, project and equipment life.

6.2.4 Equipment for OBR

In Option-I, the same draglines i.e. two 10m3/66mR draglines and two 24m3/88mR draglines will continue. For remaining OB removal of the parting between Turra and Purewa Bottom Seam 10m3 Hyd. Shovel with 100 T dumper have been provided. For parting between Purewa Top and Purewa Bottom seam, 10m3 Elect. Rope shovel and 100 T dumper have been provided.

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क्षेत्रीय निदेशक
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For the OB above Purewa Top, 20m3 Rope Shovels and 190 T dumpers have been provided. 250 mm Drills have been provided for drilling in overburden.

In Option –II, the existing two 10/70 draglines would be replaced by two new 24m3/88mR dragline and will work above Turra seam. For drilling in dragline bench, provision has been made for 311 mm drill.

In Option –III, the existing draglines will continue to work above Turra Seam. The height of the dragline bench will depend upon annual coal requirement from turra seam and the capacity of draglines. The OB above dragline bench and up-to Purewa top seam floor will be worked by 10m3 Electric Rope Shovels, 10m3 Hyd. Shovel and 100T dumpers. The OB removal above Purewa top seam will be outsourced.

In Option-IV, as provided in Option-II, the existing 2 nos. draglines will be replaced by two nos. new 24m3/96mR dragline and will work above Turra Seam. The drilling in dragline bench, a provision of 311 mm drill have been made. For OB removal between dragline bench and Purewa Top seam, 10m3 Elect. Rope Shovel, 10m3 Hyd. Shovel and 100 T dumpers will continue as common in all the options. The OB removal above Purewa Top seam shall be outsourced.

6.2.5 Equipment for Coal Winning

For Turra seam two 8-10m3 electric/diesel hydraulic shovels have been envisaged with 100 T dumpers. For Purewa seams 5.5m3 electric/ diesel hydraulic backhoe shovels have been provided with 100 T dumpers. Ripper Dozers have been provided which may be used for removal of inseam bands or by drilling/blasting.

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BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6,
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In all the four options 100T dumpers have been proposed in shovel-dumper excavation from Turra seam upto Purewa Top seams.

6.2.6 Requirement of HEMM

The total requirement of HEMM for all the proposed four options have been given in the Table No.6.3.

6.3 MINING SYSTEM& SYSTEM PARAMETERS

The elements of mining system have been determined in accordance with the parameters of excavation and transport equipment and the parameters of drilling and blasting.

The height of main bench over Turra seam excavated by dragline will vary according to the requirement of coal exposure from Turra seam. The dragline cut width is adopted as 70m. The slope of dragline bench has been proposed as 70^0.

The OB above dragline bench and upto Purewa Top floor will be excavated by 10m3 Hyd. Shovel, 10m3 Rope Shovels and 100 T dumpers.

The OB above Purewa Top seam will be excavated by 20m3 Rope Shovel with 190 T dumpers. In outsourcing option (Option-III & IV), the OB above Purewa Top seam shall be excavated by outsourcing.

GENERAL MANAGER
BINA PROJECT

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Table No.6.3

Bina-Kakri Amalgamation OCP (10 Mtpa)

Requirement of HEMM

Sl. No.	HEMM :-	SIZE/CAP.	Existing as on 31.03.2010	PR Provn.(6.0) Mtpa)	Option-I	Option-II	Option-III	Option-IV
A.	OBR							
1	Dragline	24m3/88mR	2	2	2	4	2	4
2	Dragline	10m3/65mR	2	2	2		2	
3	Electric rope shovel	20 m3			8	8		
4	Electric rope shovel	10 m3	4	4	5	4	5	4
5	Hydraulic shovel (Elec./Diesel)	10 m3	1	1	2	2	2	2
6	Rear Dumper	190T			68	68		
7	Rear Dumper	100T	14		69	57	69	57
8	Rear Dumper	85T	20	48				
9	Drill	311 mm				4		4
10	Drill	250 mm	11	14	27	23	14	10
11	Dozer	770 HP			5	5		
12	Dozer	410 HP	4	11	15	15	15	15
B.	Coal Winning							
1	Hydraulic shovel (Elec./Diesel)	8-10 m3			2	2	2	2
2	Hydraulic B'hoe (Elec./Diesel)	4.5/5.5 m3	3	4	4	4	4	4
3	Rear Dumper	100 T			28	28	28	28
4	Rear Dumper(CB)	85 T	17	17				
5	Drill	160 mm	3	5	7	7	7	7
6	Dozer with ripper	410 HP			2	2	2	2
7	Dozer	410 HP	4	4	6	6	6	6
8	F E Loder	5.74/6.1	1	1				
c.	Common							
1	Grader	280 HP	1	2	6	6	4	4
2	Grader	145 HP	1	1				
3	Crane (Hydraulic)	75 T			1	1		1
4	Crane (Hydraulic)	30/50 T		3	2	2	2	2
5	Crane (Pick and Carry)	10 T	4		4	4	4	4
6	Diesel Backhoe	2.5 m3		2	1	1	2	2
7	F E Loder	5.74/6.1	1		2	2	2	2
8	Wheel Dozer	300 HP	2	2	2	2	2	2
9	Hyd. Shovel	1.2 m3		2	2	2	2	2
D.	Reclamation							
1	Hyd. Shovel	2.5 m3		1	1	1	1	1
2	Dozer	410 HP	2	4	5	5	4	4
3	Grader	280 HP	2	2	4	4	2	2
4	Tipping truck	12T		5	5	5	5	5
5	Water Sprinklers	64 KL			6	6		
6	Water Sprinklers	28 KL	4	6	4	4	8	8

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
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The system parameters as above have been tabulated and given in the table below:

Table No.6.4

Sl. No.	Particulars	Unit	Overburden		Coal
			Dragline	Shovel	
1	Bench Height	m	37-47	15-18	10-15
2	Working Bench Width	m	70	55-60	45
3	Non-working bench width	m	70	35-40	25
4	Bench slope	Deg.	70	70	80
5	Blast Hole dia	mm	311/250	250	160
6	Inclination of Boreholes		Inclined	Vertical	Vertical

The above mining system and system parameters have been proposed for departmental option i.e. Option-I and Option-II. For outsourcing of OB as proposed in Option-III & IV, the mining system parameters will depend upon the size and type of equipment deployed by the outsourcing agency.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
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CHAPTER-VII

MINING & DUMPING STRATEGY

7.0 CONSTRAINTS ON MINE DEVELOPMENT

The Bina-Kakri Amalgamation OCP is an amalgamation of existing Bina Extension OCP and a part of Kakri OCP. However, following surface constraints will have to be tackled during implementation of the project:

i) High stripping area creating difficulty in OB accommodation.

ii) Shortage of land for external dumping.

iii) The expansion area from the existing mines is under forest cover.

iv) Shortage of land for extension of workshop and other infrastructure facilities.

7.1 MINING STRATEGY/SEQUENCE

In the proposed project, Bina Extension OCP will be the central part of the mine. In the northern flank, the boundary between Bina Extension & Kakri OCPs and a part of Kakri OCP has been included to give sufficient strike length. Similarly in the southern flank, a part of the Ruhela Block has been included to give sufficient strike length and to maintain the alignment of dragline cut.

GENERAL MANAGER
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7.1.1 Sequence of Mining

The existing Bina Extension OCP is presently being worked in two sections namely North and South with the use of one central haul road. The proposed mine will continue in the same manner with the use of same central haul road. The North section will be in advance to the South section to serve as sump in the central part. A mid-entry in the northern part may be formed as per the requirement to prevent the difficulty during monsoon.

7.1.2 OB Removal

The main bench over the Turra Seam will be excavated by draglines working in vertical tandem. The height of the bench will depend on the requirement of coal exposure from the Turra seam. The existing set of 10m3/66mR and 24m3/88mR is sufficient for the exposure of coal requirement as per calendar programme. However, the existing 10m3/66mR dragline has completed the scheduled life and it was proposed in the Planning Committee meeting to replace it by new 24m3/88mR draglines. Option-II & Option-IV has been formulated with all four 24m3/88mR draglines. However, due to the limitation of dump height imposed by DGMS, the draglines in this option will be under utilized in most part of the life of the project unless coal thickness is reduced in the last phase of the mine.

The OB above dragline bench up to floor of Purewa Top seam will be excavated by 10m3 Hyd. Shovel, 10m3 Elect. Rope Shovel with 100 T dumpers. The OB above Purewa Top seam will be excavated by 20m3 Elect. Rope Shovel with 190 T dumpers in departmental options of I & II.

In outsourcing Options of III & IV, the entire OB removal above Purewa Top seam is proposed to be outsourced.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशालय
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7.1.3 Coal Production

The Turra seam coal will be mined by 8-10m3 Hyd. Shovel with 100 T dumpers. The Purewa seams will be mined by 5.5m3 Hyd. Shovel (Backhoe) with 100 T dumpers. The Turra seam coal will be transported to the receiving pit while the Purewa seams coal will be dumped in Coal Stock Yard in both the flanks. It will then be transported to the receiving pit by tippers.

The inseam band will be taken either by Ripper Dozer or by Drilling Blasting depending upon its thickness.

7.1.4 **Amalgamation of Quarries**: The dragline cut of the north section shall be subsequently increased entering into the boundary area and then part of the Kakri mine as proposed in the Plan. A artificial barrier shall be maintained between the workings of North Section of the proposed mine and rest part of the Kakri mine. To facilitate the increase in length of dragline cut, bench height of the dragline bench should be suitably reduced to maintain the dump profile.

7.1.5 Transportation Lead

For OB removal, peak dumper provision in the PR has been made for an estimated transport average lead of 3.5 Km. For coal of Turra Seam, dumper position has been made for estimated lead of 4.5 Km whereas for Purewa seams dumper provision has been made for an estimated lead of 3.5 Km.

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7.1.6 Dragline Balancing Diagram

In Option-I and Option-III, a set of one 10m3/66mR and one 24m3/88mR will be deployed in each section in vertical tandem. The 10m3/66mR dragline will be deployed in the top dig only. For its remaining small capacity it may not be brought to lower bench due to its poor health. As such in some of the balancing combination its total capacity may not be fully utilized. In Option-II & IV, a set of two 24m3/88mR draglines will be deployed in vertical tandem. The dragline at Upper Bench shall take the top dig and also come to the main bench and take the part of the key-cut. A bench height of 47m corresponds to a dump height of 80m. Higher dump height by dragline may be planned after obtaining necessary permission from the concerned authorities. A coal rib of only 9.5m height against spoil heap has been left. This leads to an additional re-handling but better recovery of coal from conservation point of view.

The dragline productivity, re-handling alongwith coal exposure for different combination of bench height has been given in the table below:

For 10m3/66mR and 24m3/88mR dragline combination

Bench Height (m)	Annual Coal Exposure (Mt)	Dragline productivity (Mm3)	Re-hand-ling (Mm3)	%age Re-handling	Method of work
37(12+25)	2.71	3.97	1.28	24.38	Vertical tandem
38 (13+25)	2.69	4.04	1.31	24.48	
40 (13+27)	2.46	3.89	1.36	25.90	
42 (14+28)	2.35	3.9	1.39	26.27	
42 (12+30)	2.20	3.64	1.41	27.92	
44(14+30)	2.17	3.78	1.44	27.58	
47 (14+33)	1.95	3.62	1.50	29.30	

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क्षेत्रीय निदेशक
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For both 24m3/88mR draglines combination

Bench Height (m)	Annual Coal Exposure (Mt)	Dragline productivity (Mm3)	Re-handling (Mm3)	% Re-handling	Method of work
47(14+33)	2.97	5.52	2.28	29.23	Vertical tandem
50(15+35)	2.76	5.46	2.34	30	
55 (17+38)	2.47	5.39	2.41	30.90	

The dragline balancing diagrams prepared for the above combination has been given vide Plate No.MIN-13 & MIN-14.

7.1.6 Dumping Strategy

The overburden from the dragline will be side-cast in the de-coaled floor of Turra seam. The OB from the upper benches being handled by Shovel dumper system is proposed to be dumped internally over the dragline cast spoil. The final stage dump plan (Plate No.MIN-17) shows that there is a shortage of dumping space for 131.44 Mm3 of overburden in the pit internally.

7.1.7 Dumping Arrangement

The proposed dragline dumping has been limited as per the present permission being granted by the DGMS. Shovel-Dumper spoil dumps will be formed in benches of 30m and slope of individual dump bench will be 37° (equal to angle of repose of OB material). The width of berm between two adjacent benches will be 40m. Overall slope of dump works out to 28°. Top soil will be stacked separately which will be used up for spreading over the completed OB dumps by the end of project life. For the formation of dumps and leveling of dumps 770 HP dozers have been envisaged.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6,
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7.1.8 **Capacity of Dump**

Sl. No.	Particulars		Dump Capacity (Mm3)		
			South	North	Total
1	**EXISTING DUMP**				
	A) External Dump		-	-	75.00
	B) Internal Dump		100.00	155.90	255.90
	Total		100.00	155.90	330.90
2	**PROPOSED DUMP – INTERNAL DUMP**				
	South		North		Total
1	Upto D/Le Heap	345.13	Upto D/Le Heap	300.93	646.06
2	Upto 210m	15.34	Upto 210m	12.91	28.25
3	Upto 240m	24.99	Upto 240m	26.87	51.86
4	Upto 270m	77.47	Upto 270m	68.95	146.42
5	Upto 300m	121.30	Upto 300m	85.32	206.62
6	Upto 330m	110.17	Upto 330m	69.13	179.30
7	Upto 360m	95.76	Upto 360m	54.43	150.19
8	Upto 390m	78.84	Upto 390m	40.60	119.44
9	Upto 420m	61.07	Upto 420m	27.95	89.02
10	Upto 450m	43.11	Upto 450m	17.08	60.19
11	Upto 480m	26.48	Upto 480m	-	26.48
12	Upto 510m	4.69	Upto 510m	-	4.69
	Total	1004.34	Total	704.17	1708.51

Note: The proposed dump is having a shortage for 131.44 Mm3 of OB. This will be finally adjusted after closure of Kakri OCP.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
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सिंगरौली

CHAPTER-VIII

MINING SCHEDULE & EQUIPMENT PHASING

8.0 DESIGN CRITERIA

8.1 The design criteria adopted for mining operations of Bina-Kakri Amalgamation OCP (10 Mtpa) are as follows:

i)	No. of Annual Working Days	- 330
ii)	No. of Daily Shifts	- 3 for Coal & OB
iii)	Duration of Shift hours	- 8

The mine is to be worked on above three shifts per day, 7 days per week and 330 days per annum schedule.

8.2 ANNUAL PRODUCTIVITY OF EXCAVATORS

Annual productivity of excavators is based on the following considerations apart from the above design criteria:

a)	Excavation Category	
	i. OB	- 90% Cat-II & 10% Cat-VI
	ii. Coal	- 100% Cat-III
b)	Material Density	
	i. Overburden	- 2.35t/m3
	ii. Coal	
	1. Turra Seam	- 1.59 t/m3
	2. Purewa Bottom Seam	- 1.57 t/m3
	3. Purewa Top Seam	- 1.56 t/m3
c)	Swell Factor:	
	i. OB	- 0.73
	ii. Coal	- 0.74

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
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d) Availability of Equipment
- Excavator
  - i. Dragline - 85%
  - ii. Rope Shovel - 80%
  - iii. Hyd. Shovel - 80%
  - iv. Rear Dumper,120T - 72%
  - v. Rear Dumper, 100T - 67%

e) Utilization of Equipment
  - i. Dragline - 73%
  - ii. Rope Shovel, 10m3 - 58%
  - iii. Rope Shovel, 20m3 - 59%
  - iv. Hyd. Shovel - 61%

f) Factors allowed for traveling, positioning etc.
  - i. Dragline - 0.80
  - ii. Rope Shovel - 0.80
  - iii. Hyd. Shovel - 0.85

The standard Annual productivity of Excavators based on the above factors is given in the table below:

Table No.8.1

Sl. No.	Particulars	Rock Type	Excavation Category	Annual Productivity(Mm3)
1	Dragline, 24m3/88mR			
	- 90° Swing	Overburden	90% Cat-III 10% Cat-IV	4.10
	- 120° Swing			3.70
	- 180° Swing			3.09
2	Dragline, 10m3/66mR			
	- 90° Swing	Overburden	90% Cat-III 10% Cat-IV	1.41
	- 120° Swing			1.27
	- 180° Swing			1.06
3	20 m3 Elect. Rope Shovel+ 190 T Dumper	Overburden	90% Cat-III 10% Cat-IV	4.45
4	10 m3 Elect. Rope Shovel+ 100 T Dumper	Overburden	90% Cat-III 10% Cat-IV	2.13
5	10 m3 Hyd. Shovel + 100 T Dumper	Overburden	90% Cat-III 10% Cat-IV	2.71
6	9.5 m3 Hyd. Shovel + 100 T Dumper	Coal	100% Cat-III	2.66
7	5.5 m3 Hyd.(BH) Shovel + 100 T Dumper	Coal	100% Cat-III	1.76

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6.

The standard Annual productivity of Dumpers for different lead based on the above factors is given in the table below:

Table No.8.2

Sl. No.	Shovel	Dumper	Rock Type	Dumper Productivity (Mm3) – Lead (Km)			
				3.00	3.50	4.00	4.50
1	20m3 ER	190 T	OB	0.5891	0.5434	0.5070	0.4709
2	10m3 ER	100 T		0.2499	0.2306	0.2152	0.1998
3	10m3 Hyd	100 T		0.2865	0.2639	0.2461	0.2281
4	9.5m3 Hyd	100 T	Coal	0.3194	0.2948	0.2753	0.2556
5	5.5m3 Hyd (BH)	100 T		0.2541	0.2353	0.2263	0.2051

8.3 CALENDAR PROGRAMME OF EXCAVATION

8.3.1 Target for Coal Production & OB removal (Year-wise)

Bina-Kakri Amalgamation OCP has been planned for a targeted capacity of 10 Mtpa. The break-up of section-wise, year-wise, seam-wise coal production and parting-wise OB excavation for different options are given in Table No.8.3 to Table No.8.6.

8.3.2 Natural OB

The volume of OB excavation has been adjusted with the consideration of equipment deployment, its utilization and minimization of advance stripping, uniformity of workload in the above calendar programme of excavation. The natural volume of OB above Purewa Top Seam for Option-III i.e. Partial OB outsourcing has been given in the Table No.8.7.

8.4 EQUIPMENT SCHEDULE

The requirement of HEMM e.g. shovel, dumpers, drills etc. have been estimated as per the annual productivity based on the adopted design criteria and workload determined by the calendar programme given in the tables above. The year-wise population of different HEMM for the corresponding production for all the three options is given in the Table Nos.8.8 to Table No.8.11.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. बो.सं.–6,
सिंगरौली

8.5 DRILLING & BLASTING OPERATION

8.5.1 Category of rock for drilling and type of Drilling rigs

Based upon the physico-mechanical properties of coal and OB rocks, the drilling category has been assumed as VIII for coal and X for Overburden. RBH Drills of 311 mm dia are proposed for drilling in main dragline bench in Option-II. For all other OB benches in all the options 250 mm drills have been provided. For coal benches 160 mm drills have been provided.

8.5.2 Elements of Drilling & Blasting

The elements of drilling and blasting would be decided during the actual course of mining operation. However, based on available data from existing mines of NCL it is proposed that for 311 mm drills the burden and spacing pattern would be 10mx11m for dragline bench and for shovel benches of the height 15-18m it would be 8mx10m. For coal benches, drilling pattern of 8mx8m for Turra seam and pattern of 7mx7m for Purewa seams are proposed.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.का.–6,
सिंगरौली

Table No.8.3

Bina-Kakri Amalgamation OCP (10 Mtpa)

CALENDAR PROGRAMME OF EXCAVATION (OPTION-I)

SOUTH SECTION

SL. No.	PARTICULARS	Year of Quarry Operation																										Total
		11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	
I.	COAL PRODUCTION (Mt)																											
	TOTAL	5.00	5.00	4.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	2.58	133.08
	- PUREWA TOP	0.49	0.52	0.65	0.92	0.95	1.11	1.10	1.10	1.09	0.93	0.93	0.93	0.93	0.95	0.94	0.94	0.94	0.91	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.40	22.48
	- PUREWA BOTTOM	1.04	1.01	1.38	1.89	1.87	1.71	1.71	1.72	1.73	1.88	1.88	1.89	1.85	2.00	2.03	2.03	2.03	2.02	1.99	1.99	1.99	1.99	1.99	1.99	1.99	0.97	46.59
	- TURRA SEAM	1.47	1.47	1.95	2.69	2.68	2.68	2.69	2.68	2.68	2.69	2.69	2.69	2.69	2.55	2.53	2.53	2.53	2.57	2.69	2.69	2.69	2.69	2.69	2.69	2.68	1.31	64.61
II.	VOLUME OF OBR (Mm3)																											
	TOTAL	15.71	15.70	20.31	31.95	31.95	31.94	31.95	31.95	31.95	31.95	31.94	31.95	31.95	31.93	31.94	31.94	31.94	31.94	27.64	27.63	27.64	27.64	27.64	27.64	25.97	13.83	746.63
	- BY DRAGLINE	3.66	3.66	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	104.26
	- BY SHOVEL-DUMPER	11.59	11.58	16.65	27.13	27.12	27.11	27.15	27.13	27.12	27.14	27.12	27.13	27.13	27.11	27.12	27.12	27.12	27.12	22.81	22.80	22.81	22.81	22.81	22.81	21.22	9.39	623.12
	- IN SEAM BAND	0.46	0.46	0.62	0.78	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.78	0.78	0.78	0.78	0.78	0.80	0.80	0.80	0.80	0.80	0.80	0.71	0.40	19.23
	REHANDLING(Mm3)	1.5	1.5	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	38.44
III	STRIPPING RATIO (m3/t)	5.24	5.23	7.58	5.81	5.81	5.81	5.82	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.03	5.02	5.03	5.03	5.03	5.03	4.72	5.16	5.69

NORTH SECTION

SL. NO.	PARTICULARS	Year of Quarry Operation																										Total
		11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	
I.	COAL PRODUCTION (Mt)																											
	TOTAL	3.00	3.00	4.00	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	3.27	0.00	107.77
	- PUREWA TOP	0.58	0.69	0.91	0.84	0.67	0.67	0.67	0.67	0.77	0.85	0.86	0.69	0.85	0.84	0.84	0.84	0.84	0.82	0.59	0.59	0.59	0.59	0.59	0.59	0.42	0.00	18.24
	- PUREWA BOTTOM	1.04	1.04	1.36	1.47	1.41	1.41	1.41	1.41	1.40	1.35	1.35	1.35	1.35	1.33	1.33	1.33	1.33	1.37	1.26	1.26	1.26	1.26	1.26	1.26	0.92	0.00	32.74
	- TURRA SEAM	1.38	1.27	1.71	2.19	2.42	2.42	2.42	2.42	2.33	2.27	2.27	2.27	2.27	2.28	2.28	2.28	2.28	2.30	2.65	2.65	2.65	2.65	2.65	2.65	1.93	0.00	56.72
II.	VOLUME OF OBR (Mm3)																											
	TOTAL	15.70	15.70	24.79	27.87	27.91	27.90	27.91	27.90	27.91	27.87	27.89	27.97	27.86	27.88	27.89	27.88	27.89	27.91	27.95	25.74	25.75	25.76	25.75	25.95	17.30	0.00	648.75
	- BY DRAGLINE	2.37	2.37	3.36	3.78	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	4.04	4.04	4.04	4.04	4.04	4.04	4.04	0.00	94.62
	- BY SHOVEL-DUMPER	12.96	12.96	20.09	23.45	23.38	23.37	23.38	23.37	23.39	23.35	23.37	23.35	23.36	23.35	23.37	23.36	23.37	23.39	23.26	21.05	21.06	21.06	21.06	21.26	12.69	0.00	538.95
	- IN SEAM BAND	0.37	0.37	0.50	0.63	0.64	0.64	0.64	0.64	0.64	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.64	0.64	0.64	0.64	0.64	0.64	0.57	0.00	15.18
	REHANDLING(Mm3)	0.98	0.98	1.39	1.44	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.31	1.31	1.31	1.31	1.31	1.31	1.31	0	35.00
II	STRIPPING RATIO (m3/t)	5.23	5.23	6.20	6.19	6.20	6.20	6.20	6.20	6.20	6.19	6.20	6.21	6.20	6.20	6.20	6.20	6.20	6.20	6.21	5.72	5.72	5.72	5.72	5.77	5.29	0.00	6.02

TOTAL (SOUTH+NORTH)

SL. NO.	PARTICULARS	Year of Quarry Operation																										Total
		11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	
I.	COAL PRODUCTION (Mt)																											
	TOTAL	8.00	8.00	8.50	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	8.77	2.58	241.45
	- PUREWA TOP	1.17	1.21	1.57	1.76	1.62	1.78	1.77	1.77	1.86	1.81	1.81	1.81	1.81	1.78	1.78	1.78	1.78	1.74	1.41	1.41	1.41	1.41	1.41	1.41	1.24	0.40	40.72
	- PUREWA BOTTOM	2.08	2.05	2.78	3.36	3.28	3.12	3.12	3.13	3.13	3.22	3.23	3.23	3.23	3.20	3.21	3.21	3.21	3.28	3.25	3.25	3.25	3.25	3.25	3.25	2.91	0.97	79.33
	- TURRA SEAM	2.75	2.74	3.67	4.88	5.10	5.10	5.11	5.10	5.01	4.96	4.96	4.96	4.96	4.83	4.81	4.81	4.81	4.87	5.34	5.34	5.34	5.34	5.34	5.34	4.62	1.31	121.40
II.	VOLUME OF OBR (Mm3)																											
	TOTAL	31.40	31.40	55.10	59.82	59.86	59.84	59.86	59.85	59.87	59.84	59.84	59.83	59.84	59.82	59.83	59.82	59.83	59.85	55.59	53.37	53.39	53.39	53.39	53.59	43.27	13.83	1395.38
	- BY DRAGLINE	6.03	6.03	7.40	7.82	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	8.08	8.08	8.08	8.08	8.08	8.08	8.08	4.04	198.90
	- BY SHOVEL-DUMPER	24.54	24.54	46.58	50.53	50.50	50.48	50.53	50.50	50.51	50.49	50.49	50.48	50.49	50.47	50.49	50.48	50.49	50.51	46.07	43.85	43.87	43.87	43.87	44.07	33.91	9.39	1162.07
	- IN SEAM BAND	0.83	0.83	1.12	1.42	1.43	1.43	1.43	1.43	1.42	1.42	1.42	1.42	1.42	1.41	1.41	1.41	1.41	1.42	1.44	1.44	1.44	1.44	1.44	1.44	1.28	0.40	34.41
	REHANDLING(Mm3)	2.48	2.48	2.70	2.75	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.62	2.62	2.62	2.62	2.62	2.62	2.62	1.31	67.44
II	STRIPPING RATIO (m3/t)	5.23	5.23	6.88	5.88	5.98	5.98	5.98	5.98	5.99	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.99	5.56	5.34	5.34	5.34	5.34	5.36	4.93	5.16	5.78

GENERAL MANAGER
BINA PROJECT

Table No.8.4

Bina-Kakri Amalgamation OCP (10 Mpta)

CALENDAR PROGRAMME OF EXCAVATION (OPTION-II)

SOUTH SECTION

SL. NO.	PARTICULARS	Year of Quarry Operation																										Total
		11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	
I.	COAL PRODUCTION (Mt)																											
	TOTAL	3.00	3.00	4.00	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	2.68	133.68
	- PUREWA TOP	0.49	0.52	0.66	0.92	0.95	1.11	1.10	1.10	1.09	0.93	0.93	0.93	0.93	0.95	0.94	0.94	0.94	0.91	0.82	0.82	0.82	0.82	0.82	0.82	0.40	22.48
	- PUREWA BOTTOM	1.04	1.01	1.38	1.89	1.87	1.71	1.71	1.72	1.73	1.88	1.88	1.88	1.85	2.00	2.03	2.03	2.03	2.02	1.99	1.99	1.99	1.99	1.99	1.99	0.97	46.59
	- TURRA SEAM	1.47	1.47	1.96	2.69	2.68	2.68	2.69	2.68	2.68	2.69	2.69	2.69	2.69	2.69	2.53	2.53	2.53	2.57	2.69	2.69	2.69	2.69	2.69	2.69	1.31	64.61
II.	VOLUME OF OBR (Mm3)																											
	TOTAL	16.71	16.70	30.31	31.95	31.95	31.94	31.95	31.95	31.95	31.96	31.94	31.95	31.95	31.93	31.94	31.94	31.94	31.94	27.64	27.63	27.64	27.64	27.64	27.64	25.97	12.83	746.53
	- BY DRAGLINE	3.66	3.66	4.98	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	3.62	137.58
	- BY SHOVEL-DUMPER	11.59	11.58	24.71	25.65	25.64	25.63	25.67	25.65	25.64	25.66	25.64	25.66	25.65	25.63	25.64	25.64	25.64	25.64	21.33	21.32	21.33	21.33	21.33	21.33	19.74	9.61	569.84
	- IN SEAM BAND	0.46	0.46	0.62	0.78	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.78	0.78	0.78	0.78	0.78	0.80	0.80	0.80	0.80	0.80	0.80	0.71	0.40	19.23
	REHANDLING(Mm3)	1.5	1.5	2.00	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	1.58	56.50
III.	STRIPPING RATIO (m3/t)	5.24	5.23	7.58	5.81	5.81	5.81	5.82	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.03	5.02	5.03	5.03	5.03	5.03	4.72	5.16	5.59

NORTH SECTION

SL. NO.	PARTICULARS	Year of Quarry Operation																										Total
		11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	
I.	COAL PRODUCTION (Mt)																											
	TOTAL	3.00	3.00	4.00	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	3.27	0.00	107.77
	-PUREWA TOP	0.68	0.69	0.91	0.64	0.67	0.67	0.67	0.67	0.77	0.88	0.88	0.88	0.88	0.84	0.84	0.84	0.84	0.83	0.59	0.59	0.59	0.59	0.59	0.59	0.42	0.00	18.24
	- PUREWA BOTTOM	1.04	1.04	1.38	1.47	1.41	1.41	1.41	1.41	1.40	1.35	1.35	1.35	1.35	1.38	1.38	1.38	1.38	1.37	1.26	1.26	1.26	1.26	1.26	1.26	0.92	0.00	32.74
	- TURRA SEAM	1.28	1.27	1.71	2.19	2.42	2.42	2.42	2.42	2.33	2.27	2.27	2.27	2.27	2.29	2.28	2.28	2.28	2.39	2.65	2.65	2.65	2.65	2.65	2.65	1.93	0.00	56.79
II.	VOLUME OF OBR (Mm3)																											
	TOTAL	15.70	15.70	24.79	27.87	27.91	27.90	27.91	27.90	27.91	27.87	27.88	27.87	27.86	27.88	27.89	27.88	27.88	27.91	27.96	25.74	25.75	25.75	25.75	25.95	17.30	0.00	648.75
	- BY DRAGLINE	2.37	2.37	3.36	4.23	4.60	4.60	4.60	4.60	4.68	4.74	4.74	4.74	4.83	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	4.75		119.96
	- BY SHOVEL-DUMPER	12.96	12.96	20.93	23.01	22.67	22.66	22.67	22.65	22.60	22.50	22.52	22.50	22.42	21.73	21.74	21.73	21.74	21.76	21.78	19.57	19.58	19.58	19.78	11.60			513.61
	- IN SEAM BAND	0.37	0.37	0.50	0.63	0.64	0.64	0.64	0.64	0.64	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.64	0.64	0.64	0.64	0.64	0.64	0.57		15.18
	REHANDLING(Mm3)	0.98	0.98	1.39	1.75	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	2.00	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	0	49.63
III.	STRIPPING RATIO (m3/t)	5.23	5.23	6.20	5.19	5.20	5.20	5.20	5.20	5.20	5.19	5.20	5.19	5.20	5.20	5.20	5.20	5.20	5.20	5.21	5.72	5.72	5.72	5.72	5.77	5.29		6.02

TOTAL (SOUTH + NORTH)

SL. NO.	PARTICULARS	Year of Quarry Operation																										Total
		11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	
I.	COAL PRODUCTION (Mt)																											
	TOTAL	6.00	6.00	8.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	8.77	2.68	241.45
	- PUREWA TOP	1.17	1.21	1.57	1.78	1.62	1.78	1.77	1.77	1.86	1.81	1.81	1.81	1.81	1.79	1.78	1.78	1.78	1.74	1.41	1.41	1.41	1.41	1.41	1.41	1.24	0.40	40.72
	- PUREWA BOTTOM	2.08	2.05	2.75	3.36	3.28	3.12	3.12	3.13	3.13	3.23	3.23	3.23	3.23	3.22	3.41	3.41	3.41	3.39	3.25	3.25	3.25	3.25	3.25	3.25	2.91	0.97	79.33
	- TURRA SEAM	2.75	2.74	3.67	4.88	5.10	5.10	5.11	5.10	5.01	4.96	4.96	4.96	4.96	4.98	4.81	4.81	4.81	4.82	5.34	5.34	5.34	5.34	5.34	5.34	4.62	1.31	121.40
II.	VOLUME OF OBR (Mm3)																											
	TOTAL	31.40	31.40	55.10	59.82	59.86	59.84	59.89	59.85	59.87	59.84	59.84	59.83	59.84	59.82	59.83	59.82	59.83	59.85	55.59	53.37	53.39	53.39	53.59	53.59	43.27	13.83	1396.28
	- BY DRAGLINE	6.03	6.03	8.34	9.75	10.12	10.12	10.12	10.12	10.20	10.26	10.26	10.26	10.35	11.04	11.04	11.04	11.04	11.04	11.04	11.04	11.04	11.04	11.04	11.04	10.39	3.62	257.52
	- BY SHOVEL-DUMPER	24.54	24.54	45.64	48.66	48.31	48.29	48.34	48.31	48.24	48.16	48.16	48.15	48.07	47.36	47.38	47.37	47.38	47.40	43.11	40.89	40.91	40.91	40.91	41.11	31.69	9.61	1109.45
	- IN SEAM BAND	0.83	0.83	1.12	1.42	1.43	1.42	1.43	1.43	1.42	1.42	1.42	1.42	1.42	1.41	1.41	1.41	1.41	1.42	1.44	1.44	1.44	1.44	1.44	1.44	1.28	0.40	34.41
	REHANDLING(Mm3)	2.48	2.48	3.45	4.03	4.18	4.18	4.18	4.18	4.21	4.24	4.24	4.24	4.26	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	1.58	106.67
III.	STRIPPING RATIO (m3/t)	5.23	5.23	6.89	5.55	5.59	5.59	5.59	5.59	5.59	5.58	5.59	5.58	5.59	5.59	5.58	5.58	5.58	5.59	5.59	5.34	5.34	5.34	5.34	5.36	4.93	5.16	5.78

GENERAL MANAGER
BINA PROJECT

Table No 6.5

BINA-KAKRI AMALGAMATION OCP (10 Mtpa)

Calendar Programme of Excavation (Option III)

SOUTH SECTION

SL. NO.	PARTICULARS	Year of Quarry Operation																										Total
		11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	
I.	COAL PRODUCTION (Mt)																											
	TOTAL	3.00	3.00	4.00	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	2.68	133.68
	- PUREWA TOP	0.49	0.52	0.66	0.92	0.95	1.11	1.10	1.10	1.09	0.93	0.93	0.93	0.95	0.95	0.94	0.96	0.93	0.93	0.91	0.82	0.82	0.82	0.82	0.82	0.82	0.40	22.48
	- PUREWA BOTTOM	1.04	1.01	1.38	1.83	1.87	1.71	1.71	1.72	1.73	1.88	1.89	1.88	1.88	2.00	2.05	2.00	2.03	2.02	1.99	1.99	1.99	1.99	1.99	1.99	1.99	0.87	46.59
	- TURRA SEAM	1.47	1.47	1.96	2.65	2.68	2.68	2.69	2.68	2.68	2.69	2.69	2.69	2.67	2.55	2.51	2.53	2.54	2.55	2.57	2.69	2.69	2.69	2.69	2.69	2.69	1.31	64.61
II.	VOLUME OF OBR (Mm3)																											
	TOTAL	15.71	15.70	20.31	31.55	31.95	31.94	31.96	31.96	31.95	31.96	31.94	31.95	31.95	31.93	31.93	31.94	31.94	31.94	31.94	27.64	27.63	27.64	27.64	27.64	27.64	25.07	13.83	746.63
	- BY DRAGLINE	3.66	3.66	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	104.28
	- BY SHOVEL-DUMPER (Dept.)	3.35	3.35	5.32	8.86	8.83	7.69	7.73	7.70	7.68	7.38	7.37	7.37	7.37	7.54	7.58	7.58	7.58	7.58	8.02	9.24	9.24	9.24	9.24	9.24	9.24	9.27	1.49	195.35
	- BY SHOVEL-DUMPER(Outsourcing)	8.24	8.23	10.33	16.27	16.49	16.42	16.42	16.43	16.44	16.75	16.74	16.75	16.75	16.67	16.53	16.53	16.53	16.53	15.90	13.56	13.55	13.56	13.56	13.56	13.56	11.93	6.90	427.77
	- IN SEAM BAND	0.46	0.46	0.62	0.78	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.78	0.78	0.78	0.78	0.78	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.71	0.40	19.23
	REHANDLING(Mm3)	1.5	1.5	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	34.44
III.	STRIPPING RATIO (m3/t)	5.24	5.23	7.58	5.81	5.81	5.81	5.82	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.02	5.03	5.03	5.03	5.03	5.03	4.72	1.76	5.59

NORTH SECTION

SL. NO.	PARTICULARS	Year of Quarry Operation																										Total
		11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	
I.	COAL PRODUCTION (Mt)																											
	TOTAL	3.00	3.00	4.00	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	3.27	0.00	107.77
	- PUREWA TOP	0.68	0.69	0.91	0.84	0.67	0.67	0.67	0.67	0.77	0.88	0.88	0.88	0.88	0.84	0.84	0.84	0.84	0.83	0.59	0.59	0.59	0.59	0.59	0.59	0.42	0.00	18.24
	- PUREWA BOTTOM	1.04	1.04	1.38	1.47	1.41	1.41	1.41	1.41	1.40	1.35	1.35	1.35	1.35	1.38	1.38	1.38	1.38	1.37	1.26	1.26	1.26	1.26	1.26	1.26	0.82	0.00	32.74
	- TURRA SEAM	1.28	1.27	1.71	2.19	2.42	2.42	2.42	2.42	2.33	2.27	2.27	2.27	2.27	2.28	2.28	2.28	2.28	2.30	2.65	2.65	2.65	2.65	2.65	2.65	1.93	0.00	56.79
II.	VOLUME OF OBR (Mm3)																											
	TOTAL	13.66	13.66	18.77	23.87	23.89	22.95	22.99	22.96	22.94	21.90	21.89	21.89	22.01	23.65	23.67	23.67	23.67	24.15	25.33	25.33	25.33	25.33	25.33	25.33	22.15	6.53	572.34
	- BY DRAGLINE	2.37	2.37	3.36	3.78	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	4.04	4.04	4.04	4.04	4.04	4.04	4.04	0.00	98.62
	- BY SHOVEL-DUMPER (Dept.)	3.66	3.66	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	104.28
	- BY SHOVEL-DUMPER (Outsourcing)	7.26	7.26	10.07	15.41	15.52	14.58	14.62	14.59	13.97	13.33	13.32	13.32	13.44	15.07	15.11	15.11	15.11	15.55	16.60	16.60	16.60	16.60	16.60	16.60	13.49	2.49	358.28
	- IN SEAM BAND	0.37	0.37	0.50	0.63	0.64	0.64	0.64	0.64	0.64	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.64	0.64	0.64	0.64	0.64	0.64	0.57	0.00	15.19
	REHANDLING(Mm3)	0.98	0.98	1.30	1.44	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.31	1.31	1.31	1.31	1.31	1.31	1.31	0	33
III.	STRIPPING RATIO (m3/t)	4.55	4.55	4.69	5.30	5.31	5.10	5.11	5.10	5.01	4.87	4.86	4.86	4.89	5.25	5.25	5.26	5.26	5.38	5.63	5.63	5.63	5.63	5.63	5.63	6.77		5.31

TOTAL (SOUTH + NORTH)

SL. NO.	PARTICULARS	Year of Quarry Operation																										Total
		11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	
I	COAL PRODUCTION (Mt)																											
	TOTAL	6.00	6.00	8.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	8.77	2.68	241.45
	- PUREWA TOP	1.17	1.21	1.57	1.76	1.62	1.78	1.77	1.77	1.86	1.81	1.81	1.81	1.83	1.79	1.78	1.78	1.78	1.74	1.41	1.41	1.41	1.41	1.41	1.41	1.24	0.40	40.72
	- PUREWA BOTTOM	2.08	2.05	2.76	3.36	3.28	3.12	3.12	3.13	3.13	3.23	3.23	3.23	3.23	3.18	3.41	3.41	3.41	3.39	3.25	3.25	3.25	3.25	3.25	3.25	2.91	0.87	79.33
	- TURRA SEAM	2.75	2.74	3.67	4.88	5.10	5.10	5.11	5.10	5.01	4.96	4.96	4.96	4.94	4.83	4.81	4.81	4.81	4.87	5.34	5.34	5.34	5.34	5.34	5.34	4.62	1.81	121.40
II	VOLUME OF OBR (Mm3)																											
	TOTAL	31.40	31.40	39.10	59.02	59.06	59.04	59.08	59.06	59.07	59.04	59.04	59.03	59.04	59.02	59.03	59.02	59.03	59.05	56.59	53.37	53.39	53.39	53.39	53.59	47.27	13.83	1380.28
	- BY DRAGLINE	6.03	6.03	7.40	7.82	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	8.08	8.08	8.08	8.08	8.08	8.08	8.08	8.08	4.04	198.90
	- BY SHOVEL-DUMPER (Dept.)	7.26	7.26	10.07	15.41	15.52	14.58	14.62	14.59	13.97	13.33	13.32	13.32	13.44	15.07	15.11	15.11	15.11	15.55	16.60	16.60	16.60	16.60	16.60	16.60	13.49	2.49	358.28
	- BY SHOVEL-DUMPER (Outsourcing)	17.29	17.29	25.71	39.17	35.16	36.10	36.11	36.11	36.54	37.16	37.17	37.16	37.03	35.42	35.38	35.37	35.38	34.96	29.47	27.25	27.27	27.27	27.27	27.47	20.41	6.90	699.61
	- IN SEAM BAND	0.83	0.83	1.12	1.42	1.43	1.43	1.43	1.43	1.42	1.42	1.42	1.42	1.42	1.41	1.41	1.41	1.41	1.42	1.44	1.44	1.44	1.44	1.44	1.44	1.28	0.40	34.41
	REHANDLING(Mm3)	2.48	2.48	2.7	2.75	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.62	2.62	2.62	2.62	2.62	2.62	2.62	1.31	67.44
II	STRIPPING RATIO (m3/t)	5.23	5.23	6.09	5.59	5.59	5.56	5.59	5.59	5.59	5.56	5.56	5.56	5.53	5.58	5.58	5.58	5.58	5.59	5.56	5.34	5.34	5.34	5.34	5.36	4.55	5.16	5.74

BINA PROJECT

Table No 6.0

BINA-KAKRI AMALGAMATION OCP (10 Mtpa)

Calendar Programme of Excavation (Option IV)

SOUTH SECTION

SL. NO	PARTICULARS	Year of Quarry Operation																										Total
		11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	
I	COAL PRODUCTION (Mt)																											
	TOTAL	3.00	3.00	4.00	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	2.63	133.63
	- PUREWA TOP	0.49	0.62	0.66	0.92	0.85	1.11	1.10	1.10	1.09	0.93	0.93	0.93	0.93	0.95	0.94	0.94	0.94	0.91	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.40	22.48
	- PUREWA BOTTOM	1.04	1.01	1.09	1.69	1.87	1.71	1.71	1.72	1.73	1.88	1.88	1.88	1.88	2.00	2.03	2.03	2.03	2.02	1.99	1.99	1.99	1.99	1.99	1.99	1.99	0.97	46.59
	- TURRA SEAM	1.47	1.47	1.96	2.89	2.68	2.68	2.69	2.68	2.68	2.69	2.69	2.69	2.69	2.55	2.53	2.53	2.53	2.57	2.69	2.69	2.69	2.69	2.69	2.69	2.69	1.31	64.61
II	VOLUME OF OBR (Mm3)																											
	TOTAL	15.71	15.70	20.31	31.95	31.95	31.94	31.99	31.96	31.95	31.96	31.95	31.95	31.95	31.93	31.94	31.94	31.94	31.94	27.64	27.63	27.64	27.64	27.64	27.64	25.57	13.43	748.63
	- BY DRAGLINE	3.66	3.66	4.56	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	3.62	137.66
	- BY SHOVEL-DUMPER (Dept.)	3.35	3.35	4.35	7.35	7.15	6.21	6.25	6.22	6.20	5.80	5.89	5.89	5.89	6.26	6.10	6.10	6.10	6.04	7.76	7.76	7.76	7.76	7.76	7.76	7.79	2.71	162.97
	- BY SHOVEL-DUMPER (Outsourcing)	8.24	8.23	10.03	18.27	18.49	19.42	19.42	19.45	19.44	19.75	19.74	19.73	19.73	19.57	19.53	19.53	19.53	19.10	13.56	13.55	13.56	13.56	13.56	13.56	11.95	6.99	427.77
	- IN SEAM BAND	0.46	0.46	0.82	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.78	0.78	0.78	0.78	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.71	0.40	19.23
	REHANDLING(Mm3)	1.5	1.5	2.06	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	1.58	56.69
III	STRIPPING RATIO (m3/t)	5.24	5.23	7.58	5.81	5.81	5.81	5.82	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.03	5.02	5.03	5.03	5.03	5.03	4.72	5.16	5.59

NORTH SECTION

SL. NO	PARTICULARS	Year of Quarry Operation																										Total
		11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	
I	COAL PRODUCTION (Mt)																											
	TOTAL	3.00	3.00	4.00	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	3.27	0.00	107.77
	- PUREWA TOP	0.68	0.69	0.91	0.84	0.87	0.87	0.87	0.87	0.77	0.88	0.88	0.88	0.88	0.84	0.84	0.84	0.84	0.83	0.69	0.69	0.69	0.69	0.69	0.69	0.42	0.00	18.24
	- PUREWA BOTTOM	1.04	1.04	1.38	1.47	1.41	1.41	1.41	1.41	1.40	1.35	1.35	1.35	1.35	1.38	1.38	1.38	1.31	1.37	1.26	1.26	1.26	1.26	1.26	1.26	0.92	0.00	32.74
	- TURRA SEAM	1.28	1.27	1.71	2.19	2.42	2.42	2.42	2.42	2.33	2.27	2.27	2.27	2.27	2.28	2.28	2.28	2.28	2.30	2.65	2.65	2.65	2.65	2.65	2.65	1.93	0.00	56.75
II	VOLUME OF OBR (Mm3)																											
	TOTAL	15.70	15.70	24.79	27.87	27.91	27.90	27.91	27.90	27.91	27.87	27.89	27.87	27.89	27.86	27.85	27.85	27.8	27.95	27.95	25.74	25.75	25.75	25.75	25.95	17.30	0.00	648.76
	- BY DRAGLINE	2.37	2.37	3.39	4.23	4.60	4.60	4.60	4.60	4.68	4.74	4.74	4.74	4.83	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	4.78		119.90
	- BY SHOVEL-DUMPER (Dept.)	3.91	3.91	5.55	8.10	5.88	5.08	5.50	5.08	5.50	5.10	5.10	5.10	5.10	5.90	5.90	5.90	5.90	5.90	5.88	5.88	5.88	5.88	5.88	5.88	3.48	0.00	127.57
	- BY SHOVEL-DUMPER (Outsourcing)	9.05	9.05	15.38	16.91	16.62	16.56	16.63	16.68	17.09	17.40	17.42	17.40	17.29	15.84	15.83	15.84	15.80	15.80	15.90	13.69	13.70	13.70	13.70	13.90	8.46	0.00	376.04
	- IN SEAM BAND	0.37	0.37	0.09	0.63	0.84	0.64	0.64	0.64	0.64	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.64	0.64	0.64	0.64	0.64	0.64	0.51	0.00	19.16
	REHANDLING(Mm3)	0.68	0.68	1.39	1.75	1.90	1.90	1.90	1.90	1.90	1.86	1.86	1.86	2.00	2.28	2.28	2.28	2.27	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	0.00	49.87
III	STRIPPING RATIO (m3/t)	5.23	5.23	6.20	6.19	6.20	6.20	6.20	6.20	6.20	6.19	6.20	6.19	6.20	6.20	6.20	6.20	6.20	6.20	6.20	6.21	5.72	5.72	5.72	5.72	5.77	6.29	6.02

TOTAL (SOUTH + NORTH)

SL. NO	PARTICULARS	Year of Quarry Operation																										Total
		11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	
I	COAL PRODUCTION (Mt)																											
	TOTAL	6.00	6.00	8.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	5.77	2.63	241.40
	- PUREWA TOP	1.17	1.31	1.57	1.76	1.82	1.78	1.77	1.77	1.86	1.81	1.81	1.81	1.81	1.79	1.78	1.78	1.78	1.74	1.51	1.51	1.51	1.51	1.51	1.51	1.24	0.40	40.72
	- PUREWA BOTTOM	2.08	2.05	2.76	3.36	3.28	3.12	3.12	3.13	3.13	3.23	3.23	3.23	3.23	3.38	3.41	3.41	3.41	3.39	3.25	3.25	3.25	3.25	3.25	3.25	2.91	0.97	79.33
	- TURRA SEAM	2.75	2.74	3.67	4.88	5.10	5.10	5.11	5.10	5.01	4.96	4.96	4.96	4.96	4.93	4.91	4.91	4.91	4.87	5.34	5.34	5.34	5.34	5.34	5.34	4.02	1.31	121.40
II	VOLUME OF OBR (Mm3)																											
	TOTAL	31.40	31.40	55.10	59.82	59.86	59.84	59.89	59.86	59.87	59.84	59.84	59.83	59.81	59.82	59.83	59.82	59.83	59.85	55.59	53.37	53.39	53.39	53.59	53.59	43.27	13.43	1395.39
	- BY DRAGLINE	6.03	6.03	8.34	9.75	10.12	10.12	10.12	10.12	10.23	10.26	10.26	10.26	10.35	11.04	11.04	11.04	11.04	11.04	11.04	11.04	11.04	11.04	11.04	11.04	10.30	3.62	257.52
	- BY SHOVEL-DUMPER (Dept.)	7.26	7.26	9.93	13.46	13.13	12.13	12.25	12.20	11.70	11.00	10.99	10.99	11.02	11.90	12.00	12.00	12.00	12.44	13.64	13.64	13.64	13.64	13.64	13.64	11.27	2.71	289.64
	- BY SHOVEL-DUMPER (Outsourcing)	17.29	17.29	25.71	35.17	35.18	36.10	36.11	35.11	36.54	37.16	37.17	37.16	37.05	35.40	35.36	35.37	35.38	34.96	29.47	27.25	27.27	27.27	27.27	27.47	20.41	6.99	800.81
	- IN SEAM BAND	0.83	0.83	1.12	1.42	1.43	1.43	1.43	1.43	1.42	1.42	1.42	1.42	1.41	1.41	1.41	1.41	1.42	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.28	0.40	39.41
	REHANDLING(Mm3)	2.18	2.18	3.45	4.03	4.18	4.18	4.18	4.18	4.21	4.24	4.24	4.24	4.24	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	1.58	156.67
III	STRIPPING RATIO (m3/t)	5.23	5.23	6.03	5.98	5.98	5.98	5.99	5.99	5.99	5.98	5.98	5.98	5.99	5.99	5.98	5.98	5.98	5.99	5.56	5.34	5.34	5.34	5.34	5.38	4.93	5.16	5.78

GENERAL MANAGER
BINA PROJECT

Table No.6.7

CMPDI

BINA-KAKRI AMALGAMATION OCP (10 Mtpa)

Calendar Programme of Excavation (Option III) - Natural OB

SOUTH SECTION

Sl. No.	PARTICULARS	Year of Quarry Operation																										Total
		11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	
I.	COAL PRODUCTION (Mt)																											
	TOTAL	3.00	3.00	4.00	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	3.50	2.68	133.68
	- PUREWA TOP	0.49	0.52	0.60	0.92	0.95	1.11	1.10	1.10	1.09	0.93	0.93	0.93	0.93	0.95	0.94	0.94	0.94	0.94	0.91	0.82	0.82	0.82	0.82	0.82	0.82	0.40	22.48
	- PUREWA BOTTOM	1.04	1.01	1.35	1.85	1.87	1.31	1.31	1.32	1.32	1.83	1.88	1.88	1.88	2.02	2.05	2.05	2.05	2.05	2.02	1.89	1.99	1.99	1.99	1.99	1.99	0.97	46.59
	- TURRA SEAM	1.47	1.47	1.95	2.93	2.68	2.68	2.69	2.68	2.69	2.69	2.69	2.69	2.69	2.53	2.53	2.53	2.53	2.53	2.57	2.69	2.69	2.69	2.69	2.69	2.69	1.31	64.61
II.	VOLUME OF OBR (Mm3)																											
	TOTAL	19.52	19.52	21.42	29.56	29.55	31.17	31.21	31.18	31.17	31.35	31.34	31.34	31.34	32.51	32.78	32.78	32.78	31.88	29.61	29.51	29.51	29.51	29.51	29.51	29.85	14.90	799.62
	- BY DRAGLINE	3.66	3.66	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	104.28
	- BY SHOVEL-DUMPER (Dept.)	3.35	3.35	5.32	8.86	8.03	7.69	7.73	7.72	7.68	7.38	7.37	7.37	7.37	7.55	7.55	7.55	7.55	8.02	9.24	9.24	9.24	9.24	9.24	9.24	9.27	2.68	195.34
	- BY SHOVEL-DUMPER (Outsourcing)	8.05	8.05	11.03	15.88	16.49	16.65	16.65	16.65	16.65	15.14	15.14	15.14	15.14	20.15	20.26	20.26	20.26	19.03	15.43	15.43	15.43	15.43	15.43	15.43	16.83	7.38	427.77
	- IN SEAM BAND	0.46	0.46	0.62	0.78	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.78	0.78	0.78	0.78	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.71	0.40	19.20
	REHANDLING(Mm3)	1.5	1.5	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	34.44
III	STRIPPING RATIO (m3/t)	5.17	5.17	5.35	5.38	5.44	5.67	5.67	5.67	5.67	5.70	5.70	5.70	5.70	5.91	5.90	5.90	5.90	5.80	5.37	5.37	5.37	5.37	5.37	5.37	5.43	5.56	5.59

NORTH SECTION

I.	COAL PRODUCTION (Mt)																											
	TOTAL	3.00	3.00	4.01	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.52	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	3.27	0.00	107.77
	- PUREWA TOP	0.68	0.69	0.91	0.84	0.87	0.87	0.87	0.87	0.77	0.86	0.86	0.86	0.86	0.84	0.84	0.84	0.84	0.83	0.59	0.59	0.59	0.59	0.59	0.59	0.42	0.00	15.24
	- PUREWA BOTTOM	1.04	1.04	1.38	1.47	1.41	1.41	1.41	1.41	1.43	1.35	1.35	1.35	1.35	1.38	1.38	1.38	1.38	1.37	1.26	1.26	1.26	1.26	1.26	1.26	0.92	0.00	32.74
	- TURRA SEAM	1.28	1.27	1.71	2.19	2.42	2.42	2.42	2.42	2.33	2.27	2.27	2.27	2.27	2.29	2.29	2.29	2.28	2.30	2.65	2.65	2.65	2.65	2.65	2.65	1.93	0.00	56.73
II.	VOLUME OF OBR (Mm3)																											
	TOTAL	15.83	15.88	22.61	24.84	24.36	24.36	24.36	24.36	26.40	29.11	29.12	29.10	28.43	32.03	32.03	32.03	32.03	31.64	25.75	25.74	25.75	25.75	25.75	25.75	18.80	0.00	640.75
	- BY DRAGLINE	2.37	2.37	3.38	3.78	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	4.04	4.04	4.04	4.04	4.04	4.04	4.04	0.00	94.60
	- BY SHOVEL-DUMPER (Dept.)	3.91	3.91	5.55	6.55	6.69	6.69	6.69	6.69	6.69	5.95	5.95	5.95	6.07	7.53	7.53	7.53	7.53	7.53	7.36	7.36	7.36	7.36	7.36	7.36	4.22	0.00	162.51
	- BY SHOVEL-DUMPER (Outsourcing)	9.24	9.23	13.10	13.88	13.14	13.14	13.14	13.14	15.55	17.64	17.65	17.63	17.84	19.59	19.59	19.59	19.59	19.60	13.70	13.69	13.70	13.70	13.70	13.70	9.06	0.00	376.04
	- IN SEAM BAND	0.32	0.33	0.58	0.63	0.64	0.64	0.64	0.64	0.64	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.65	0.64	0.64	0.64	0.64	0.64	0.51	0.00	15.78
	RE HANDLING(Mm3)	0.95	0.96	1.39	1.49	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.31	1.31	1.31	1.31	1.31	1.31	1.31	0	33
III	STRIPPING RATIO (m3/t)	5.29	5.29	5.63	5.52	5.41	5.41	5.41	5.41	5.87	6.25	6.25	6.24	6.32	7.12	7.12	7.12	7.12	7.03	5.72	5.72	5.72	5.72	5.72	5.72	5.75		5.92

TOTAL (SOUTH + NORTH)

I.	COAL PRODUCTION (Mt)																											
	TOTAL	6.00	6.00	8.01	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	6.77	2.68	241.45
	- PUREWA TOP	1.17	1.21	1.51	1.76	1.82	1.78	1.77	1.77	1.86	1.81	1.81	1.81	1.81	1.78	1.78	1.78	1.78	1.74	1.41	1.41	1.41	1.41	1.41	1.41	1.24	0.40	40.72
	- PUREWA BOTTOM	2.08	2.05	2.73	3.39	3.28	3.52	3.52	3.13	3.13	3.23	3.23	3.23	3.23	3.38	3.41	3.41	3.41	3.39	3.25	3.25	3.25	3.25	3.25	3.25	2.91	0.97	79.33
	- TURRA SEAM	2.75	2.74	3.67	4.85	5.10	5.10	5.11	5.10	5.01	4.96	4.96	4.96	4.96	4.82	4.81	4.81	4.81	4.82	5.34	5.34	5.34	5.34	5.34	5.34	4.62	1.31	121.40
II.	VOLUME OF OBR (Mm3)																											
	TOTAL	31.40	31.40	43.92	54.40	54.31	55.53	55.57	55.54	57.56	59.46	59.46	59.44	59.77	64.54	64.81	64.81	64.81	63.52	55.36	55.25	55.26	55.26	55.26	55.26	48.65	14.90	1,395.38
	- BY DRAGLINE	6.03	6.03	7.42	7.82	7.93	7.93	7.95	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	8.08	8.08	8.08	8.08	8.08	8.08	8.08	4.04	198.90
	- BY SHOVEL-DUMPER (Dept.)	7.26	7.26	10.87	15.41	15.32	14.38	14.42	14.33	13.97	13.83	13.82	13.82	13.44	15.07	15.11	15.11	15.11	15.55	16.60	16.60	16.60	16.60	16.60	16.60	13.49	2.40	358.25
	- BY SHOVEL-DUMPER (Outsourcing)	17.29	17.28	24.64	29.75	28.65	31.79	31.79	31.79	34.24	36.78	36.75	36.77	36.98	40.36	40.36	40.36	40.36	39.63	29.14	29.13	29.14	29.14	29.14	29.14	25.79	7.98	823.01
	- IN SEAM BAND	0.83	0.83	1.12	1.42	1.43	1.43	1.43	1.43	1.42	1.42	1.42	1.42	1.42	1.41	1.41	1.41	1.41	1.42	1.44	1.44	1.44	1.44	1.44	1.44	1.28	0.40	34.41
	RE HANDLING(Mm3)	2.48	2.48	2.7	2.75	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.62	1.31	67.44
III	STRIPPING RATIO (m3/t)	5.23	5.23	5.49	5.44	5.43	5.55	5.56	5.55	5.76	5.95	5.95	5.94	5.98	6.43	6.48	6.48	6.48	6.35	5.53	5.53	5.53	5.53	5.53	5.53	5.55	5.56	5.78

GENERAL MANAGER
BINA PROJECT

Table No.8.8

CVPD/

BINA-KHARI AMALGAMATION OPENCAST PROJECT (10 Mtpa)

SUMMARISED CALENDAR PROGRAMME OF EXCAVATIN WITH EQUIPMENT PHASING (OPTION-I)

Sl. no	PARTICULARS				Year of Quarry Operation																												Total
					11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37		
I.	COAL PRODUCTION (Mt)																																
	TOTAL				6.00	6.00	6.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	8.77	2.63	281.63
	- PUNEWA TOP				1.37	1.21	1.57	1.76	1.62	1.78	1.77	1.77	1.86	1.81	1.81	1.81	1.81	1.79	1.78	1.76	1.78	5.74	1.41	1.41	1.41	1.41	1.41	1.41	1.24	0.40	40.72
	- PUNEWA BOTTOM				2.06	2.05	2.76	3.36	3.26	3.12	3.12	3.13	3.13	3.23	3.23	3.23	3.23	3.58	3.41	3.41	3.41	3.39	3.25	3.25	3.25	3.25	3.25	3.25	2.93	0.97	70.33
	- TURRA SEAM				2.75	2.74	3.67	4.88	5.10	5.10	5.11	5.10	5.01	4.96	4.96	4.96	4.96	4.63	4.81	4.83	4.81	4.87	5.34	5.34	5.34	5.34	5.34	5.34	4.62	1.26	121.49
II	VOLUME OF OBR (Mm3)																																
	TOTAL				31.40	31.40	55.10	59.82	59.86	59.84	59.89	59.85	59.87	59.84	59.84	59.83	59.84	59.82	59.83	59.82	59.82	59.85	56.59	53.37	53.39	53.39	53.39	53.39	43.27	13.83	1385.38
	- BY DRAGLINE				6.03	6.03	7.4	7.82	7.93	7.93	7.93	7.95	7.93	7.93	7.93	7.93	7.93	7.95	7.93	7.93	7.93	7.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	190.60
	- BY SHOVEL-DUMPER				24.54	24.54	46.58	50.59	50.50	50.49	50.55	50.50	50.51	50.49	50.49	50.50	50.49	50.47	50.49	50.48	50.49	50.51	46.07	43.85	43.87	43.87	43.87	44.07	33.91	9.39	1162.07
	- IN SEAM BAND				0.83	0.83	1.12	1.42	1.43	1.43	1.43	1.40	1.42	1.42	1.42	1.42	1.42	1.41	1.41	1.41	1.41	1.42	5.44	1.44	1.44	1.44	1.44	1.44	1.36	0.40	32.61
	REHANDLING(Mm3)				2.48	2.48	2.7	2.75	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.62	2.62	2.62	2.62	2.62	2.62	1.31	0.44	
III.	STRIPPING RATIO (m3/t)				5.23	5.23	8.69	5.98	5.99	5.98	5.99	5.99	5.99	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.66	5.34	5.34	5.34	5.34	5.36	4.93	5.16	5.78
	HEMM	SIZE/CAP.	Existing as on 31.10.2010	New Addl. PR Proun. (6 Mtpa)	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	Total		
A.	OBR :-																																
1	Dragline	24m3/88m3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2			
2	Dragline	10 m3/85m3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2			
3	Electric rope shovel	20 m3					6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	6	6	6	6	6	5	2			
4	Electric rope shovel	10 m3	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	1			
5	Hydraulic shovel (Elec /Diesel)	10 m3	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	1	2			
6	Rear Dumper	180T					65	65	65	66	66	66	67	66	66	66	66	65	65	65	65	64	54	50	50	50	50	51	38	13	63		
7	Rear Dumper	100T	14		14	14	32	61	61	61	61	61	61	61	61	61	61	61	63	63	63	63	69	69	69	69	69	69	50	11	69		
8	Rear Dumper	85T	20	48	20	20	20																										
9	Drill	250 mm	11	14	5	5	25	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	25	24	24	24	24	24	19	6	25	
10	Dozer	770 HP					4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4	4	4	3	5	
11	Dozer	410 HP	4	11	5	5	14	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	12	12	12	12	12	12	8	15		
B.	Coal Winning :-																																
1	Hydraulic shovel (Elec./Diesel)	8-10 m3					2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
2	Hydraulic ff fce (Elec./Diesel)	4.5/5.5 m3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2	1			
5	Rear Dumper	100 T					9	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	25	10	28		
4	Rear Dumper(OB)	85 T	17	12	17	17	17																										
5	Dril	160 mm	3	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	6	4	3		
6	Dozer with ripper	410 HP					1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
7	Dozer	410 HP	6	4	4	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	4	2	6		
8	F.E Loder	5.74/6.1	1	1	1	1																											
C.	Common :-																																
1	Grader	250 HP	1	2	2	2	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6			
2	Grader	145 HP	1	1	1	1																											
3	Crane (Hydraulic)	75 T					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
4	Crane (Hydraulic)	30/50 T		3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
5	Crane (Pick and Carry)	10 T	4		2	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
6	Diesel Backhoe	2.5 m3		2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
7	F.E Loder	5.74/6.1	1				2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
8	Wheel Dozer	300 HP	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
9	Hyd. Shovel	1.2 m3		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
D	Reclamation :-																																
1	Hyd. Shovel	2.5 m3		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
2	Dozer	410 HP	2	4	2	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
3	Grader	250 HP	2	2	2	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
4	Water Sprinklers	64 KL					5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6		
5	Water Sprinklers	28 KL	4	6	6	6	4	4	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6		
6	Tipping Trucks	12 T		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		

Chapter-8, Page-10

GENERAL MANAGER
BINA PROJECT

Table No.8.9

CMPDI

BINA-KAKRI AMALGAMATION OPENCAST PROJECT (13 Mtpa)

SUMMARISED CALENDAR PROGRAMME OF EXCAVATIN & EQUIPMENT PHASING(OPTION-II)

Sl. No.	PARTICULARS				Year of Quarry Operation																												Total
					11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37		
I	COAL PRODUCTION (Mt)																																
	TOTAL				6.00	6.00	8.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	8.77	2.69	241.45
	- PUREWA TOP				1.17	1.21	1.57	1.76	1.82	1.78	1.77	1.77	1.88	1.81	1.81	1.81	1.81	1.79	1.78	1.78	1.78	1.74	1.41	1.41	1.41	1.41	1.41	1.41	1.24	0.40	40.72
	- PUREWA BOTTOM				2.08	2.05	2.78	3.38	3.28	3.12	3.12	3.13	3.13	3.23	3.23	3.23	3.23	3.38	3.41	3.41	3.41	3.39	3.25	3.25	3.25	3.25	3.25	3.25	2.91	0.97	79.33
	- TURRA SEAM				2.75	2.74	3.67	4.86	5.10	5.10	5.11	5.10	5.01	4.96	4.96	4.96	4.96	4.83	4.81	4.81	4.81	4.87	5.34	5.34	5.34	5.34	5.34	5.34	4.62	1.31	121.40
II.	VOLUME OF OBR (Mm3)																																
	TOTAL				31.40	31.40	55.10	59.82	59.84	59.84	59.85	59.85	59.87	59.84	59.84	59.84	59.84	59.82	59.83	59.82	59.83	59.85	55.59	53.37	53.35	53.35	53.35	53.35	43.27	13.83	1395.38
	- 6Y DRAGLINE				6.03	6.03	8.34	9.75	10.12	10.12	10.12	10.12	10.2	10.25	10.25	10.25	10.25	11.04	11.04	11.04	11.04	11.04	11.04	11.04	11.04	11.04	11.04	11.04	10.30	3.82	257.52
	- 3Y SHOVEL-DUMPER				24.54	24.54	45.84	48.68	48.31	48.29	48.34	48.31	48.24	48.14	48.14	48.14	48.27	47.36	47.36	47.37	47.36	47.40	43.11	40.89	40.91	40.91	41.11	31.69	5.61	1103.44
	- N SEAM BAND				0.83	0.83	1.12	1.42	1.42	1.43	1.43	1.43	1.42	1.42	1.42	1.42	1.41	1.41	1.41	1.41	1.41	1.42	1.44	1.44	1.44	1.44	1.44	1.28	0.40	34.41
	RE HANDLING(Mm3)				2.45	2.45	3.45	4.05	4.18	4.18	4.18	4.18	4.21	4.24	4.24	4.24	4.29	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	1.58	129.61
III.	STRIPPING RATIO (m3/t)				5.23	5.23	6.89	5.98	5.99	5.98	5.99	5.99	5.99	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.56	5.34	5.34	5.34	5.34	5.56	4.93	5.16	5.78
	HEMM :-	SIZE/CAP.	Existing as on 31.10.2010	Nos. Extn PR Provn. (6 Mtpa)	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	Total				
A.	OBR :-																																
1	Dragline	24m3/168mR	2	2	2	2	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4			
2	Dragline	15m3/66mR	2	2	2	2	1																										
3	Electric rope shovel	20 m3					6	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	7	6	6	6	6	5	3	1			
4	Electric rope shovel	15 m3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	1	4			
5	Hydraulic shovel (Elec./Diesel)	10 m3	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2			
6	Rear Dumper	190T					65	65	65	66	66	66	67	68	68	68	68	66	66	65	65	64	54	50	50	50	51	38	13	68			
7	Rear Dumper	100T	14		14	14	26	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	51	53	53	53	48	12	57			
8	Rear Dumper	85T	30	48	20	20	20																										
9	Drill	311 mm					2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4			
10	Drill	250 mm	11	14	5	5	18	23	23	23	23	23	23	23	23	23	22	22	22	22	22	22	20	19	19	19	19	15	5	23			
11	Dozer	320 HP	4				4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4	4	3	5			
12	Dozer	410 HP		11	5	5	14	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	12	12	12	12	12	12	8	15			
B.	Coal Winning :-																																
1	Hydraulic shovel (Elec./Diesel)	8-10 m3					2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
2	Hydraulic Shovel (Elec./Diesel)	4.5/5.5 m3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2	1	4		
3	Rear Dumper	100 T					9	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	25	10	28			
4	Rear Dumper(CB)	85 T	17	17	17	17	17																										
5	Drill	160 mm	3	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	5	4	1			
6	Dozer with ripper	410 HP					1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
7	Dozer	410 HP	4	4	4	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	4	2	6		
8	F E Loder	5.7/6.1	1	1	1	1																											
C.	Common :-																																
1	Grader	280 HP	1	2	2	2	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6			
2	Grader	145 HP	1	1	1	1																											
3	Crane (Hydraulic)	75 T					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
4	Crane (Hydraulic)	30/50 T		3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
5	Crane (Pick and Carry)	10 T	4		2	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4			
6	Diesel Backhoe	2.5 m3		2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
7	F E Loder	5.7/6.1	1				2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
8	Wheel Dozer	300 HP	2	2	2	2	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
9	Hyd. Shovel	1.2 m3		2	2	2	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
D.	Reclamation :-																																
1	Hyd. Shovel	2.5 m3		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
2	Dozer	410 HP	2	4	2	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5			
3	Grader	280 HP	2	2	2	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4			
4	Water Sprinklers	64 KL				5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	6	6	6	6	6	6	6			
5	Water Sprinklers	28 KL	4	6	6	6	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4			
6	Tipping Trucks	12 T		5	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5			

GENERAL MANAGER
BINA PROJECT

Table No 8.10

BINA KHARI AMALGAMATION OPENCAST PROJECT (10 Mtpa)

SUMMARISED CALENDAR PROGRAMME OF EXCAVATION & EQUIPMENT PHASING (OPTION III)

SL no.	PARTICULARS				Year of Quarry Operation																													Total
					11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37		
I	COAL PRODUCTION (Mt)																																	
	TOTAL				6.00	6.00	8.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	8.77	2.66	241.43
	- PUREWA TOP				1.17	1.21	1.57	1.78	1.62	1.78	1.77	1.77	1.80	1.81	1.81	1.81	1.81	1.81	1.78	1.78	1.78	1.78	1.78	1.41	1.41	1.41	1.41	1.41	1.24	0.43	40.72
	- PUREWA BOTTOM				2.08	2.01	2.78	3.16	3.28	3.12	3.12	3.13	3.15	3.25	3.21	3.21	3.22	3.22	3.39	3.41	3.41	3.41	3.39	3.25	3.25	3.25	3.25	3.25	3.25	2.91	0.92	78.33
	- TURGA SEAM				2.75	2.79	3.65	4.06	5.10	5.10	5.11	5.10	5.05	4.94	4.98	4.98	4.97	4.97	4.83	4.81	4.81	4.81	4.83	5.34	5.34	5.34	5.34	5.34	5.34	4.62	1.31	121.43
II	VOLUME OF OBR (Mcm)																																	
	TOTAL				31.40	31.40	33.10	38.02	38.08	38.04	38.09	37.80	37.81	37.85	38.05	37.81	37.81	37.82	37.82	37.82	38.85	38.85	38.99	51.37	51.39	51.39	51.39	51.39	51.39	43.27	13.83	1365.38
	- BY DRAGLINE				6.83	6.83	7.6	7.62	7.63	7.63	7.63	7.63	7.63	7.63	7.63	7.63	7.63	7.63	7.63	7.63	7.63	7.63	7.63	8.08	8.08	8.08	8.08	8.08	8.08	6.84	1.64	195.99
	- BY SHOVEL-DUMPER (Dayr.)				7.26	7.26	10.67	15.41	15.53	15.58	15.62	15.34	15.53	15.83	15.92	15.92	15.95	15.97	15.97	15.97	15.97	15.97	15.95	16.80	16.80	16.80	16.80	16.80	16.80	13.49	2.48	336.05
	- BY SHOVEL-DUMPER (Outsourcing)				17.29	17.29	20.71	25.17	25.18	25.18	25.11	25.11	25.04	25.19	25.19	25.19	25.19	25.19	25.19	25.19	25.19	25.19	25.19	26.49	26.51	26.51	26.51	26.51	26.51	20.94	6.51	833.61
	- IN SEAM BAND				0.83	0.83	1.13	1.42	1.45	1.45	1.43	1.43	1.43	1.42	1.42	1.42	1.41	1.41	1.41	1.41	1.41	1.41	1.43	1.44	1.44	1.44	1.44	1.44	1.44	1.28	0.43	54.91
	RE-HANDLING(Mcm)				2.49	2.49	2.7	2.75	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.62	2.62	2.62	2.62	2.62	2.62	2.62	1.31	67.94
III	STRIPPING RATIO (m3/t)				5.23	5.23	4.14	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	3.81	4.93	5.19	5.18
	ITEM	SIZE/CAP.	Existing as on 31.03.2016	Extra Cum (To Procure) (5 Mtpa)	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	Total					
A	OMS :-																																	
1	Dragline	24m/2355m3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2			
2	Dragline	10 m/356m3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
3	Electric rope shovel	20 m3																																
4	Electric rope shovel	10 m3	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	1	5			
5	Hydraulic shovel (Elec./Diesel)	15 m3	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2			
7	Rear Dumper	190T																																
8	Rear Dumper	100T	14		14	14	32	61	61	61	61	61	61	61	61	61	61	61	61	61	63	63	63	63	63	63	63	63	55	11	89			
9	Rear Dumper	85T	20	48	20	20	25																											
10	Dozer	250 Hp	11	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	10	5	14			
11	Dozer	170 HP																																
12	Dozer	410 HP	4	11	11	11	11	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	12	12	12	12	12	12	8	15			
B	Coal Winning :-																																	
1	Hydraulic shovel Elec./Diesel	8.10 m3					2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
2	Hydraulic Shovel (Elec./Diesel)	4.5/5.5 m3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	1	4			
3	Rear Dumper	100 T					8	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	10	28			
4	Rear Dumper(CB)	85 T	12	12	12	12	12																											
5	Dozer	180 Hp	3	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	5	4	7			
6	Dozer with ripper	410 HP					1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
7	Dozer	410 HP	4	5	4	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	4	2	6			
8	F.E Loder	3.7m3	1	1	1	1																												
C	Common :-																																	
1	Grader	200 HP	1	2	2	2	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	4			
2	Grader	145 HP	1	1	1	1																												
3	Crane (Hydraulic)	75/100 T																																
4	Crane (Hydraulic)	30/50 T		2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3			
5	Crane (Pick and Carry)	15 T	4				4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4			
6	Diesel Backhoe	2.5 m3		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
7	F.E Loder	3.7m3	1		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
8	Wheel Dozer	300HP	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
9	Hyd. Shovel	1.2 m3		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
D	Reclamation :-																																	
1	Hyd. Shovel	2.5 m3		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
2	Dozer	410 HP	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4			
3	Dozer	280 HP	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
4	Water Sprinkers	64 KL																																
5	Water Sprinkers	28 KL	6	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8			
6	Tipping Trucks	12 T	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5			

Contd. P. Page 12

GENERAL MANAGER
BINA PROJECT

Table No 8.11

BINA-KAKRI AMALGAMATION OPENCAST PROJECT (10 Mtpa)

SUMMARISED CALENDAR PROGRAMME OF EXCAVATION & EQUIPMENT (OPTION-A)

S. No.	PARTICULARS	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	Total
I	COAL PRODUCTION (Mt)																											
	TOTAL	6.00	6.00	8.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	8.77	2.61	247.45
	- PUREWA TOP	1.11	1.21	1.57	1.76	1.82	1.78	1.77	1.71	1.66	1.81	1.81	1.81	1.81	1.79	1.76	1.78	1.75	1.24	1.41	1.41	1.41	1.41	1.41	1.41	1.24	0.93	40.12
	- PUREWA BOTTOM	2.56	2.05	2.76	3.36	3.28	3.12	3.12	3.12	3.11	3.23	3.23	3.21	3.11	3.86	3.41	3.41	3.41	3.36	3.25	3.25	3.25	3.25	3.25	3.25	2.91	0.97	78.33
	- TURRA SEAM	2.75	2.74	3.67	4.88	5.10	5.10	5.11	5.10	5.01	4.96	4.96	4.96	4.96	4.85	4.83	4.81	4.81	4.81	5.34	5.38	5.34	5.34	5.34	5.34	4.62	1.07	121.48
II	VOLUME OF OBR (Mm3)																											
	TOTAL	31.48	31.48	51.10	59.67	59.16	59.94	59.88	59.16	59.67	59.94	59.94	59.83	[illegible]	59.92	59.83	59.43	59.63	59.85	55.59	53.37	53.29	53.19	53.31	53.58	40.27	13.87	1395.38
	- BY DRAGLINE	6.03	6.03	5.14	9.73	10.12	10.12	10.12	10.12	10.2	10.24	10.26	10.26	[illegible]	11.04	11.04	11.04	11.04	11.04	11.04	11.04	11.04	11.04	11.04	11.04	10.3	2.52	259.53
	- BY SHOVEL DUMPER (Deptt)	7.26	7.26	9.93	11.48	10.13	12.19	12.29	12.25	11.70	11.00	12.99	12.09	[illegible]	11.96	12.00	12.00	12.00	12.44	13.64	13.64	13.64	13.64	13.64	13.64	11.27	2.71	299.64
	- BY SHOVEL DUMPER (Outsourcing)	17.29	17.29	35.11	35.17	35.18	35.12	35.11	35.11	36.54	31.16	37.17	31.18	[illegible]	31.62	35.28	35.27	35.36	34.06	29.41	27.76	27.21	27.22	27.37	27.47	20.47	6.80	803.81
	- AT SEAM BAND	0.83	0.83	1.12	1.42	1.41	1.40	1.43	1.43	1.42	1.42	1.42	1.42	1.42	1.41	1.41	1.41	1.41	1.42	1.44	1.46	1.44	1.44	1.44	1.44	1.28	0.92	35.61
	TO HANDLING (Mm3)	2.48	2.48	3.45	4.00	4.18	4.18	4.18	4.18	4.21	4.24	4.24	4.24	4.24	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	1.58	106.81
III.	STRIPPING RATIO (m3/t)	5.23	5.23	6.09	5.96	5.99	5.98	5.99	5.95	5.99	5.98	5.98	5.98	5.56	5.56	5.98	5.98	5.98	5.99	5.56	5.34	5.34	5.34	5.34	5.36	4.50	5.16	5.76

Year of Mining Operation

S. No.	HEMM	SIZE/CAP	Existing as on 31.10.2010	New Sets PR Proven (8 Mtpa)	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	Total
A	OBR :-																														
1	Dragline	24m3/96m	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
2	Dragline	15m3/96m	2	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Dragline	24m3/96m			0	0	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	Electric rope shovel	20 m3		2	0	2																								
5	Electric rope shovel	10 m3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2	1	5
6	Hydraulic shovel (Elec./Diesel)	6.5m3	1	1	1	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
7	Rear Dumper	180T		6	2	0																								
8	Rear Dumper	100T	14		14	14	26	53	53	53	53	53	53	53	57	53	53	53	53	53	1	53	57	57	57	57	57	52	46	12	61
9	Rear Dumper	85T	20	46	20	20	25	8																						
10	Drill	311 mm					2	4	4	4	4	4	4	4	4	4	4	4	4	4		4	4	4	4	4	4	4	4	4
11	Drill	250 mm	11	14	14	14	12	12	10	10	10	10	10	10	10	10	10	10	10	10		10	12	10	10	10	10	10	8	8	10
12	Dozer	770 HP																												
13	Dozer	410 HP	4	11	11	11	13	16	15	15	15	15	15	15	15	15	15	15	15	15		15	12	12	12	12	12	12	12	8	12
B	Coal Mining :-							5	5	5	5	5	5	5	5	5	5	5	5	5		6	6	6	6	6	6	6	5	1	
1	Hydraulic shovel (Elec./Diesel)	6-15 m3		0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2		2	2	2	2	2	2	2	2	2	2
2	Hydraulic shovel (Elec./Diesel)	4.5/5.5 m3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1	4	4	4	4	4	1	2	1	4
3	Rear Dumper	100 T		9	9	9	9	20	26	28	28	27	28	28	28	26	28	28	28	28	18	28	28	28	28	28	28	28	25	15	4
4	Rear Dumper(T.B)	85 T	17	17	17	17	17																							
5	Drill	160 mm	5	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7		7	7	7	7	7	7	7	5	4	7
6	Dozer with ripper	410 HP		3	3	3	1	2	2	2	2	2	2	2	2	2	2	2	2	2		2	2	2	2	2	2	2	2	2	2
7	Dozer	410 HP	4	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	4	2	6
8	F.E.Loader	5.7m3	1	1	1	1																								
C	Common :-																														
1	Grader	280 HP	1	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
2	Grader	145 HP	1	1	1	1																								
3	Crane (Hydraulic)	75/80 T		0	0	0																								
4	Crane (Hydraulic)	30/50 T		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
5	Crane (Pick and Carry)	10 T	4	5	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
6	Diesel Backhoe	2.5 m3		3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
7	F.E.Loader	5.7m3	1	2		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
8	Wheel Dozer	300 HP	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
9	Hyd. Shovel	1.5 m3		2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
D	Reclamation :-																														
1	Hyd. Shovel	2.5 m3		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	Dozer	410 HP	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
3	Grader	280 HP	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	Water Sprinklers	68 KL																												
5	Water Sprinklers	28 KL	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	6
6	Tipping Trucks	12 T		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
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8.5.3 **Requirement of Drills**

The requirement of drill has been assessed considering the following factors:

- Workload as per Calendar programme of excavation;
- Annual productivity of drills;
- Yield per running meter of hole drilled;
- Drilling speed i.e. meterage per hour of the drills;
- Physical location of the drill with respect to excavator and
- Plan cycle of repair and maintenance.

8.5.4 The following powder factor/specific consumption of explosive has been adopted for estimating the annual requirement of explosive.

- OB from Dragline benches - 0.6 Kg/m3
- OB from Shovel benches - 0.3 Kg/m3
- Coal Seams - 0.2 Kg/m3

However, during the actual course of mining operation, powder factor, bench marked for different benches i.e. coal, OB (shovel-dumper) and OB (Dragline) by NCL will be adopted.

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BINA PROJECT

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CHAPTER-IX

COAL QUALITY

9.1 INTRODUCTION

Bina-Kakri amalgamation project will have linkage with Anpara TPS, Obra TPS of UPRVUNL. It will also serve as basket linkage to meet the overall demand of coal on NCL. The PR envisages extraction of coal from Turra, Purewa Bottom and Purewa Top Seam.

9.2 QUALITY ANALYSIS

The quality of coal seams has been assessed based on iso-grade lines provided in Geological Report of Chandela Block. The grade of Turra, Purewa Bottom and Purewa Top Seams varies from Grade-D to Grade-G. The characterization of grades depending upon the UHV is given below:

- Grade-B - UHV-5600 to 6200 K.Cal./Kg.
- Grade-C - UHV-4940 to 5600 K.Cal./Kg.
- Grade-D - UHV-4200 to 4940 K.Cal./Kg.
- Grade-E - UHV-3360 to 4200 K.Cal./Kg.
- Grade-F - UHV-2400 to 3360 K.Cal./Kg.
- Grade-G - UHV-1300 to 2400 K.Cal./Kg.

Seam-wise and grade-wise ROM coal quality of total mineable coal is given in Table No.9.1.

Table No.9.1

Name of Seam	Grade-wise distribution of Reserve (Mt)				
	D	E	F	G	Total
Turra	-	114.22	7.18	-	121.40
Purewa Bottom	7.72	35.04	33.58	2.99	79.33
Purewa Top	26.02	14.70	-	-	40.72
Total	33.74	163.96	40.76	2.99	241.45

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In the proposed PR, a product mix grade of Gr-E has been adopted.

9.3 SPECIFIC GRAVITY OF COAL

The grade-wise specific gravity has been calculated based on the formula: Sp.Gr=1.28 + 1% of average ash content which is given in the table below:

Table No.9.2

Coal Seam	Grade				UHV (K.Cal/Kg) Overall
	D	E	F	G	
Purewa Top	1.51	1.56	-	-	3745
Purewa Bottom	1.52	1.57	1.64	1.73	3550
Turra	-	1.59	1.64	-	3620

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CHAPTER- X

PUMPING & DRAINAGE

10.1 INTRODUCTION

The pumping system of Bina-Kakri Amalgamation Opencast Project (10 Mpta) has been designed to dewater the in-flow of water due to precipitation falling within the active pit limit during the monsoon season to enable the mining activity to continue round the year.

The planning of de-watering of the mine has been done in such a way that as far as possible the working faces and haul roads remain dry. The layout of the quarry provides suitable gradient along the quarry floors and the benches to facilitate self-drainage of water to the lowest level of the quarry.

The rain water intake to the opencast mine is non-uniform during the year. The maximum rain water intake will be during the period of about four months i.e., June to September in a year. During dry season, say October to May, seepage from strata is expected to be moderate and the same can be dealt by running a few number of pumps provided for monsoon pumping. During this period repair and overhauling of the pumps will be done by rotation.

Bina-Kakri Amalgamation OCP is situated on the eastern fringe of Moher plateau. The plateau top is more of less flat with a gentle slope towards west and south and a steep escarpment in the east. The escarpment in the east roughly corresponds to in-crop position of the top most workable coal horizon. The general elevation of the area above mean sea level varies from 300 m along the escarpment to over 400 m on plateau.

GENERAL MANAGER
BINA PROJECT

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The entire pumped out water will be discharged near the mine entry where from water will be drained to near by its natural gravity.

Within the quarry, the alignment of dragline cuts are so planned that most of the water from the flanks will flow into the main sump due to gravity. From the main sump, the main pumps will pump the water out of the mine.

10.2 Basic Consideration

The general criteria for determining the number of pumps, layout and design of the pumping installation are as under:

a) Geographical location of the project

b) General climatic conditions, surface feature of the terrain beyond the boundary of the mine.

c) Calendar Plan of excavation of quarry.

d) Geological characteristics of OB and coal seams.

e) Meteorological data of nearest rain gauge station.

f) Catchment areas, mined out areas beyond excavation, spoil dump area, maximum depth of the quarry etc.

g) Maximum number of days to pump out the accumulated water in the quarry during peak rainfall in monsoon and number of pump operation hours per day.

h) Desired location at surface, where the quarry water can be discharged considering the surface drainage system.

j) Life of the project is 26 years.

GENERAL MANAGER
BINA PROJECT

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10.3 Assessment of volume of water to be pumped

Volume of rain water entering to the mine and accumulating in the quarry (make of water) has been assessed on the basis of the following formula:

$Q = A \times H \times n \ m^3/day$

Where, A = Catchment area in m^2

H = Maximum daily precipitation in m

n = Run off co-efficient

The run off co-efficient (n) has been considered as below:

For mined out area	:	0.60
For area beyond excavation	:	0.15
For internal dumped area	:	0.10

The value of maximum daily precipitation has been determined from probability curve plotted based on data received from nearby meteorological station for last 10 years. The assessment has been made for maximum daily precipitation at probabilities of 10% and 3.8% which corresponds to repetition once in every 10 years and 26 years (life of the project) respectively.

The volume of maximum daily rain water intake to each section up to the end of the project life, computed from above formula is tabulated below:

Section	Catchment area in km2			Max. daily rainfall (mm)		Volume of water ('000m3/day)	
	Mined out area	Internal dump area	Area beyond excavn	At 3.8 % Proba-bility	At 10% Proba-bility	At 3.8% Proba-bility	At 10% Proba-bility
Main sump	1611760	3306756	66847	220	187	316.478	269.006

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
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10.4 Pumping capacity

Pumping system has been designed for the volume of water accumulated in the mine at 3.8% probability in final stage of production considering maximum daily rainfall as 220 mm which corresponds to project life of 26 years. Capacity of sump has been decided to accommodate rain water corresponding to maximum daily rainfall at 10% probability.

- Peak pumping capacity worked out -316478 cu.m

  Above volume of water will be dewatered in 5 days at the rate of 20 hours pumping per day.

- Pumping capacity per hour thus worked out : 3164.78 cu.m

10.4 Selection of Pumps

10.4.1 Main Pumps

Maximum capacity of pumping has determined based on operating time of 20 hrs a day. Peak pumping capacity per hr is 3164.78 cu.m. Rated capacity of each pump is 1100 m3/hr. No. of main pumps selected is 4 and stand-bye pump is 1. Estimated head has been considered as 230m with rated power of motor 1200 kW and supply voltage 6.6 kV and 290m head with rated power of motor1500 kW and supply voltage 6.6 kV.

Provision of above 5 nos. main pumps of 1100m3/hr with 230m head and 290 m head have been made in 1st, 5th and 7th years of production. Details of the proposed pumps with phased requirement and capital investment has been furnished in the Appendix-A.3.4.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. के.क्षे.
सिंगरौली

10.4.2 Slurry Pumps

During the heavy rainfall, overburden may be washed away from the edges of slopes and internal dumps, needing pumps capable of handling slime/ slurry. For pumping slurry/sludge containing large solid particles, 3 nos. portable slurry pumps of 101m^3/hr, 28m head with one or two channel impellers with free flow passages varying from 40 mm to 190 mm in diameter are proposed. Details of the proposed slurry pumps along with investment details have been given in the Appendix-A.3.4.

10.4.3 Face Pumps

6 nos. face pumps of 40 m^3/hr, 30m head driven by 10 kW electric motor have been provided for carrying water from localized depression in the face area to main sumps. Phasing and investment on face pumps has been given in the Appendix-A.3.4.

10.4.4 Diesel Pumps

2 nos. diesel pumps set of 80 lps (289 cum/hr) capacity, one each with 250 m head and 80m head have been provided for use in emergency during electrical power failure

10.5 Pipe & Fittings

The delivery pipe lines from the pumping station are proposed to be taken out through the side of haul road provided in the middle of the quarry. These pipes are eventually brought to the surface from where, the water will be discharged to the natural drainage system. Suction and delivery ranges have been selected on the basis of the pumping capacity during probable maximum rainfall and velocity of flow within the reasonable limit. The ranges thus selected for pumps are of 400 mm, 300 mm, 200 mm and 100 mm nominal diameter.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. (प.क्षे.–ii),
भिलाई

10.6 Brief Summary

Sl. No.	Items	Qty
1	Main Pump , 1100 m3/hr, 230m head 1200kw	3 Nos
2	Main Pump , 1100m3/hr, 290m head, 1500kw	2 Nos
3	Face pump 40m3/hr, 30m head, 10 kW	6 N0s
4	Slurry pump 101m3/hr, 28m head, 37kW	3 Nos
5	Diesel pump 289m3/hr, 250m head	1 No.
6	Diesel pump 289m3/hr, 80m head	1 No.
7	Pipes	LS
8	Pipes fitting etc	LS
9	Pontoons	2

10.7 Capital Investment

The capital investment for pumps, pipes & fittings has been given in **Appendix-A.3.4.**

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क्षेत्रीय निदेशक
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CHAPTER- XI

COAL HANDLING PLANT

11.1 INTRODUCTION

The existing main CHP has been designed for 4.50 Mtpa coal dispatch. ROM coal has crushed down by one number 1500 TPH Gyratory crusher from (-) 1500 mm size to a size of (-) 200 mm and discharges coal either to a conveyor for transporting coal to loading bunker or to deshaling plant. Crushed ROM coal/ deshaled coal is stored in loading bunker and dispatched by rail wagons through a 300 te overhead hopper through pre-weigh hopper and rapid loading system. The system has 1 no. 15000 te primary ground bunker and 1 no. 15000 te secondary ground bunker at loading end.

An Expansion Project Report for Bina Extension OCP (6.0 Mtpa) was prepared in Dec., 1999 and approved by G.O.I. The approved EPR envisaged the addl. provision of 2 nos. 1000 TPH semi mobile crusher, 1 no. Ground bunker of 15000 te capacity, 2 nos. reclaim cum loading conveyor to reclaim coal from bunker and discharge into a 300 te overhead loading hopper and dispatch by rail wagons through rapid loading system to cope up the addl. 1.5 Mtpa coal. But the approved CHP of 1.5 Mtpa has not yet been commissioned and addl. coal production of 1.5 Mtpa is presently transported by road.

Now, it has been envisaged to have a full-fledged coal handling plant and coal Deshaling Plant to cater 10 Mtpa coal production. For this, a separate comprehensive CHP has been proposed for additional 5.50 Mtpa coal dispatch which also includes the approved CHP provision of 1.5 Mtpa. A provision of one no. addl. 5.5 Mtpa coal Deshaling Plant has been provided separately.

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क्षेत्रीय निदेशक
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The proposed coal handling plant shall have the facilities for receiving ROM coal from rear discharge dumpers, crushing the coal to a specific size of (-) 200mm, storage & reclamation, rapid loading system with silo and belt transport between the intermediately points. The ROM coal has to be crushed down from (-) 1500 mm size to a size of (-) 200 mm by gyratory crushers and discharges into a primary ground bunker, received coal from primary ground bunker through plough feeders and discharges coal either to a conveyor for transporting coal to secondary ground bunker or to coal deshaling plant. ROM crushed coal/deshaled coal is stored in the secondary ground bunker and dispatched by rail wagons through a silo consisting of pre-weigh hopper and rapid loading system. A link conveyor has also been envisaged for interlinking the new CHP with old CHP.

11.2 Design Parameters of Proposed CHP

11.2.1 Basic data

- Production capacity in million tonnes : 10 (Incremental 5.5 Mtpa for CHP)
- Number of working days per annum : 330
- Number of working shifts per day : 3
- Duration of each shift (Hours) : 5
- Type of Dumpers : 100 T Rear dumper
- Feed size of ROM coal in mm : (-) 1500 mm
- Product size in mm : (-) 200 mm

11.2.2 CHP Working Schedule

a) Crushing and storage : 3 shifts/day
(From receiving pit up to Bunker)

b) Reclamation and loading : 3 shifts/day and 7 days a week

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BINA PROJECT

केन्द्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
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11.2.3 System Capacity

The handling capacity of the CHP has been decided to match with the coal production of 5.5 Mtpa. Based on 330 working days per year and 5 hours per shift, and in order to meet the fluctuations of coal output from the mine due to irregularities of transport system and seasonal fluctuations, the system capacity of the CHP has been fixed at 2 x 1800 TPH.

11.2.4 Salient Features of CHP

- Two number of receiving pit of 170 te capacity hopper each.
- Two number of gyratory crusher of 1500 TPH to crush ROM coal from (-) 1500 mm to (-) 200 mm size.
- One number of pedestal mounted rock breaker with each receiving pit to deal with oversize lump size of (+) 1500 mm.
- One number of Apron feeder in each receiving pit to feed crushed coal from gyratory crusher to conveyors.
- One number of self-flowing storage overhead primary ground bunkers of 22000 te capacity and one number of secondary ground bunkers of 22000 te capacity at loading end.
- Eight number of Plough feeders each of 1800 TPH capacity for reclamation of coal from the bunkers.
- 2x1800 TPH conveyors for Silo loading.
- One number of Rapid load out systems comprising of 3000 te silo and two number of pre weigh hoppers with flood loading chutes.
- Associated belt conveyors.
- Link conveyors between proposed 5.5 Mtpa CHP to existing 4.5 Mtpa CHP.
- Miscellaneous facilities like dust control system; fire fighting, ventilation system, plant cleaning system, infrastructure for preventive maintenance etc.
- Necessary electrical, interlocking, signaling and communication facilities.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

11.2.5 System Description

The coal handling plant of 10 Mtpa capacity for Bina-kakri amalgamation OCP consists of 2 nos. of receiving pit, 2 nos. of Gyratory crushers (1500 TPH) to crush ROM coal from (-)1500 mm to (-) 200 mm size, two number of ground bunkers each of 22,000 te capacity and one number Silo of 3000 te capacity with associated belt conveyors and accessories, link conveyor to transport coal between proposed 5.5 Mtpa CHP to Existing 4.5 Mtpa CHP.

11.2.6 Plant Description

11.2.6.1 Receiving Pit and crusher complex

The Run-off mine coal from the opencast mine project shall be received into the both receiving pits by means of rear discharge dumpers of 100T.Both receiving pits are provided with 170 te capacity hopper and gyratory crusher of 1500 TPH for crushing of ROM coal from (-) 1500 mm down to (-) 200 mm size.

Two number pedestal mounted hydraulically operated rock breaker has been provided to rake and break oversize lumps. The crushed coal from the crusher shall be collected by apron feeders to transport the same through a set of conveyors to a primary ground bunker of 22000 te capacity. Coal received from primary ground bunker through plough feeders and discharges coal either to a conveyor for transporting coal to coal deshaling plant or, to secondary ground bunker, if necessary by a two way chutes. Deshaled coal or, ROM coal is stored in the secondary ground bunker of 22000 te capacity for dispatch.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.कें.
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11.2.6.2 Storage bunker and Reclamation System

Two number storage bunker of 22,000 te capacity each one primary and other secondary has been proposed for Bina-Kakri amalgamation CHP. The bunkers shall be constructed of pre-cast concrete slabs with sides sloping at 55^0 to the horizontal. The bottom of bunker will have longitudinal slits with a long tunnel. Below the slit, plough feeders with reclaim conveyors shall be provided. The capacity of the reclaim conveyors and plough feeders shall be 1800 TPH each.

Two sets of reclaim conveyors below the secondary bunker will discharge coal directly to silo loading conveyors which subsequently discharges coal into silo of 3000 te capacity.

11.2.6.3 Wagon Loading System

The Silo loading conveyors discharge coal in a 3000 te silo. Below the silo two numbers pre-weigh hoppers are provided with flood loading facility. The load out system shall be complete with power pack, level sensors and microprocessor based controls for the operation of the gates and chutes in a preset sequence for uniform and correct loading of wagons. The pre-weigh hopper filling capacity shall be selected in accordance with the type of railway wagons arriving under the loading station. The weighing capacity of pre-weigh hopper shall be 72 te.

The system shall permit loading of each wagon with pre-weighed quantity of coal, thereby eliminating the necessity of any wagon weighing equipment. The whole system shall be designed to operate either in fully automatic or in semiautomatic mode. In case of automatic mode closing and opening of different gates is done automatically during the entire loading operation until the rakes of wagon gets loaded. In semiautomatic mode, opening and closing of chute is done by the operator for each wagon and all other operations viz., .recording/displaying of weights, closing of chutes and filling of pre-weigh hopper is done automatically. The system is complete with all necessary facility needed for successful operation of the system.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
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सिंगरौली

The sampling unit consisting of automatic primary sampler, jaw crusher/hammer mill including sample collecting device shall be located adjacent to wagon loading silo. The sample collected shall be sent to laboratory for analysis.

11.2.6.4 Dust Extraction System

The objective of the system is to extract coal dust from various dust generating points, clean the dust laden air by trapping coal particles and finally discharge clean air into the atmosphere so that dust concentration in the CHP premises, even under the critical worst operating condition is less than stipulated limit.

11.2.6.5 Dust Suppression System

The objective of this system is to eliminate the air borne coal dust or suppresses the coal dust at its source. The system involves confinement of the dust within the dust producing area by a curtain of moisture and wetting the coal dust by direct contact between the particles and droplet of water. Adequate number of precision anti-clog nozzles will be installed at suitable locations for suppressing dust by spraying water. Suitable control for dust suppression shall be provided and the system shall be so interlocked that it operates only when the conveyor system is operating or the loading operation is on.

11.2.6.6 Noise Control

It is well-accepted fact that noise pollution causes fatigue to operating personnel. Provision will be made to keep down the noise level to the extent it is feasible as per relevant IS/International standards. All machine mounting will have in their foundation anti-vibration pads/sheets for reducing the vibration and thereby noise. All transfer chutes and hoppers shall have wear resistant rubber or ultra high molecular weight plastic liners of various thicknesses as per design requirement and their suitability.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
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11.2.6.7 Fire Fighting and Fire detection System

Necessary fire fighting system along with fire detection & annunciation system have been envisaged for the plant. This includes fire hydrant tees at strategic locations at equal spacing of 30 meters with suitable water supply pipelines. The fire detection & annunciation unit shall be located at strategic location of the plant. In addition, portable fire extinguishers to deal with electrical/oil/ordinary fires shall be provided at all strategic locations in the plant.

11.2.6.8 Plant cleaning System

To facilitate cleaning at strategic locations ample number of high pressure water servicing points have been envisaged. These service points will be so located that with a 15/20 M long hose, any working area in the plant or equipment-working place can be reached. These service points will be provided with quick connecting hose couplings for easy fixing and dismantling of hoses.

To handle discharge from plant effluent, washing of the plant area, sump pumps of suitable design and capacities have also been envisaged where required. Plant effluent shall be discharged through open drain/pipe.

11.2.6.9 Plant Maintenance System

For effective maintenance of all the equipment, there will be sufficient working space around the equipment/ machinery. All the equipment and conveyor discharge drums/transfer points etc. shall have covered and well ventilated housing complete with access stair ways, hand rails, platforms, cross over ladders etc. as required.

Necessary electric hoists and chain pulley blocks at suitable points of adequate capacity will also be provided on various floors.

GENERAL MANAGER
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11.2.6.10 Weighment

For the purpose of weighment, belt weighers have been envisaged. In addition, for recording of weight of coal dispatched to the consumers, pre-weigh system of weighment has also been envisaged with the wagon loading system.

11.2.6.11Electrical

The electrical system shall comprise of:

- Power reception and distribution system.
- Centralised sequence control-cum-interlocking, automation, signaling and instrumentation system.
- Illumination of plant and adjacent area.
- Centralised welding circuit.
- Earthing.

11.2.6.12 Capital requirement of CHP

The Estimated addl. capital requirement for 5.5 Mtpa incremental CHP is Rs. 304.35 Crores and detail has been given in **Appendix-A.3.5**. For incremental 1.5 Mtpa CHP an addl. amount of Rs 59.18 crores has already been approved in EPR for Bina extension OCP (6 Mtpa)..

11.3 Railway Siding

11.3.1 General Information Existing Railway siding

The existing railway siding at Bina OCP has capacity of full rack as per Railway norms for 4.5 Mtpa coal despatch. At present there is one loading point in operation.

GENERAL MANAGER
BINA PROJECT

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The characteristics of the existing railway siding is as under:

- Siding gauge : 1.6764M
- Fixed point : Take off from chainage 28.215 Km from Karaila Road railway stn.
- Total track length of the siding has full capacity for empties and load.
- Gradient as per Railway Norms.
- Two empty receiving lines and two after load lines to hold a full rake of boxes. Out of these two lines, one is being used by existing Bina CHP and other line is proposed to be used by Krishnashila CHP under construction.
- One engine escape line.

11.3.2 Existing sequence of operation for 4.5 Mtpa

- Empty rake is brought by Indian Railway engines and are placed at empty receiving line.
- Engine is detached and another loaded rake is drawn out with the same engine (at front) by load drawal line.
- Loading is being done through existing CHP and rail engine is hauling the rake.

11.3.3 Proposed Railway Siding facility for additional 5.5 Mtpa

Following additional railway siding facility for Bina-Kakri Amalgamation (Ph-II CHP) has been proposed:

- One empty receiving line of full length (750m).
- One after load line of full length (750m).
- One engine escape line
- Loading line with arrangement of mechanical loading and in-motion weighment of wagons
- One take-off point from KBJ line

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क्षेत्रीय निदेशक
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11.3.4 Sequence of operation of proposed CHP

The empty rake will be brought by Indian Railways from its own marshalling yard and placed on empty receiving line .The engine will be detached and will be move on through engine escape line and will be coupled to the empty rake for loading into wagons in-motion through silo of CHP. The loading will be done in one hour for the full rake and move back to railways marshalling yard at Krishnashila Railway station.

11.3.5 Capital

The total length of proposed siding including link portion would be about 3 Km. The total estimated capital requirement of railway siding in the PR is given in **Appendix-A.5.**

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
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CHAPTER -XII

WORKSHOP & STORES

12.1 INTRODUCTION

For maintenance and repair of equipment deployed in Bina-Kakri Amalgamation opencast mine two tier workshop facility has been envisaged.

- Existing and proposed project workshop will undertake daily maintenance, scheduled maintenance, minor and medium repair of HEMM and other mining, mechanical & electrical equipment already deployed in Bina OCP and proposed to be deployed at Bina-Kakri Amalgamation OCP.

- Capital repair and major overhauling will be done at Central workshop, Jayant.

Facility planning required for workshop and store of 10 Mtpa capacity opencast project has been done considering the existing facilities available at Bina OCP (6 Mtpa). A comprehensive layout of workshop and store has been prepared to meet the further maintenance & repair requirement of HEMM and other P&M and to provide proper storage facilities for spares, sub-assemblies and consumables.

The proposed new project workshop & store will have the following facilities.

- Maintenance and repair of various equipment and their assemblies and sub-assemblies deployed in the project.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
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- Mobile repair workshop and service unit for maintenance and repair of field equipment like shovels, drills, dozers, electrical installations, pumps etc. at site.
- A well equipped store for storage of spare parts, float engines & transmissions, consumable, POL, scrap etc.

In general, two shift working has been envisaged for the workshop. A section of maintenance facility will however be available for round the clock service throughout the year.

12.2 EQUIPMENT MAINTENANCE FACILITIES

Maintenance and repair facilities have been planned to achieve the high level of availability, reliability and longer life of HEMM and other P&M.

Maintenance and repair load of workshop has been assessed on the basis of annual operating time of equipment, cyclic maintenance and man-hour requirement. Apart from the assessment of maintenance and repair load on workshop and store, space requirement for parking, dis-assembly and assembly of equipment, washing, machining section, open and covered storage spaces etc. has been worked out. The proposed size of workshop with store for Option-I&II (Departmental) and Option-III&IV (OB partially outsourced) will be as under:

Table No. 12.1

Particular	Shop Size (m x m)	
	Option-I&II (Departmental)	Option-III&IV (OB partially outsourced)
Overall Workshop and Store	450x150	365x150
Excavation Workshop	300x150	240x150
E&M Workshop	80x115	55x115
Project Store	70x115	70x115
Common Facilities	150x35	125x35

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
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12.3 SCOPE OF WORK

Facility planning is based on following scope of services:

12.3.1 Excavation Workshop

Preventive Maintenance

- Daily maintenance, routine lubrication and bi-weekly washing of equipment.
- Inspection
- Incidental minor repairs of assemblies and sub-assemblies of mining and mechanical equipment, i.e. dumper, dozer, shovel, RBH drill etc.

Scheduled Maintenance

- Medium repair and replacement of assemblies and sub-assemblies.
- Mobile repair and maintenance facilities at site with maintenance crew for field equipment.

12.3.2 E&M Workshop

- Minor repair, medium repair and replacement of components, assemblies and sub-assemblies of mechanical equipment such as CHP, pump etc.
- Minor and medium repair of electrical equipment such as switch gear, motor, self starter etc.
- Battery charging facilities and re-conditioning of batteries.

12.4 FACILITIES

Following facilities have been provided in the Excavation workshop and E&M workshop respectively for quality maintenance and repair work as envisaged in the scope of work.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

12.4.1 Excavation Workshop

- Mechanized washing on specially constructed platform for dumpers and dozers.
- Daily maintenance bays for dumpers and dozers.
- Schedule inspection and lubrication bays for dumpers and dozers.
- Scheduled maintenance, medium repair and minor repair facilities for Dumpers and Dozers.
- Minor repair and replacement of sub-assemblies and assemblies of Shovels, Drills and other field equipment at site as well as in the workshop.
- Machining section
- Electrical repair and Radiator repair section
- Welding and structural section
- Pavements for dumper and dozer parking
- Overhead and U/g water reservoirs.
- Supporting facilities like sub-station, computer room, electronics room, charge stores, tool room, offices, pump room, cycle stand, canteen, security post, fire fighting facilities, ventilation system etc.
- Material handling facilities
- Mobile repair workshop and mobile re-fuelling station

12.4.2 E&M Workshop

- E&M repair complex for maintenance and minor repair of CHP equipment, Pumps, electrical equipment and installations.
- Machining section, electrical repair section, structural section etc.
- Supporting facilities like charge store, tool store, cycle stand, computer room, toilet, security post, offices etc.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

12.5 WORKSHOP LAYOUT

12.5.1 Excavation Workshop

List of major HEMM proposed to be deployed in the Bina-Kakri amalgamation OCP for Option-I (Departmental with existing D/L), Option-II (Departmental with new higher size D/L), Option-III (Partially OB outsourced with existing D/L) & Option-IV (Partially OB outsourced with new higher size D/L) is as under:

Table No. 12.2

S. No.	List of HEMM	Cap	Unit	Qty			
				Option-I	Option-II	Option-III	Option-IV
1	Dragline	24m3/88mR	No.	2	4	2	4
2	Dragline	10m3/66mR	No.	2	0	2	0
3	Elec. Rope shovel	20m3	No.	8	8	0	0
4	Elec. Rope shovel	10m3	No.	5	5	5	5
5	Hyd. Shovel	10m3	No.	2	2	2	2
6	Hyd. Shovel (E/D)	8-10 m3	No.	2	2	2	2
7	Hyd. B/hoe (B/hoe)	4.5/5.5 m3	No.	4	4	4	4
8	Diesel B/hoe	2.5 m3	No.	2	2	2	2
9	Hyd. Shovel	2.5 m3	No.	2	2	2	2
10	Hyd. Shovel	1.2 m3	No.	2	2	2	2
11	Rear Dumper	190 T	No.	68	68	0	0
12	Rear Dumper	100 T	No.	97	85	97	85
13	RBH Drill	311mm	No.	-	4	-	4
14	RBH Drill	250mm	No.	27	23	14	10
15	RBH Diesel Drill	160 mm	No.	7	7	7	7
16	Dozer	770 hp	No.	5	5	0	0
17	Dozer	410 hp	No.	26	26	25	25
18	Dozer with ripper	410 hp	No.	2	2	2	2
19	Wheel Dozer	300 hp	No.	2	2	2	2
20	Motor Grader	280 hp	No.	10	10	6	6
21	FE Loader	5.74/6.1	No.	2	2	2	2
22	Crane (Hydraulic)	75t	No.	1	1	0	0
23	Crane (Hydraulic)	30/50t	No.	2	2	3	3
24	Crane (Pick & Carry)	10t	No.	4	4	4	4
25	Water Sprinkler	64 kl	No.	6	6	0	0
26	Water Sprinkler	28 kl	No.	4	4	8	8

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
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The maintenance and repair bays and other facilities for dumpers and other HEMM have been designed based on the prevailing CMPDI norms and OEMs recommendations.

Excavation workshop has been planned for maintenance and repair work of Dumpers, Dozers, Shovels, Drills, Loaders, Cranes, water sprinklers and other mining equipment. The capital repairs are proposed to be carried out at Central workshop, Jayant.

General layout drawing of workshop and store for option-I&II (Departmental) has been given in Drg. No.:R6/E&M/300078 and general layout drawing of workshop and store for option-III&IV (Partially OB outsourced) has been given in Drg.No.: R6/E&M/300079 respectively.

Size of major functional shops and their bracket heights are as under:

Table No. 12.3

Major Shops	Option- I & II (Departmental)				Option- III&IV (Partially OB outsourced)			
	No. of bays	Bay Size	Shop size	Bracket Height	No. of bays	Bay Size	Shop size	Bracket Height
Dumper Repair Complex	12	12x18	144x40	13.0 m	5	12x18	60x40	12.5 m
Dozer and Face equipment Repair Complex	4	10x10	30x50	6.5 m	2	10x10	30x30	8.0 m

12.5.2 E&M Workshop

PR for Bina-Kakri Amalgamation OCP (10 Mtpa) has envisaged large nos of pumps, CHP equipment, transformers and other misc. electrical and mechanical equipment. The maintenance facilities for CHP equipment, pumps and other E&M equipment have been designed based on the prevailing CMPDI norms and OEMs recommendations.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. (प.क्षे.)-6,
सिंगरौली

Overall size of E&M workshop will be 80m x 115m for option-I & II and 55m x 115m for option-III&IV. General Layout drawing of workshop & store for option-I & II has been given in Drg. No.: R6/ E&M/ 300078 and for option-III&IV has been given in Drg. No.: R6/ E&M/ 300079 respectively. Size of major E&M shops will be as under:

Table No. - 12.4

Major Shops	Option- I & II		Option- III & IV	
	Shop size	Bracket height	Shop size	Bracket height
E&M Repair Complex	24 m x 36 m	6.0 m	24 m x 24 m	6.0 m
LMV Repair shop	20 m x 30 m	6.0 m	-	-

12.5.3 Project Store

This workshop will have a Project store to meet the total requirement of project and workshop. Overall size of Project store will be 70m x 115m for option-I, II, III & IV. The size of main store sheds/ buildings are given below.

Table No. - 12.5

Major Shops	Option- I & II		Option- III & IV	
	Shop size	Bracket height	Shop size	Bracket height
Store shed	24 m x 60 m	8.0 m	24 m x 46 m	8.0 m
POL store	24 m x 18 m	4.5 m	12 m x 15 m	4.5 m
Store office	5 m x 10 m	4.5 m	5 m x 10 m	4.5 m

12.6 WORKSHOP P&M.

- The selection of Workshop P&M (Machine tools) and store P&M has been done considering the maintenance programme of various HEMM, job wise requirement in respect of dimensions, nature of operations to be performed, frequency of such requirements, degree of precision etc.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. बो.ले.–6,
बिनाझारी

- Provision of Tyre press, Tyre handler, E.O.T cranes, mobile cranes, fork lift trucks, trolleys, electric hoist, chain pulley blocks, jacks etc. has been made for quick and effective handling of heavy materials and tyres within and outside the shops.

- P&M for Workshop & Store has been assessed separately for option-I&II and option-III&IV and has been given in **Appendix - A.3.3.**

12.7 CAPITAL INVESTMENT

The estimated additional capital requirement for workshop & store P&M for option-I&II is Rs. 23.61 Crores and for option-III&IV is Rs. 12.20 Crores and details has been given in **Appendix- A.3.3** separately.

GENERAL MANAGER
BINA PROJECT

वरिष्ठ प्रबंधक
सी.एम.पी.डी.आई. प्रो.सं.-6.
सिंगरौली

Chapter – XIII

POWER SUPPLY, ILLUMINATION & COMMUNICATION

13.1 INTRODUCTION

This chapter deals briefly with the source of incoming power supply, project and CHP substations, power distribution arrangement, illumination, automation & communication facilities required for the project. Three Options, namely, Option – I, Option – II, Option – III and Option – IV i.e. Departmental with existing Draglines, Departmental with new higher capacity Draglines, OB Partial outsourcing with existing Draglines and OB Partial outsourcing with new higher capacity Draglines respectively have been envisaged. However, in all the cases Coal mining will be done departmentally.

13.2 SOURCE OF SUPPLY

At present the project is having two 33kV substations, namely, OB substation and Coal substation. Both substations are receiving power through 33kV overhead lines from existing Bina switching substation. The overhead line feeding to existing OB substation is routed through the north haul road at the boundary of Bina & Kakri. These lines are to be diverted to clear the way for this amalgamation project. It is also proposed to shift existing OB substation to a new location with enhanced capacity. Proposal for diversion of existing OH line as well as shifting of OB substation has been taken up separately and is under process.

For this amalgamation project it is proposed to enhance the capacity of existing OB and Coal substations to cater the additional electrical load.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. (प.सं.)-6,
सिंगरौली

13.3 MAXIMUM DEMAND & TRANSFORMER CAPACITY

13.3.1 EXISTING SYSTEM –

The connected load and corresponding maximum demand of existing OB and Coal substations are as under :

OB Substation –

Connected load in kW	-	**11166 kW**
Maximum demand in kVA	-	**5918 kVA**

COAL Substation –

Connected load in kW	-	**14672 kW**
Maximum demand in kVA	-	**8466 kVA**

Capacity of existing OB and Coal substations are as under –

OB Substation –

1 x 10 MVA, 33/6.6kV
1 x 7 MVA, 33/6.6kV
1 x 3 MVA, 33/6.6/3.3kV

Coal Substation –

1 x 10 MVA, 33/6.6kV
1 x 10 MVA, 33/6.6/3.3kV
1 x 5 MVA, 33/6.6/3.3kV

13.3.2 Proposed System –

For this amalgamation project the capacity of existing OB and Coal substations have to be enhanced to cater the additional electrical load. The connected load and corresponding maximum demand of additional loads coming under amalgamation project for various options have been elaborated below:

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

SL. NO.	OPTION	SUBSTATION	CONNECTED LOAD In kW	MAXM.DEMAND In KVA
1	OPTION - I	OB SUBSTATION	13501	6930
		COAL SUBSTATION	15556	9428
		TOTAL	**29057**	**16358**
2	OPTION - II	OB SUBSTATION	16974	8607
		COAL SUBSTATION	15396	9242
		TOTAL	**32370**	**17849**
3	OPTION - III	OB SUBSTATION	2006	1145
		COAL SUBSTATION	14656	8874
		TOTAL	**16662**	**10019**
4	OPTION - IV	OB SUBSTATION	5384	2818
		COAL SUBSTATION	14556	8781
		TOTAL	**19940**	**11599**

As elaborated above, the connected load and corresponding maximum demand of existing OB and Coal substations are 23505 kW and 17221 kVA respectively.

SL. NO.	OPTION	SUBSTATION	CONNECTED LOAD In kW	MAXM. DEMAND in KVA
1	OPTION - I	OB SUBSTATION	24667	12848
		COAL SUBSTATION	30228	17892
		TOTAL	**54895**	**30740**
2	OPTION - II	OB SUBSTATION	25429	13652
		COAL SUBSTATION	30028	17706
		TOTAL	**56457**	**31358**
3	OPTION - III	OB SUBSTATION	13173	7052
		COAL SUBSTATION	29268	17339
		TOTAL	**42441**	**24401**
4	OPTION - IV	OB SUBSTATION	14838	7863
		COAL SUBSTATION	29188	17246
		TOTAL	**44026**	**25109**

For 10 Mtpa project, the connected load and corresponding maximum demand of OB and Coal substations for various options are as under :-

Option wise connected load and corresponding maximum demand considering existing as well as additional loads of the 10Mtpa project have been elaborated below.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.कें.-6,
सिंगरौली

In case of Outsourcing option, it is presumed that all the outsourced HEMM will be electric driven. Accordingly, capacities of transformers as well as capacity of OB substation have been kept identical with the departmental options. However, for calculation of power bill, only the departmental loads coming under the individual options have been considered.

The maximum demand will be achieved after considering 80% diversity and improving the system power factor to 0.98 by providing capacitor banks of adequate capacity.

The OB Substation will supply power to Draglines, Shovels, Drills and part of quarry lights. The Coal Substation will cater to the loads of Coal Shovels, CHP, Pumping, Workshop, Colony and balance quarry lights.

13.3.3 Substation Capacity

Substation capacity of all options will be same.

13.3.3.1 OB Substation :

As elaborated earlier, the existing OB substation is having installed capacity of 20 MVA. To meet the demand of additional loads coming under amalgamation project, it is proposed to enhance the capacity to 30 MVA by installing one more 10MVA transformer.

13.3.3.2 Coal Substation :

The existing Coal substation is having total installed capacity of 25 MVA. Due to increase in coal production, CHP alongwith pumping and other allied loads will also increase. Considering the additional loads it is proposed to install one more 10MVA transformer in the existing Coal substation. The enhanced capacity will take care of total coal and common loads.

GENERAL MANAGER
BINA PROJECT

13.4 METERING ARRANGEMENT

13.4.1 At 33kV Side

For the purpose of energy charges for Expansion Project all the 33kV control panels will be provided with the following meters :

i) Trivector Meter with MD indicator
ii) Ammeter
iii) Voltmeter
iv) Frequency Meter

13.4.2 At 6.6kV Side

All incoming panels will be provided with

i) kWH Meter
ii) Ammeter
iii) Voltmeter
iv) PF Meter

All outgoing panels will be provided with

i) kWH Meter
ii) Ammeter
iii) Voltmeter

13.5 VOLTAGE DISTRIBUTION & SYSTEM EARTHING

The various voltages proposed to be used at the project are :

Incoming supply to Project	:	33kV
Incoming supply to CHP	:	6.6kV
Incoming supply to Workshop	:	6.6kV

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षेत्र–5,
सिंगरौली

Incoming supply to Addl. Quarters	:	6.6kV
Shovels	:	6.6kV
Drills	:	6.6kV
Pumping	:	6.6/0.415kV
CHP	:	6.6/0.415kV
Colony & water supply	:	415Volts
Lighting inside the quarry	:	240Volts
Lighting outside the quarry	:	240Volts

In this project, restricted earthed neutral system has been proposed to be adopted for all equipment. To ensure safety to working personnel and for prevention of shock hazards an effective earthing system has been envisaged. There will be earthing grid surrounding the project substations. The equivalent resistance of the earthing grid shall preferably be kept below one ohm.

13.6 PROTECTIONS

13.6.1 Transformers

The following protections for all the 10 MVA transformers will be provided in the 33kV circuit breaker controlling HT side of the transformer:

i) Percentage differential protection
ii) IDMT over current protection with high set instantaneous element
iii) IDMT earth fault protection

In addition to the above, the following protecting gadgets will be incorporated alongwith the transformers:

i) Buchholz Relay (alarm and trip)
ii) Winding temperature indicator
iii) Oil temperature indicator

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. (क्षे.स.)-6,
सिंगरौली

13.6.2 Secondary control of transformers

All the 6.6kV circuit breakers controlling the secondary of transformers shall be provided with IDMT over current and E/F relays with high set instantaneous element and shall have provision to trip on all internal faults of the transformers which are sensed through the percentage differential and Buchholz protections.

13.6.3 6.6kV outgoing feeders

All the circuit breakers controlling the 6.6kV outgoing feeders shall have the following protections:

i) IDMT over current protection with high set instantaneous element
ii) Restricted earth fault protection

13.7 POWER SUPPLY AND DISTRIBUTION

13.7.1 Power Distribution to Quarry

All the draglines, shovels, drills etc. to be deployed for OB removal/re-handling will receive power from the OB substation through 6.6kV overhead lines with ACSR Wolf conductor. All other loads like coal shovels, CHP, pumps, colony, workshop etc. will get power from Coal Substation through 6.6kV overhead lines with ACSR Wolf conductor. Near the mine, quarry, OHL will be terminated and power will be fed to field equipment through cable, field switch and trailing cable.

13.7.2 Power supply to CHP

The project is having a separate CHP substation for feeding power to CHP loads. It is proposed to construct a separate coal handling plant to handle the additional 4 Mtpa coal. Subsequently, the capacity of existing CHP

GENERAL MANAGER

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.स.–6

substation will be increased by installing power transformers, primary and secondary switchgears and allied equipment. Three switching stations namely switching station-I, switching station-II and switching station-III will be constructed near crusher house, ground bunker and RLS respectively. The switching stations will receive power from CHP substation through 6.6kV overhead line. Complete CHP will be fed from these three switching stations.

13.7.3 Power supply to Workshop

The existing Bina project is having its own Workshop which is receiving power from the existing Coal substation. For this amalgamation project, the capacity and size of existing Workshop has to be increased. Accordingly, power will be supplied to Workshop by two 6.6kV feeders from Coal Substation. Power will be received by the workshop substation from a double pole structure to be constructed near workshop substation by cable.

13.7.4 Power supply to Colony

For supplying power to additional quarters it is proposed to construct a colony substation of suitable capacity. These transformers will get power at 6.6kV from the proposed Coal Substation by Over Head Line. The existing colony will continue to get power from the existing substation.

13.8 ILLUMINATION

Overall illumination of the project has been envisaged as under :

13.8.1 Quarry Illumination

The working areas of the quarry shall be illuminated by a system of 4x250W HPSV lamps mounted on 15mts. high fabricated towers which will be installed along the edges of quarry workings. Power to these lights will be fed through 25kVA, 6.6/0.230kV lighting transformers. Besides this the area in the vicinity of each drill will be lighted by one 10kVA, 6.6/0.230kV lighting transformer.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. ब.स.-6

13.8.2 Haul Road Illumination

Entire haul road area will be illuminated by 250W HPSV lamps mounted on steel tubular poles. These poles will be erected along the haul roads. Power to these lamps will be provided from the 100kVA, 6.6/0.415kV transformers.

13.8.3 Spoil Dump Illumination

Spoil dump illumination will be carried out by 1000W metal halide lamps mounted on steel tubular poles with 25kVA, 6.6/0.230kV transformers.

13.8.4 General Illumination

Adequate provision has been made for illumination of installations near magazines, roads and other strategic places by 250W HPSV lamps. Where ever possible all the industrial roads will be illuminated by 150W HPSV lamps and fittings fitted on street lighting poles. Workshop and CHP will have their own independent illumination systems. Colony roads will also have their own independent illumination system.

13.8.5 Emergency Illumination

Provision has been made for portable emergency lights during power failure, for illuminating the important locations, such as, project office, substation, store, hospital, magazine, security and time office etc.

13.9 COMMUNICATION

Following Communication system has been envisaged for amalgamation project :

i) 200/100 Lines Telephone Exchange

ii) Surface Mine Communication comprising DECT

iii) CODMACS

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6.
सिंगरौली

iv) OITDS (Operator Independent Truck Dispatch System)

v) Internet facility

vi) VHF Communication

vii) Synthesized Handheld Trans Receiver with all accessories (Walky-Talky Set)

vii) Synthesized Mobile set alongwith Whip antenna, RF cable with connector (Wireless Base Station)

viii) Repeater Station (45-50 Watt)

13.10 SPECIFIC ENERGY CONSUMPTION

The expected pattern of energy consumption has been estimated based on the quantum of work done and no. of working hours in the year.

The peak annual energy consumption and other power indices for different options are appended in following tables :

Option – I

A. For Peak Production of 10 Mtpa :

Sl. No.	Power Consumer	Energy Cons. (MkWh)	Energy Consn./t of Prodn. (kWh/t)	Energy Charge/t (`./t)
1	Overburden	48.42	4.84	21.44
2	Coal	36.80	3.68	16.30
3	Common	54.88	5.48	24.28
4	Total :	140.10	14.00	62.02

Based on the existing power tariff, the peak annual power bill will be of the order of ₹6205.40 lakhs.

B. For Additional Production of 4 Mtpa :

Sl. No.	Power Consumer	Energy Cons. (MkWh)	Energy Consn./t of Prodn. (kWh/t)	Energy Charge/t (`./t)
1	Overburden	21.85	5.46	24.35
2	Coal	22.41	5.60	24.98
3	Common	26.31	6.58	29.35
4	Total :	70.57	17.64	78.68

Based on the existing power tariff, the peak annual power bill will be of the order of ₹3148.77 lakhs.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. ओ.सं.–6.
सिंगरौली

Entire haul road area will be illuminated by 250W HPSV lamps mounted on steel tubular poles. These poles will be erected along the haul roads. Power to these lamps will be provided from the 100kVA, 6.6/0.415kV transformers.

13.8.3 Spoil Dump Illumination

Spoil dump illumination will be carried out by 1000W metal halide lamps mounted on steel tubular poles with 25kVA, 6.6/0.230kV transformers.

13.8.4 General Illumination

Adequate provision has been made for illumination of installations near magazines, roads and other strategic places by 250W HPSV lamps. Where ever possible all the industrial roads will be illuminated by 150W HPSV lamps and fittings fitted on street lighting poles. Workshop and CHP will have their own independent illumination systems. Colony roads will also have their own independent illumination system.

13.8.5 Emergency Illumination

Provision has been made for portable emergency lights during power failure, for illuminating the important locations, such as, project office, substation, store, hospital, magazine, security and time office etc.

13.9 COMMUNICATION

Following Communication system has been envisaged for amalgamation project :

i) 200/100 Lines Telephone Exchange

ii) Surface Mine Communication comprising DECT

iii) CODMACS

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6,
सिंगौली

Option – II

A. For Peak Production of 10 Mtpa :

Sl. No.	Power Consumer	Energy Cons. (MkWh)	Energy Consn./t of Prodn. (kWh/t)	Energy Charge/t (`./t)
1	Overburden	50.44	5.04	22.23
2	Coal	36.80	3.68	16.23
3	Common	60.97	6.10	26.90
4	Total :	148.21	14.82	65.36

Based on the existing power tariff, the peak annual power bill will be of the order of ₹6534.15 lakhs.

B. For Additional Production of 4 Mtpa :

Sl. No.	Power Consumer	Energy Cons. (MkWh)	Energy Consn./t of Prodn. (kWh/t)	Energy Charge/t (`./t)
1	Overburden	23.87	5.97	26.92
2	Coal	22.41	5.60	25.26
3	Common	25.31	6.33	28.55
4	Total :	71.59	17.90	80.73

Based on the existing power tariff, the peak annual power bill will be of the order of ₹3227.31 lakhs.

Option – III

A. For Peak Production of 10 Mtpa :

Sl. No.	Power Consumer	Energy Cons. (MkWh)	Energy Consn./t of Prodn. (kWh/t)	Energy Charge/t (`./t)
1	Overburden	23.07	2.31	10.16
2	Coal	36.80	3.68	16.19
3	Common	57.90	5.79	25.48
4	Total :	117.78	11.78	51.83

Based on the existing power tariff, the peak annual power bill will be of the order of ₹5178.59 lakhs.

B. For Additional Production of 4 Mtpa :

Sl. No.	Power Consumer	Energy Cons. (MkWh)	Energy Consn./t of Prodn. (kWh/t)	Energy Charge/t (`./t)
1	Overburden	9.46	2.36	10.24
2	Coal	22.41	5.60	24.30
3	Common	22.24	5.56	24.14
4	Total :	54.11	13.52	58.68

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6,
सिंगरौली

Based on the existing power tariff, the peak annual power bill will be of the order of ₹2347.67 lakhs.

Option – IV

C. For Peak Production of 10 Mtpa :

Sl. No.	Power Consumer	Energy Cons. (MkWh)	Energy Consn./t of Prodn. (kWh/t)	Energy Charge/t (₹/t)
1	Overburden	25.14	2.51	11.05
2	Coal	36.80	3.68	16.19
3	Common	58.29	5.83	25.65
4	Total :	120.23	12.02	52.89

Based on the existing power tariff, the peak annual power bill will be of the order of ₹5291.77 lakhs.

D. For Additional Production of 4 Mtpa :

Sl. No.	Power Consumer	Energy Cons. (MkWh)	Energy Consn./t of Prodn. (kWh/t)	Energy Charge/t (₹/t)
1	Overburden	11.52	2.88	12.64
2	Coal	22.41	5.60	24.58
3	Common	22.63	5.66	24.85
4	Total :	56.56	14.14	62.07

Based on the existing power tariff, the peak annual power bill will be of the order of ₹2483.87 lakhs.

13.11 CAPITAL INVESTMENT FOR ELECTRICAL P&M

Option wise capital investment for the project for electrical power supply, distribution, illumination, earthing, automation and communication have been appended below :

(Amount in Rs. Lakh)

Sl. No.	Variant	Existing Provision	Additional Provision	Total Provision
1	Option - I	1355.89	4066.81	5422.70
2	Option - II	1355.89	4066.49	5422.38
3	Option - III	1355.89	3527.91	4883.80
4	Option - IV	1355.89	3550.45	4906.34

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. (भा.स.प्र.)
मध्यप्रदेश सिंगरौली

The detailed breakup of the estimates have been elaborated in Appendix-A.3.2 of respective options.

13.12 ENERGY CONSERVATION

In order to reduce the electrical energy losses of Bina-Kakri Amalgamation Project, the following proposals are made:

Use of ACSR Wolf Conductor for both 33 KV and 6.6 KV systems throughout the mine will reduce line losses and improve voltage regulation.

Installation of energy meters at different points in the project and colony to monitor and check power consumption.

Installation of automatic 'ON' and "OFF" devices for street lights, colony approach roads, CHP, workshop etc. external lighting of services buildings with per-set timing for switching 'ON' and "OFF" of the lights, so that the energy would be saved by reducing the wasteful burning hours.

Water garland drains are to be made around the periphery of the mine so as to confine the catchment area when the garland drain. This will reduce the make of water which in turn will reduce the energy consumption for pumping.

Frequent starting and stopping of the main pumps should be avoided. For this purpose sump capacities are to be kept adequate. Also, pumping can be avoided at peak hours to reduce the maximum demand of the project.

CHP: Within the given parameters selection of layout is to be done to have minimum coal conveyance distance. High voltage drives are selected wherever possible to limit losses, motor and cable size.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशालय
सी.एम.पी.डी.आई. क्षे.सं.-6,

Illumination

Low energy consuming and high lumen producing sodium vapour lighting of workshop, CHP and lighting of approach roads, railway siding, haul roads etc. and 150 W HPSV lamps have been provided for lighting of colony road, park, external, lighting of recreation centres, rest houses, shopping centres etc.

The following actions are proposed which may reduce the energy consumption on lighting:

a) Regular cleaning of lamps
b) Use of electronic choke in place of conventional choke.
c) Design of building ensuring optimum use of natural light.
d) For interior walls of buildings, selection of proper colour with higher reflection factor is recommended for interior lighting. This will reduce the energy consumption.
e) Provision of electronic regulators with domestic ceiling fans to avoid ohmic losses which occurs in conventional regulations.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. के.क्षे.–S,
सिंगरौली

CHAPTER- XIV

CIVIL CONSTRUCTION

14.1 GENERAL

Civil Construction involves mainly residential buildings, non-residential/service structures, surface reorganization, roads & culverts, water supply and sewerage system for the smooth operation of the mine/project for the augmentation of coal production from existing 6 Mtpa to 10 Mtpa in four options (Option I II III & IV) of Bina-Kakri Amalgamation OCP.

14.1.1 Life and type of Specification

The proposed quarters for the additional employees of the OCP shall be constructed at the existing township of Bina project as per norms. The provision of permanent buildings of RCC frame structure for quarters and service buildings have been made. The life of permanent buildings may be considered as 58 Years or actual life of the OCP.

14.1.2 Nature of Soil

The block for coal mining area and township for Bina-Kakari Amalgamation Project has already been identified. The actual nature of soil shall be identified by soil tests after the finalization of sites for different structures. However, the area of proposed mine is on plateau and the actual soil deposit is consolidation of disintegrated ordinary sedimentary rocks, sands and fine soils.

14.1.3 External Services

All civil construction works shall be done through contractual system.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. (सी.एस.)-6,
भोपाल

14.2 COST INDEX AND SPECIFICATION

Cost of Civil construction has been estimated on basis of norms and calculations at the prevailing Cost Index at Singrauli. The Cost Index has been calculated as 2340 applicable as on March-2011 at Singrauli with respect to 100 base of CPWD, SOR at Delhi as on 1.10.1976 (shown in Appendix-A.2.3).

Specification of residential buildings and non-residential buildings should follow BIS, BPE, CPWD or NBC Norms.

14.3 SERVICE BUILDINGS

14.3.1 Provision of Service/Welfare Buildings

The provision of expansion of the existing General Manager office and boundary wall has been made in the Office complex of the existing township at Bina.

Additional provision for Statutory service buildings such as Pit head bath, First Aid Centre, Rest shelter, Training centre, Boundary walls etc. in the mine area has been made.

The provision of Magazine house and boundary wall have been made for the storage of explosive materials of the mine.

Adequate provision of welfare/community buildings with suitable boundary walls such as Dispensary, School, Worker's Training Institute, Rest house/Officer's club, Staff rest house, Shopping centre, Training hostel, Bank, Canteen, Garage etc in addition to existing space of buildings have been made as shown in Appendix-A 2.1.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. (म.प्र.)
सिंगरौली

14.3.2 Site for Service Buildings

Extension of the Central Project Office / CGM Office, has been proposed at the existing site. Workshop, CHP, Sub-station, Statutory buildings etc. are to be constructed at suitable site in the mine/industrial area.

14.3.3 Salient features of important Service Buildings

14.3.3.1 Workshop

Normal maintenance and repairs of HEMM and other P&M have to be done in the project workshop. Provision for infra-structure of workshop & store for the proposed coal production (10 Mtpa) in addition to the existing facilities has been made as shown in Appendix-A2.1. Different civil structures required for the workshop have to be constructed as per site condition of the Master Plan. However, major repairs of HEMM have to be done at Central workshop, Jayant.

14.3.3.2 Store

Additional store facilities have been provided for Store office, POL store, Store yard, Scrap yard, Store shed, Security room and boundary walls. Provision of Store has been made in the Workshop complex as per plan and shown in Appendix-A2.1.

14.3.3.3 Sub-station

Adequate sub-station facilities are already available for 4.5 Mtpa production from Bina OCP. Additional fund provision for sub-station buildings for Colony, OB section and coal section with boundary walls at different locations (one for colony, one for OB section and one for coal section in mine area) have been made for the power supply to produce 10 Mtpa coal from Bina -Kakri OCP in addition to the existing substation facilities (shown in Appendix-A.2.1).

GENERAL MANAGER

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6,
सिंगरौली

14.3.3.4 Dragline/Shovel erection yard

Adequate additional provision for Dragline/ Shovel erection yard has been made in addition to the existing facilities for the increased production from the OCP. (shown in Appendix-A.2.1).

14.3.3.5 Magazine

Adequate additional provision for magazine and boundary wall has been made in addition to existing facilities for the increased production from the OCP. (shown in Appendix-A.2.1).

14.3.4 Cost Estimate

Details of provision of fund for service buildings on different heads have been shown in Appendix-A.2.1 for additional production for the different options (Option-I, II, III, &VI).

14.4 RESIDENTIAL BUILDINGS

The additional requirement of 367, 324, 205 and 178 residential quarters/flats has been assessed as per the entitlement of manpower of the mine for Option-I, II, III & IV respectively which would be constructed in the existing township after approval of any one from the these options. Surplus quarters of MQ-type/LCH in the township may be utilized for the needful employees of the NCL project.

14.4.1 Provision of Houses

There are 2097 qtrs already available the township. However, under provision of planning. there is requirement of 70 % overall quarter satisfaction for the project. The location of project is at the remote place for which 100% quarter satisfaction as per entitlement has been considered for officers for their prompt service. There are surplus MQ-type/ LCH- type quarters in the proposed options of the OCP plan.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. (प.क्षे.)-I
सिंगरौली

Additional provision of 367 Nos. of B/C/D-type quarters has to be made to meet total requirement of 1842 quarters for overall 70 % quarter satisfaction for Option-I as calculated in table below.

Additional provision of 324 Nos. of B/C/D-type quarters has to be made to meet total requirement of 1773 quarters for overall 70 % quarter satisfaction for Option-II as calculated in table below.

Additional provision of 205 Nos. of B/C/D-type quarters has to be made to meet total requirement of 1394 quarters for overall 70 % quarter satisfaction for Option-III as calculated in table below.

Additional provision of 178 Nos. of B/C/D-type quarters has to be made to meet total requirement of 1344 quarters for overall 70 % quarter satisfaction for Option-IV as calculated in table below.

The fund provision has been made as per requirement of quarters for the different Options shown in Appendix-A2.2.

The provision of different types of residential buildings/quarters as per entitlement of the category of manpower has been shown in the table below for different options:

Table - 14.1
(Option- I)

Sl. No.	Category of Manpower	Provision of Houses in %	Man-power (Nos.)	Existing Qtrs. (Nos.)	Additional Provision of Qtrs (Nos.)	Total Reqt. of Qtrs. in Nos.	Type of Qtrs.
1	Officers (Sr.)	100%	69	15	54	69	D
2	Officers	100%	113	78	35	113	C
3	Supervisory/ Monthly Rated staff	65%	1244	406	278	684	B
4	Daily Rated staff & Monthly Rated staff	81 %	1205	976	0	976	MQ/ A
	Total	**70%**	**2631**	**1475**	**367**	**1842**	

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6
सिंगरौली

Table - 14.2
(Option- II)

Sl. No.	Category of Manpower	Provision of Houses in %	Man-power (Nos.)	Existing Qtrs. (Nos.)	Additional Provision of Qtrs (Nos.)	Total Reqt. of Qtrs. (Nos.)	Type of Qtrs.
1	Officers (Sr.)	100%	69	15	51	66	D
2	Officers	100%	112	78	31	109	C
3	Supervisory/ Monthly Rated staff	66%	1179	406	242	648	B
4	Daily Rated staff/ Monthly Rated	80 %	1187	950	0	950	MQ/ A
	Total	**70%**	**2541**	**1449**	**324**	**1773**	

Table - 14.3
(Option- III)

Sl. No.	Category of Manpower	Provision of Houses in %	Man-power (Nos.)	Existing Qtrs. (Nos.)	Additional Provision of Qtrs (Nos.)	Total Reqt. of Qtrs. (Nos.)	Type of Qtrs.
1	Officers (Sr.)	100%	54	15	39	54	D
2	Officers	100%	81	78	3	81	C
3	Supervisory/ Monthly Rated staff	65%	871	406	163	569	B
4	Daily Rated staff/ Monthly Rated	70 %	986	690	0	690	MQ/ A
	Total	**70%**	**1992**	**1189**	**205**	**1394**	

Table - 14.4
(Option- IV)

Sl. No.	Category of Manpower	Provision of Houses in %	Man-power (Nos.)	Existing Qtrs. (Nos.)	Additional Provision of Qtrs (Nos.)	Total Reqt. of Qtrs. (Nos.)	Type of Qtrs.
1	Officers (Sr.)	100%	54	15	39	54	D
2	Officers	100%	81	78	3	81	C
3	Supervisory/ Monthly Rated staff	61%	832	406	136	542	B
4	Daily Rated staff/ Monthly Rated	70 %	953	667	0	667	MQ/ A
	Total	**70%**	**1920**	**1166**	**178**	**1344**	

The above quarter satisfaction has been adopted tentatively on the basis of the planned status of manpower due to the following reasons.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. म.प्र.-6,
सिंगरौली

i) There are mostly skilled workers in the OCP. These workers will have to be brought from outside. Hence, appropriate accommodation should be provided by the project to such workers. The place of mine is located in remote area and there is no township facility where private accommodation can be availed. Hence, 70 % overall quarter satisfaction has been considered.

ii) 100 % Quarter satisfaction of officers has been considered due to non availability of private housing facilities near the mine and prompt service of officers are required for maintaining productivity and safety of the mine.

The details of type of quarters and investment are shown in the Appendix-A.2.2.

14.4.2 Type of Construction

The residential buildings has been considered as permanent type three storied RCC frame structure. Specifications of construction should fulfill as per the norms of BPE/CPWD.

14.4.3 Site for Township

The additional residential buildings/quarters for the employees of the OCP shall be constructed at the site to be made available at suitable locations of the existing township of Bina.

14.4.4 Unit Cost and Cost Estimate

The details of calculation of Unit Cost of different types of quarters and cost estimate of investment on residential buildings have been shown in the Appendix - A.2.4 and Appendix-2.2 respectively based on present Cost Index.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई., क्षे.सं.–6,
सिंगरौली

14.5 ROADS AND CULVERTS

The requirement of roads & culverts has been assessed as per norms and plan. The details of investment on Colony road, Haul road, Heavy duty road, Approach road to Magazine and Feeder road have been shown in Appendix-A.8.2. Provision for culverts, drains, slabs, tree guards etc. for the road has been considered as per the norms.

14.5.1 Colony Roads and Culverts

Provision of 6.5 Km (1.5 Km length of 7 m wide pavement and 5.0 Km length 3.75 m wide pavement) long Colony roads along with suitable culverts, drains, RCC slabs etc. has been made for the expansion of the existing colony (provision as shown in Appendix A -8.2.)

14.5.2 Service Roads and Culverts

Proposed service roads includes approach road to magazine, haul road, heavy duty road to Workshop, approach road to magazine and feeder road.

Provision of Moorum/ WBM haul road of 4 Km length & double lane/ 25 m wide for 100/190 t dumper with Dozer path, shoulder, culverts, drains etc. for the mine has been made

Provision of 2 Km heavy duty road with 7.5 m wide bituminous pavement has been made to connect the workshop with haul road.

Provision of 2 Km approach road with7.5 m wide bituminous pavement has been made to connect the magazine house with haul road.

Provision of Moorum/ WBM Feeder road of 1.0 Km length and 25 m width for 100 t dumper with drains, culverts etc. for the mine has been made.

GENERAL MANAGER
BINA PROJECT

Sufficient provision of bituminous and concrete pavement within the workshop has been made. Provision of sufficient parking space with concrete pavement has also been made. The requirements/ specifications of roads shall be revised /modified as per the site conditions.

14.5.3 Diversion of Non- CIL Roads

There is no major Non-CIL road/public road within the proposed mine area which required is to be diverted.

Capital Requirement

The details of cost estimates and provision on different heads of roads & culverts have been shown in Appendix-A 8.2.

14.6 WATER SUPPLY AND SEWAGE DISPOSAL ARRANGEMENT

The provisions for drinking water supply, industrial water supply and sewage disposal system have been considered as per the norms/practice of the mine planning for OCP.

14.6.1 Water Supply

The permanent water supply arrangement for Bina-Kakri Opencast Project is linked with off take point of Integrated Water Supply Scheme (IWSS), for Singrauli. Separate central bulk storage reservoir for IWSS water for drinking and industrial water to collect water for further supply to the township and the mine.

Colony Water Supply

Water from the collection reservoir of the existing colony of Bina- Kakri OCP shall be pumped to overhead tanks at suitable place in township. The water from the overhead tank shall be distributed by gravity to the individual houses and other service buildings through the distribution pipeline network. In order to deliver water to the buildings in the township, sufficient

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

provision has been made for necessary pipelines, pumps, bulk reservoir, sump/collection reservoir overhead tank etc. as shown in Appendix-A.8.3. The tentative provision of colony water supply for additional houses has been made for Option-I. Same provisions have been considered for other options also which may be revised after finalization.

Potable/Drinking Water Demand

The present domestic water demand of the existing township is 0.55 MGD. Additional demand of domestic water shall be 0.2 MGD for proposed additional quarters for option-I &II and 0.1 MGD for Option III & IV respectively. The cumulative proposed domestic/potable water demand of township has been estimated to 0.75 MGD for Option I &II as per norms as given in the table below

Table No - 14.6

Sl.No	Items	Norms
i)	Percentage satisfaction for housing adopted vis-a-vis residential employees strength	70% of the total employee strength.
ii)	Size of employee family	5 members
iii)	Per capita supply planned for residential and their families	50 gallons per capita per day
iv)	Potable Water requirement of non-residential employee at work site.	10 gallons per head/day(45 ltrs.) as per IS-1172
v)	Potable water demand for service buildings	10% of potable water demand of residential population
vi)	Potable water demand for canteen 160 seats	15 GPD per seat
vi)	Dispensary up to 10 Beds	75 GPD/bed
vii)	School	10GPD/ unit
viii)	Losses	10% of total supply

Manual on Water Supply of Govt. of India, Ministry of Health recommends that provision for fire fighting need not be made for towns having population less than 50,000. Since the population of proposed Bina township would be much less, no provision for fire fighting has been made for the township.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.कें.-6,
सिंगरौली

Industrial/ Non-drinking Water Supply

The demand of industrial water has been assessed as per norms for the requirements of technological needs of different works in the mine. The total daily industrial water demand of 0.97 MGD has been assessed for the proposed OCP. The need for water has been assessed mainly for the activities at the workshop (0.3 MGD), CHP (0.37 MGD) and Mine (0.3 MGD). Provision for fulfilling requirement of additional water for industrial use for these activities has been made accordingly. Industrial Water from the bulk storage reservoir at the offtake point of IWSS shall be carried out by pipeline system to the proposed Sump/ground reservoir at the industrial site of Workshop and CHP. Distribution of industrial water from Workshop & CHP shall be carried out by pumps through pipeline from the sump/ ground reservoir to the mining activity centre. Suitable overhead water tank shall be used for continuous water supply for different activities. Suitable arrangement of recycling of water for reuse should be made after treatment of industrial water for conservation of water.

In order to deliver water to individual industrial units from the IWSS offtake point/bulk storage reservoir, sufficient provision has been made for necessary pipelines, pumps, bulk reservoirs, overhead tank etc. as shown in Appendix-A.8.3.

Industrial Fire Fighting Demand

To meet fire fighting water demand, water is to be stored in RCC ground reservoir (2x50000 G) at suitable place, for fire fighting purpose of Quarry, CHP and Workshop. Filling of industrial water in sump/ ground reservoir shall be made by pumping though the pipe line system from the bulk reservoir at IWSS offtake point. Necessary provision of reservoirs, pipelines, pumps etc. has been provided in Appendix- A8.3.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

Industrial Water Supply for Fire Fighting

Industrial Water shall be stored in Ground water reservoirs at the suitable places in Workshop/CHP area to supply water for fire fighting to the Workshop, Mine & CHP. Suitable pipelines, pumps, reservoirs etc. shall be made to supply water to the different places as per the site condition for which provision of fund has been made.

14.6.2 Sewage Disposal

Colony Sewerage

Provision for joining sewage line of additional houses to the existing STP with modification or construction of a new STP system as per the future need along with the setup of drainage/pipelines of new quarters has been made

Industrial Sewerage and effluent

Industrial wastes from outflow of the workshop, CHP and other establishments would be collected through arrangement of settling tanks, oil and grease traps. The effluent and waste coming out of the industrial premises would be led to close circuit wasle water treatment plant and recirculation plant where after passing through sedimentation tanks and filters, it would be recycled for industrial use. Closed circuit industrial effluent treatment and re-circulation plant comprising of sedimentation/settling tank, filters, waste water sump, sewage pumping station etc. with complete system of pipe lines and pumps for treatment and disposal shall be used. The existing System of ETP shall be utilized for industrial effluent and waste management. Sufficient fund for modifications of industrial effluent system has been provided.

The domestic sewage generated in industrial premises would be led through sewerage system unit with septic tanks and soak pits. Details of capital investment for industrial sewerage system are given in Appendix-A.8.3.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. (ने.स.)-6,
सिंगरौली

14.6.3 Capital Requirement

Details of provision of water supply system and sewage disposal system and investment on different heads have been shown in Appendix-A.8.3.

14.7 SURFACE REORGANIZATION & REHABILITATION

Surface reorganization and rehabilitation has been covered under the head of Capital Outlay in Mines. Head of Capital outlay includes mainly the job of development of land additional houses in the township and other structures, Community development, Open lungs/park etc, Rehabilitation and compensation, green belt development, Retaining wall/Garland drain, Compensatory Afforestation, payment of Net Present Value of Forest Land, Ground Water Recharge & Rain water Harvesting system, ESMP/ Fire Fighting works etc.

All the works under the temporary construction and other development of township & mine have been completed for the existing mine for 4.5 Mtpa coal production. Additional provision of fund for development work for the augmentation of production to 10 Mtpa coal has been made as shown in Appendix-A8.1.

Earth Work

Development works in the form of excavation, filling, leveling disposing of surplus earth materials in residential and industrial areas for expansion of the mining works of Bina-Kakri Amalgamation OCP has been considered. Proper levelling / ground profile is required for fixing all infrastructures as per site conditions.

Provision of fund under the different heads for earth work has been shown in Appendix A.8.1.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6,
सिंगरौली

Open Lungs

Provision of open lungs and park for recreation of inhabitants in the new colony has been considered.

Community Development

It has been proposed to develop the adjoining villages. For the development of these villages, provision has been made for improvement of roads and drainage besides street lighting. It is proposed that the nearby villages will be taken up under the community development scheme for the upliftment of quality of the life.

Arboriculture

For arresting dust and protection of the environment against pollution, plantation and green belt development has been is proposed around the industrial and colony areas.

Village Rehabilitation & Compensation against R&R

The most of affected village population have been rehabilitated. However, fund has been allocated for rehabilitation and compensation of some additional people. Proper survey and identification have to be made for any such population which may exist in the mine area.

Compensatory Afforestation

Most of the compensatory afforestation in the land of mining area, dumping area, safety zone area and other infrastructure area have already been settled for the existing mine. However, fund provision for additional compensatory afforestation of forest land has been considered in the form of afforestation charges for the increased capacity of the mine.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. (सी.एस.–4),
सिंगरौली

Net present value of Forest Land

Adequate provision for fund for forest land (737 Ha) for payment of its Net Present value has been made at the rate of 9.2 Lacs per Ha.

Garland drains in the mining area

Fund provision has been made for the construction of garland drains and retaining walls. The actual requirement of work will be accessed after survey of the site condition before the execution of work.

Fire Fighting works for township

Provision for Fire fighting works for the township has been made under integrated management system of NCL/Singrauli.

Water recharge & Rain water harvesting arrangement system

Adequate fund provision has been made for the ground water recharge and rain water harvesting system. The arrangement as per site/contour conditions shall be done to retain rain water to recharge ground water such that desired water table could be maintained.

14.8 CONSTRUCTION MANPOWER

Provision of construction manpower for civil infrastructure has not been made in the project report. The proposed civil construction work of the OCP shall be done contractually through the supervisory team arranged by HQ, NCL.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.का.—6.
सिंगरौली

CHAPTER-XV

SAFETY & CONSERVATION

15.1 PREAMBLE

Opencast mining operation in general is associated with a number of hazards/risks. The various anticipated sources of danger are enumerated as under:

- Slope failure
- Dangers due to handling and use of explosives and accidents due to fly rocks and air-blasts following a faulty heavy blast
- Hazards associated with use of electricity.
- Accidents due to unruly movement of HEMM particularly dumpers.
- Dust hazards
- Fire hazards due to spontaneous heating of coal in stock piles and exposed benches.
- Fire hazards in stores and workshops where inflammable and highly inflammable materials are stores or used.
- Danger of inundation from surface and/or ground water
- Accumulation of noxious gases/fumes in deep pits.
- Road accidents within the mine premises

Adequate provisions have been made for safe working of the mine in form of design of operational system, provision of safety measures for safe use of explosives, electricity and HEMM etc. Sufficient financial provisions have been made under different heads for procurement of necessary safety equipment.

GENERAL MANAGER

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

Adequate skilled and trained manpower has also been provided for compliance of safety provisions. Regular training/refresher courses, "on the job" training will be conducted and mock rehearsals will be made to make the manpower conversant with various rules, regulations, methods of prevention and combat with hazards.

15.2 SAFETY MANAGEMENT

15.2.1 Slope Stability

The height and width of OB and coal benches will be as per the provisions of Mines Act, 1951 and the rules and regulations made their-under. Keeping the size of machineries, the dimensions of the OB benches has been proposed as below:

For coal seams		
Max. bench height	:	10m
Working bench width	:	35m
Bench slope	:	80°
For Overburden		
Max. bench height	:	15-18m
Working bench width	:	55-60m
Bench slope	:	70°

In case of outsourcing, bench parameters should be adjusted according to the size/capacity of equipment deployed.

Shovel Dumper OB Dump

In the external dump, tiers of 30m will be made and the overall slope of the dump will be kept at 28° to avoid slope failure. The dumper roads leading to different tiers of dump have been designed with a gradient of 1 in 16.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. ओ.सी.-6,
सिंगरौली

It is suggested to level the dumps and grade them outward properly to obviate water accumulation. Also, a safe distance of 60 - 100m has been kept between the toe of internal dump and the haul road during rainy season.

Dragline Dump

Dragline dump failure has become an alarming aspect in the recent time. The dump design of the dragline dump should be in accordance with the permission granted by DGMS for the purpose. A slope Monitoring Cell with advance equipment should be established at the mine.

15.2.2 **Safe of Explosives**

Site Mixed Slurry (SMS) has been proposed to be used for good fragmentation and obviate storage of bulk quantity of explosives at the pit head. However, for storage of explosives meant for priming, detonating fuse and detonators, a small magazine of 45 t capacity provided with all safety provisions is existing about 5 km from the project.

For transportation of explosives from the magazine, explosive van of approved type is also envisaged.

For proper blasting and minimizing the adverse side effects due to blasting viz. noise, ground vibration, back-breaks, air blast and fly rocks etc., the optimal blast design parameters are suggested to be used after field trials.

Provision has been made in the PR for qualified blasting In-charge with requisite number of assistants. Adherence to relevant statutory safety provisions as stipulated by DGMS, Chief Controller of Explosives and others will be observed.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. (म.प्र.)-6,
सिंगरौली

A safety zone of 300 m width beyond the quarry surface limit is envisaged for the project for safety considerations. The non-forest land falling within the 300 m safety zone will be acquired and persons, if any, residing within the danger zone will be rehabilitated so as to avoid accidents from flying fragments/projectiles. It is suggested to resort to controlled blasting near built-up areas and surface features, if any, within the safety zone.

15.2.3 Haul Road

Haul road should be laid according to alignment of the mine. The haul road design parameter should be as per the equipment and the different DGMS circulars. A separate haul road maintenance organization should be provided in the mine.

15.2.4 Use of Electricity

To prevent shock hazards, in use of electricity, proper earthing system has been envisaged. It has been proposed to use restricted earthed neutral system of power supply and adoption of fail-safe electronic relays to minimize shock hazards. The high voltage flexible cables/trailing cables will be handled by trained cable handlers who will be provided with adequate type of hand gloves & shoes.

It is suggested to strictly comply with the relevant provisions of Indian Electricity Rules, 1956 to obviate hazards due to use of electricity. Sufficient numbers of Electrical Supervisors have been provided in the manpower requirement to fulfill the statutory needs as per the rules, regulations pertaining to mining industry.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.स.–6,
सिंगरौली

15.2.5 **Use of HEMM**

Based on the excavation requirement of the mine and envisaged calendar programme, adequate number of HEMM has been envisaged in the PR with due regard to stand-by provisions for proper maintenance of the same. In this regard, the existing availability norms of HEMM have been taken into consideration.

A well equipped workshop is suggested in the PR to cater to the maintenance needs of HEMM and other equipments besides provision of necessary maintenance crew. A project store is provided for storage of slow and fast moving spares and other necessary spares of vital importance.

Adequate number of trained/skilled operators and maintenance crew are provided in the PR with due consideration of leave/sick provisions.

Properly designed haul roads are envisaged in the PR, away from the general and traffic congestion. The traffic rules as enforced by the DGMS will be strictly followed by the operators of mobile equipment like rear dumpers, water sprinklers, tippers and other light motor vehicles. All mobile equipment will be provided with audio-visual alarms.

Safety devices like fire alarm and control, operated by sensors should be inbuilt in the equipment/HEMM. Flashers should be fitted in relevant HEMM. The haul roads should be made sufficiently wide to prevent accidents. Haul roads will be designed as per the recently designed norms for plying of rear dumpers.

Inter-locking of starting with normal positions of dumper body should be provided, so that dumper cannot be started when the body is in lifted position beyond a certain limit.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशालक
सी.एम.पी.डी.आई. (सी.एस.-6),
सिंगरौली

15.2.5 **Dust**

Inventory of dust generation sources

The likely dust generating sources due to various mining operations in the project are envisaged as under:

- Drilling, blasting, excavation and transportation of overburden material;
- Drilling, blasting, excavation, crushing and transportation of run-of-mine (ROM) coal;
- Construction and demolition activities like land clearing, material/debris storage and handling etc.;
- Loading of coal at stockpile, reclaiming from pile and movement of vehicle and loading equipment;
- Wind erosion;
- Movement of vehicles on haul road (black topped and non-black topped) for transportation of coal and overburden.

Dust pollution control measures

Systematic and regular air quality monitoring is necessary to examine objectively the status of compliance with the statutory standards and for making a real assessment of ambient air quality.

The following measures are suggested in the PR to contain the pollution arising out of dust emission, within the limits.

- All the drills are provided with well designed dust extraction/suppression system;
- Blasting operations are designed in such a way so that these produce minimum dust;

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

- Effective use of sprinklers and dust suppression units during loading, transportation and handling of ROM/processed coal and overburden;

- Dust extraction/suppression system is installed in coal handling plant;

- Provision of green belt around quarry, industrial and residential areas and avenue plantation along the haul roads on surface

Black topping of permanent service roads besides proper maintenance. Water tanker/Sprinkler equipped with state of the art facilities should be properly used to reduce dust generation from haul road.

15.2.6 **Fire due to spontaneous heating in coal benches and ground stocks**

The following measures will be taken to avoid spontaneous heating:

a) Coal bench should not be left exposed for the long time in view of incubation period. It should be systematically mined out.

b) Coal bench slopes and seam outcrops will be overlain with a thin layer of inert rock so as to form an impervious layer;

c) Treatment of exposed coal seams and outdoor coal stocks with anti-pyrogenic substances;

15.2.7 **Fire in project stores and workshops**

Sufficient provision has been made in the PR for the prevention and control of fire in the project store, both E&M and HEMM workshops and sub-stations by way of installing fire extinguishers of right type and size. Timely inspection and refilling of fire extinguishers will be done.

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Systematic layout of both stores and workshops has been made so that inflammable and highly inflammable materials do not come in contact with any spark of flame. Adequate number of cautions in the form of hoardings will be displayed near such places. Effective ventilation system for the workshop & store has been envisaged in the PR.

15.2.8 Inundation

Due care should be taken to monitor the flow of water from the water reservoir in the south side of the quarry. Also, the drainage from the Tipa-Jharia Dam should be properly monitored.

The garland drains will be channelised along the outside periphery of the quarry.

15.2.9 General Lighting

Prescribed standard of lighting in the quarry and other working places as per DGMS Regulation/Circulars will be made. Adequate capital provision for the purpose has been made.

15.2.10 Training

Intensive training is to be imparted to the operators of HEMM. Only suitable trained personnel in their jobs will be deployed for operating HEMM.

NCL has a separate "Human Resources Development" department. Time bound training programme for various categories of workers, supervisors; staff and executives should be prepared and executed regularly for improving the quality of manpower so that target and quality envisaged in the project report may be achieved.

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15.2.11 Additional Permission/Relaxation Required from DGMS

All statutory permission/relaxation will have to be obtained from DGMS as and when required.

15.3 CONSERVATION

Opencast method provides maximum conservation. Efforts have been made to exploit the coal seams up-to a possible limit. Only a 9.5 m3 high rib has been left in the dragline edges.

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CHAPTER-XVI

ENVIRONMENTAL MANAGEMENT

16.1 INTRODUCTION

This chapter deals in brief the environmental aspect of Bina-Kakri Amalgamation OCP (10 Mtpa) and the adjoining area.

Mining System

Bina-Kakri Amalgamation OCP envisages to encompass the part of existing Kakri Opencast Project area with existing Bina Extension OCP. The further dip side area of Bina Extension OCP and Kakri OCP and also the part of Ruhela Block in the southern side of Bina Extn. OCP has been included to augment the coal reserve Bina-Kakri Amalgamation OCP Expansion has been planned for a targeted output of 10 Mtpa of coal. It is to be worked by Dragline and Shovel-Dumper combined system of mining.

Location, Topography and Drainage

Bina-Kakri Amalgamation OCP is located in the Moher sub-basin of Singrauli Coalfield. The project is covered in the Survey of India The area is covered under topo-sheet No. 631/12 and L/16 of the Survey of India on 1:50000 (1976). The State Boundary between Madhya Pradesh and Uttar Pradesh passes through the proposed mining block.

The Bina-Kakri Amalgamation Project is situated on the eastern fringe of Moher plateau. The plateau top is more or less flat with a gentle slope towards west and south and a steep escarpment in the east. The escarpment in the east roughly corresponds to in-crop position of the top most workable coal horizon. The general elevation of the area above mean sea level varies from 300m along the escarpment to over 400m on plateau.

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Recently a drainage trench has been made in the dip side of existing Bina-Kakri Amalgamation Project along the eastern escarpment by Tippa-Jharia Nalla which discharges into GBP Sagar.

Climate:

The climate of the area is tropical with three typical seasons i.e. winter, summer and rainy. The temperature in summer rises as high as 48° C in May-June and minimum summer temperature is 21° C. In winter (Nov-Feb.), the minimum temperature is around 4° C.

The rainy season is generally from July to Sept. with average annual rainfall around 1000mm. The maximum rainfall in 24 hrs is recorded as 225mm on 20.08.1975 at Jhingurdah Rain gauge Station.

16.2 STATUS OF EMP

Environmental clearance of Bina OCP for an annual capacity of 6 Mtpa was accorded by MoEF in 2006 vide letter No. J-11015/29/2004-IA. II(M) dated. 02.08. 2006.. Environmental clearance of Kakri OCP for an annual capacity of 4 Mtpa was accorded by MoEF in 2007 vide letter No. J-11015/218/2007-IA, II(M) dated. 20.08. 2007. For Bina-Kakri Amalgamation OCP , Environmental clearance is required

16.3 LAND REQUIREMENT AND ITS STATUS

The total land requirement for Bina-Kakri Amalgamation Project has been estimated 2348 Ha. Out of which 1798 is from existing Bina and Kakri project and balance 550 Ha forest land will be acquired. Pre mining land use is as follows:

The total land requirement for Bina-Kakri Amalgamation Project is 2348 Ha. Out of 2348 Ha, 1757 Ha is forest land and 591 Ha is non forest land.

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Forest Land: Out of 1757 Ha forest land, 1004 Ha land is in UP & 753 Ha land is in MP 1257 Ha Forest land is available with Bina & Kakri Project Additional 550 Ha forest land will be required for this amalgamation

Govt. Land: Total Govt. land is 28 Ha which is located at MP No additional Govt. land is required for this amalgamation

Tenancy Land: Out of 563 Ha Tenancy land, 546 Ha land is in UP & 17 Ha land is in MP No additional Tenancy land is required for this amalgamation

16.4 FLORA

The vegetation in study area of Bina-Kakri Amalgamation OCP is covered by large trees, shrubs and hubs. The common plant species available in the Natural Vegetation forest type in Buffer Zone (10 KM radius) are Khair, Bamboo, Dhak, Tendu, Bhelwa, Mahua, Neem, Ber, Shisam, Bahera etc.

The forest land in core zone is covered by Dhak, Tendu, Mahua, Babul, Ber, Shisam, Bahera etc. NCL has planted indeginious plants in large numbers. Plantation by NCL has been done mainly on road side, unused land, over burden dumps of Bina and Kakri OCP.

16.5 FAUNA

Diverse groups of birds were observed in the study area of Bina-Kakri Amalgamation OCP, which are as follows

Mammals: Bansuar, Monkey, Jackel, Rabbit, Cat, Dog etc

Birds : Myna, Crow, Grey headed Myna, Jungle crow, Little brown dove, Peasants, Koel, Rose Ringed Parakeet, Indian Roller, Little brown dove etc.

Insects : Locust, Grasshopper, Birni, Black Bee, stem borer, Lemmon Butterfly etc.

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After the end of mining operations, the area will be reclaimed and this may help the wild life to return to their earlier habitat.

16.6 IMPACT ON LAND

Land use pattern of Bina-Kakri Amalgamation OCP will be changed during Mining operation. Void, Internal back filled dumps and external dumps formed temporarily during coal extraction. Depth of quarry may also affect the adjoining land and water courses due to erosion of loose strata in dumps.

Opencast mining operations have beneficial as well as adverse impact on land involved, which is discussed below:

Beneficial Impact

1) In pre-mining, area involved in mining is highly undulated. During mining OB dumps & mined out area will be leveled and reclaimed. This leveled area after sometime can be developed for agro forestry or forest with leveled and suitably graded surface relief.

2) With the increase in vegetative cover during reclamation, water retention capacity of soil will increase & its erosion will decrease.

Adverse Impact

1) Dumping of overlying rocks in reverse sequence at predetermined place will alter the soil profile.
2) Formation of external OB dumps till reclamation will affect aesthetic look.
3) Increase in soil erosion in the initial stage till consolidation and biological reclamation work is over.

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Measures to be taken to improve land use are:

1) Judicious planning to make best use of land surface.
2) Green belt around colony, industrial complex etc to improve land use as well as aesthetic look.

OB Management

i) Land required for external dumps has been kept minimum and due care has been taken to start internal filling as early as possible

ii) Location of external dumps has been selected so as to reduce dumper movement to minimize air pollution

iii) OB dumps are located outside the minefield near escarpment of plateau in valley. After vegetation this will form a part of original landscape.

iv) Height of dumps has been restricted to match with original topography.

v) Concurrent reclamation of OB dumps is proposed to restore quick vegetative cover. Provision of garland drains around minefield, drains around OB dumps, drains across dump slope, drains with silt arresters, and settling ponds.

vi) No structure planned over dumps.

16.7 ENVIRONMENTAL QUALITY IMPACT AND CONTROL MEASURES AIR QUALITY

Sources of Air Pollution

Air pollution is caused due to generation of dust particles (SPM) and emission of gaseous pollutants like NO_X, SO_2, Hydrocarbons etc.

In an opencast mine dust particles are generated due to the following operations:

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i) Drilling

ii) Blasting

iii) Loading and transportation of coal and OB

iv) Crushing, conveying and loading of coal in wagon/truck.

v) Working of dozers, dumpers and plying of other vehicular traffic.

vi) Dust generation from loose OB dumps, haul roads, coal stocks due to high wind velocity.

Gaseous pollutants are emitted due to the following operations:

i) Blasting

ii) Operation of diesel equipment

iii) Spontaneous heating of waste coal and fire in coal stock.

iv) Burning of coal for domestic use.

Impacts of Air Pollution

i) As the concentration of pollutants is within the permissible limits, mining operations will not have appreciable impact on ambient air quality. This has insignificant impact on human health as seen from data obtained from local hospitals which shows no cases of respiratory problems.

ii) Deposition of dust on plant leaves affecting the growth.

Control Measures

The following control measures are proposed to restrict air pollution:

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a) **Preventive measures**

i) Dust collectors in drills

ii) Restricting the blasting during the period of high wind condition.

iii) Black topping of all service roads.

iv) Routine maintenance of HEMM to reduce gaseous emissions.

v) Limiting the speed of vehicle to reduce dust generation.

vi) Provision of air tight control rooms in CHP, telecommunication stations, electric sub-stations, HEMMs, Computer room etc.

vii) Thick green belt (with tall trees) around proposed OB dumps, around workshop, CHP and along roads and township etc.

b) Suppressive Measures

i) Water spraying on haul roads, service roads, coal pile, etc. water sprinklers (60KL) have been provided for this purpose.

ii) Proper operation and maintenance of dust extractors in CHP and other equipment.

iii) Green belt around colony and industrial complex.

iv) Concurrent reclamation of OB dumps to reduce dust generation from loose OB dump surface.

To assess the pollution level in the Bina-Kakri Amalgamation OCP area, Ambient Air Quality is monitored at regular interval as per MOEF notification at the existing Study area (Core and Buffer zone) of Bina and Kakri OCP

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WATER QUALITY

Sources of Water Pollution

1) Effluent from residential buildings, other amenity centre if discharged without treatment.

2) Runoff from Mine Area & OB dumps:

Runoff from slopes of internal OB dumps, in-pit slopes, access road if not canalized will find its way into the mine sump. This runoff will not have any pollutant except high-suspended solid concentration.

3) Seepage & Leaching of chemical from OB dumps

Part of rainwater infiltrates through OB dumps and finds its way in mine sump. This water will not have any toxic chemicals except dissolved solids.

4) Effluent from Workshop & CHP:

For proper maintenance, HEMM like dumpers, dozers, graders are washed frequently in workshop. In addition, effluent from workshop constitute washing of floor & roads in workshop premises

Impacts of Water Pollution

Anticipated impacts of water pollution are as follows:

1) Industrial effluent increases the concentration of TSS, Oil & grease etc. in natural water courses if discharged untreated.

2). Sump water, if discharged untreated, increases suspended solids, dissolved chemicals, oil/grease in natural water course.

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3) Surface run-off causes soil erosion and siltation of water courses. Siltation affects the quality and productivity of soil.

CONTROL MEASURES

As the project is under development stage, water pollution due to various mining activities can not be ascertained. However, keeping in view the experience gained in other projects following control measures have been proposed :

i) Domestic Effluent

For domestic effluent, centralized sewage treatment plant has been constructed . The sewage is being treated before being discharged into natural streams.

ii) Effluent Treatment

Workshop: To treat the effluent discharge oil & grease trap has been constructed.

CHP: Effluent from CHP is being treated through ETP.

iii) Mine Water & Runoff from dump

At present pumped out water from mine is being treated in ETP and treated water is being used for Industrial purpose

iv) Surface Runoff :

Runoff from OB dumps flow through drain around OB dump with silt arrestors into a siltation pond. It is then be discharged into nalla.

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NOISE LEVEL

Sources of Noise Pollution

Source of noise pollution during mining operations in Khadia OCP are:

1) Drilling & Blasting.
2) Operation of HEMM like dumpers, dozers, FE loaders, shovels and other motor vehicles
4) Operation in CHP due to crushing, screening, loading & unloading operations.
5) Operation of workshop equipment like compressors, fans, drilling and other machines.
6) Running of other vehicular traffic.

Impact of Noise Pollution

As the noise levels at mine site are well below threshold value of 90 dB(A), the impact of noise generated due to different mining operations is insignificant.

Control Measures

1) Provision of noise proof cabins for operators of drills, dumpers, shovels, draglines etc.
2) Routine maintenance of HEMM.
3) Provision of ear muffs and ear plugs as and when required.
4) Restriction of speed of vehicle in colony & sensitive areas.
5) Colony has been constructed at a distance of 4 to 6 Km from mine area to minimize impact of noise due to mining activities. It is suitably located with respect to main road which will also reduce the impact of noise pollution due to vehicular traffic.

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6) Provision of thick green belt around colony. It has been observed that 40-50 meter thick green belt can be effective in attenuating noise level by 7-8 dB(A).

To assess the pollution level in the Bina-Kakri Amalgamation OCP area, noise level is monitored at regular interval as per MOEF notification at the existing Study area (Core and Buffer zone) of Bina and Kakri OCP.

GROUND VIBRATION

Blasting in which about 25% of the explosive energy is utilized in actual rock breaking process and the rest is dissipated through air and ground mainly causes ground vibration.

Cause and Impact of Ground Vibration

Factors affecting ground vibration due to blasting are as follows:

1) Rock properties, tectonics of rock medium i.e. presence of faults, natural planes of weakness.
2) Overcharging of blast holes,
3) Blast-hole geometry.
4) Distribution pattern of explosive in blast hole,
5) Length of stemming column.
6) Non-availability of free face.
7) Sequence of blasting, use of delay etc.

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क्षेत्रीय निदेशक
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Impacts of ground vibration are as follows:

1) Physiological effect on human beings and other animal life.
2) Damage to buildings and other structures.
3) Lowering of water table due to excessive fracturing of strata.
4) Poor or no vegetation in the adjoining areas due to lowering of water table.
5) Wild animals and birds get scared and are driven away due to excessive ground vibration and noise.

Control Measures:

The following control measures are proposed to control ground vibration:

General Guidelines:

a) Design of optimum blast hole geometry considering bench height, dia of hole, type of explosive, nature of rock, level of fragmentation required, etc.
b) Divide total charge/blast in several parts so as to keep minimum explosive/delay. For instance dividing total charge in the parts will reduce ground vibration to 1/4 compared to the total charge blasted without using delays.
c) Use of mille-second delay detonators & relays.
d) Reduce the depth of the holes (larger the depth, the ground vibration is felt over larger area). Sub grade drilling to be controlled.
e) Avoid concentration of explosive by using deck charging.
f) To provide artificial plane of weakness between the site of blast and the important surface structures to provide dampening affect.
g) Plaster shooting should be avoided to reduce air shock wave.

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क्षेत्रीय निदेशक
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16.8 LAND RECLAMATION

Land reclamation can be divided into two stages - Technical Reclamation and Biological Reclamation. Reclamation procedures for both external and internal dumps have been given below:

Technical Reclamation

Out of total OB volume of 1395.38 Mm^3 ,in the external dump 25.67 Mm^3 of OB will be accommodated in an area of 44.1 Ha and 1369.71 Mm^3 OB will be accommodated in the internal dump.

The dragline dump height will be limited to the conditions imposed by DGMS. Shovel-Dumper spoil dumps will be formed in benches of 30m and slope of individual dump bench will be 37° (equal to angle of repose of OB material). The width of berm between two adjacent benches will be 40m. Overall slope of dump works out to 28°. Top soil will be used up for spreading over the completed OB dumps. For the formation of dumps and leveling of dumps 770 HP dozers have been envisaged

Biological Reclamation

Biological reclamation is an essential part of land reclamation. It includes selection of plant species, preparation of ground, treatment of OB, establishment of plantation & its maintenance.

Selection of plant species

Planting on dump slopes is aimed at:

- Providing quick binding of OB material
- Providing basic nutrients like nitrogen, organic matter considering above factors it is proposed to plant following species:
  Khus, Munja, Agave, Prosopis juliflora, Neem , Karanj, Bamboo, Ber , Amla, Shisham, Khair etc.

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क्षेत्रीय निदेशक
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The criteria for selection of species on OB dump top is subject to mainly environmental as well as socio-economic factors. Hence, it is proposed to plant, species which gives maximum production of wood, fruits, medicine, etc. In the initial period, after first monsoon the seedlings of grasses should be spread so that it will provide basic nutrients for later plantation.

Preparation of Ground

This includes digging of small size pits 45cm x 45cmx45cm on OB surface. Digging should be done as late as possible after the season of winter rains in Feb./Mar.

Plantation Technique

This includes seed treatment, raising of seedling in nursery and plantation. Polythene bags are placed in the holes and gaps are filled with soil & organic manures.

The expenditure for biological reclamation would be met from revenue account.

16.9 COMPENSATORY AFFORESTATION

In Bina-Kakri Amalgamation OCP, compensatory afforestation has been already done in the acquired Forest land . For balance 737 Ha (UP:84 Ha, MP:653 Ha) forest land, compensatory afforestation will be done .

16.10 GREEN BELT DEVELOPMENT

For arresting dust and protection of environment against visual pollution, plantation of trees is being done around CHP & Workshop, along railway line, haul roads and approach roads, in and around residential complex..

16.11 OPEN LUNGS

For Open lungs, the provision is made in the Project report.

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16.12 REHABILITATION

In Bina-Kakri Amalgamation OCP there is no additional tenancy land is required So, there will be no additional PAPs involved due to this amalgamation of Bina & Kakri projects

16.13 COMMUNITY DEVELOPMENT

This is basically undertaken for non-employees residing in the nearby villages. Under the community development programme the project arranges periodical health camps, immunization programme and family planning programme in the nearby villages. Construction of roads, water supply arrangement, schooling facilities are also being undertaken from time to time.

16.14 MANPOWER AND EQUIPMENT FOR ENVIRONMENT

Necessary manpower & Equipment has been provided in the Project report for Environmental Management

16.15 ECONOMICS

The total capital requirement for environmental control measures for Bina-Kakri Amalgamation OCP includes cost for technical reclamation, rehabilitation, pollution abatement, effluent treatment, compensatory afforestation, green belt development, community development, and others including furniture and fittings, open lungs and vehicles.

16.16 CONCLUSION

With the increase in coal production and subsequently higher OB removal, atmospheric pollution is to increase. Hence, the various pollution control measures must be adhered to in order to mitigate this pollution.

GENERAL MANAGER
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CHAPTER-XVII

LAND REQUIREMENT

17.1 GENERAL

The total land requirement for the proposed project has been broadly estimated as 2348 Ha which includes 1757 Ha of Forestland, 563 Ha of Tenancy land and 28 Ha of Govt. land.

17.2 The following table shows the status of land acquisition:

Table No.17.1

Type of Land	Total requirement (Ha)	Possessed as on 31.3.05 (Ha)	Balance to be acquired(Ha)
Forest Land			
UP Side	1004	920	84
MP Side	753	100	653
Total	1757	1020	737
Non-Forest Land			
UP Side			
Tenancy Land	546	546	
Govt.Land			
	546	546	
MP Side			
Tenancy Land	17	17	
Govt.Land	28	28	0
Total	45	45	0
Grand Total	**2348**	**1611**	**737**

17.3 Land Use Pattern

The land use pattern is given in the table below:

Table No.17.2

Purpose	Total Mining Lease Area(Ha)				
	Govt.		Private		Total
	Forest	Others	Agri	Others (Tenancy)	
1. Excavation Area	1085	28		142	1255
2. Storage of top Soil	65			69	134
3. Overburden/Dumps					

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BINA PROJECT

क्षेत्रीय निदेशक
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Purpose	Total Mining Lease Area(Ha)				
	Govt.		Private		Total
	Forest	Others	Agri	Others (Tenancy)	
4. Mineral Storage					
5. Infrastructure (Workshop, Admn. Buildings, CHP etc.)	25			62	87
6. Roads				9	9
7. Railways				28	28
8. Green Belt	191			32	32
9. Township Area				204	204
10. Other Safety Zone	391			17	599
TOTAL	1757	28	0	563	2348

17.4 The entire additional land required falls under forest area. Necessary financial provision has been made for the acquisition of above land in Capital Outlay in Mine (Appendix-A 8.1)

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CHAPTER-XVIII

MINE CLOSURE PLANNING

18.0 INTRODUCTION

Bina-Kakri Amalgamation OCP (10 Mtpa) is located partly in the district Sonebhadra (UP) and partly in the district Singrauli(MP), which is a part of Singrauli Coalfield.

Mine closure encompasses rehabilitation process as an ongoing programme designed to restore physical and biological quality disturbed by the mining to a level acceptable to all concerned. It must aim at leaving the area in such a way that rehabilitation does not become a burden to the society after mining operation is over. It must also aim to create as self-sustained ecosystem. Mine closure operation is a continuous series of activities starting from day one of the initiation of mining project.

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. Various other objectives are as follows.

a) To allow a productive and sustainable after-use of the site which is acceptable to the mine owner and the regulatory authority.

b) To protect public health and safety.

c) To alleviate or eliminate environmental damage and thereby encourage environmental sustainability.

d) To minimize adverse socio-economic impacts

GENERAL MANAGER

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In addition documents like EIA/EMP submitted to MoEF and the commitments made therein also have legal status.

18.3 Closure Plan Preparation

The Bina-Kakri Amalgamation OCP has been designed to 10 Mtpa Coal .The mineable reserve of coal of Bina-Kakri Amalgamation OCP is expected to be exhausted by 2038-39. The present closure plan is a conceptual type. Final decision of closure will be taken by the competent authority in appropriate time.

18.4 MINE DESCRIPTION

18.4.1 Geology

Bina-Kakri Amalgamation OCP is located in the Moher sub- basin of Singrauli Coalfield, The area is covered under topo-sheet No. 631/12 and L/16 of the Survey of India on 1:50000 (1976).

The Bina-Kakri Amalgamation Project is situated on the eastern fringe of Moher plateau. The plateau top is more or less flat with a gentle slope towards west and south and a steep escarpment in the east. The escarpment in the east roughly corresponds to in-crop position of the top most workable coal horizon. The general elevation of the area above mean sea level varies from 300m along the escarpment to over 400m on plateau.

Generalized stratigraphy of the area concerned is as follows:

Lithology	Thickness range
Soil/sand	0—2 m
Sandstone with clay bands,few impersistent cabonaceous bands	20—155 m

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Mine closure planning covers the progressive mining and post-mining phase of project. Several attributes of progressive mine closure planning have to be implemented and introduced during the period of mine operation. Progressive mine closure process is undertaken concurrently with mine development/production activities.

18.1 Reasons for closure

The Bina-Kakri Amalgamation OCP has been designed for an annual capacity of 10 Mtpa for a period of 26 years from 2012-13. The mineable reserve of coal of Bina-Kakri Amalgamation OCP project is expected to be exhausted by 2038 -39 and project need to be closed.

18.2 Legislative Requirement

There is need to define the liabilities, responsibilities and authorities of the mine management, other regulatory bodies, Central and State Governments after mine closure. Although no comprehensive legislation exists on mine closure, the following legislations are relevant to mine closure aspect of CIL's mine

- The Mines Act 1952,
- Coal Mines Regulations 1957: Regulations 6, 61, 106, 112,197 etc of Coal Mines Regulations, 1957 and its related DGMS Circulars.
- The Coal Mines (Conservation and Development) Act,1974
- Water (Prevention and Control of Pollution Act), 1974.
- Air (Prevention and Control of Pollution) Act 1981
- Environment (Protection) Act, 1986 and Environment Protection (Amendment) Rule 2000
- The Hazardous Waste (Management & Handling) Rules,1989

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. सी.एस.-II
सिंगरौली

COAL: PUREWA TOP SEAM	3.5- 11 m
Sandstone and shale	36—48 m
COAL: PUREWA BOTTOM SEAM	7—13 m
Sandstone with carbonaceous shale	40---57 m
COAL: TURRA SEAM	12—23 m
Sandstone with minor shale	+ 35 m

Structural interpretation of the area is completely based on the information gathered through drilling of bore holes. The attitude of the strata varies from ENE-WSW in south to NE-SW in the eastern part. The coal seams have a corresponding dip of about 2^0 towards north and north-west. A gradual steepening of dip to about $8\text{-}10^0$ is observed in the north-eastern part of the area. The area is devoid of any fault and intrusive

18.4.2 **Reserve**

The proposed Bina-Kakri amalgamation block comprises mainly Chandela block, a part of Tipa-Jharia block in dip side and in south side a small part of Ruhela and Marrak block.

The break-up of coal reserves mine-wise and block-wise is given below:-

Name of block	Name of mine	Geological Reserve (Mt)	Mineable reserve (My)
Chandela	Bina Extn. OCP	114.33	110.88
	Kakri OCP	12.27	5.96
	Boundary between Bina Extn.& Kakri OCP	15.99	11.52
	Part of remaining Chandela	92.64	55.63
Ruhela		44.88	15.55
Tippa-Jharia		75.15	39.63
Marrak		13.25	2.26
Total		368.51	241.45

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. लि.जे.-6,
सिंगरौली

Presence of four coal seams has been deciphered in the present area. The seams from bottom to top are Kota, Turra, Purewa Bottom & Purewa Top. The bottom most Kota Seam is impersistent in both physical and chemical characteristics. Therefore, the seam is not considered for present exercise.

The break-up of coal reserves considered in the PR of Bina-Kakri Amalgamation project is given in the table below:-

Name of seam	Area considered (Ha)	Thickness variation (m)	Geological Reserve (Mt)	Mineable reserve (Mt)
Turra	862	12-18	195.09	121.40
Purewa Bottom	789	6-12	115.52	79.33
Purewa Top	715	4-7	57.90	40.72
Total	2366		368.51	241.45

18.4.3 **Mining Method:**

The main mine parameters are given in the table below:

Sl. No.	Particulars	Unit	South section	North section
1	Maximum length of quarry along Turra floor (dip-rise)	m	4416	3427
2	Maximum length of quarry along surface (dip-rise)	m	4814	3516
3	Maximum strike of quarry along Turra floor	m	1510	1576
4	Maximum strike of quarry along surface	m	1914	1845
5	Maximum depth of excavation	m	293	297
6	Hauling depth of coal	m	165	165
7	Surface area along floor of quarry	Sq. Km	9.40	
8	Surface area along surface of quarry	Sq. Km	12.55	
9	Mineable Coal Reserve	Mt.	241.45	
10	Total volume of overburden	Mm3	1395.38	
11	Stripping Ratio	m3/t	5.78	

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. (म.प्र.)-6,
सिंगरौली

Considering geo-mining conditions such as:

i) flat gradient of 2^0-3^0 of coal seams
ii) parting of 44m-56m between Turra and Purewa Bottom seam
iii) high volume of material handling i.e. 10Mt. of coal and about 60Mm3 of OB per year
iv) existing system of dragline and shovel-dumper combination in Bina extension OCP

A combined system of mining by dragline and shovel-dumper combination has been considered most suitable for the project. Three options have been considered as given below:

Option-I : Departmental Variant with the existing Draglines.

Option-II : Departmental Variant considering replacement of old 10m3/66mR Dragline with new 24m3/88mR Dragline;

Option-III : Partial OB outsourcing i.e. outsourcing of the total OB above Purewa Top Seam with existing draglines.

Option-IV : Partial OB outsourcing i.e. outsourcing of the total OB above Purewa Top Seam with replacing 10m3/66mR Dragline with new 24m3/88mR Dragline.

In all the above options, coal winning has been proposed to be done departmentally.

The elements of mining system have been determined in accordance with the parameters of excavation and transport equipment and the parameters of drilling and blasting.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

The height of main bench over Turra seam excavated by dragline will vary according to the requirement of coal exposure from Turra seam. The dragline cut width is adopted as 70m. The slope of dragline bench has been proposed as 70^0.

The width of the cut for shovel benches has been adopted as 20m. The height of the shovel benches varies from 15-18m. The width of the working benches varies from 55-60m for two way traffic along the bench whereas the width of non-working benches varies from 35-40m which includes space required for power line.

Turra seam will be taken in two benches. Height of the bench should be adjusted for proper removal of bands with due consideration to safety. The width of the cut for coal benches has been adopted as 20m. The width of the working bench in coal seam has been considered as 45m while the width of non-working benches has been kept at 25m. The slope of each bench is proposed as 70^0 in OB and 80^0 in coal. The overall running slope in working faces will be about 16^0 to 18^0.

Bench height of OB dumps formed by Shovel-dumper system will be 30m and slope of individual dump benches will be 37^0 (equal to angle of natural repose of OB material). Width of berm between two adjacent benches will be 40m. Overall slope of dump works out to 28^0. The height and other parameters of the dragline bench should be in line with the permission granted for the purpose by DGMS.

The system parameters as above have been tabulated as given below:

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

Sl. No.	Particulars	Unit	Overburden		Coal
			Dragline	Shovel	
1	Bench Height	m	37-47	15-18	10-15
2	Working Bench Width	m	70	55-60	45
3	Non-working bench width	m	70	35-40	25
4	Bench slope	Deg.	70	70	80
5	Blast Hole dia	mm	311/250	Vertical	Vertical
6	Inclination of Boreholes		Inclined	0.3	0.2

The above mining system and system parameters have been proposed for departmental option i.e. Option-I and Option-II. For outsourcing of OB as proposed in Option-III, the mining system parameters will depend upon the size and type of equipment deployed by the outsourcing agency.

18.4.4 Coal Beneficiation

There is no proposal for Coal Beneficiation for this mine. Un-washed crushed coal from Coal Handling Plant / Silo will be dispatched to power stations and other customer through Railway system.

18.5 CLOSURE PLAN

18.5.1 Mined Out land

The total land requirement has been estimated 2348 Ha. Pre mining land use is as follows:

Type of Land	Total requirement (Ha)	Possessed as on 31.3.05(Ha)	Balance to be acquired (Ha)
Forest Land			
UP Side	1004	920	84
MP Side	753	100	653
Total	**1757**	**1020**	**737**
Non-Forest Land			
UP Side			
Tenancy Land	546	546	
Total	546	546	
Govt. Land			
MP Side			

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

Type of Land	Total requirement (Ha)	Possessed as on 31.3.05(Ha)	Balance to be acquired (Ha)
Tenancy Land	17	17	
Govt. Land	28	28	
Total	**45**	**45**	
Grand Total	**2348**	**1611**	**737**

During mining operation land use pattern will be as follows:

Sl. No.	Purpose	Area in Ha
1	Area to be Excavated	1255
2	Storage for Top soil	134
3	External O.B Dumps	
4	Mineral Storage	
5	Infrastructure (Work shop, Admn. Building)	87
6	Roads	9
7	Railways	
8	Green Belt	223
9	Township Area	204
10	Others (Safety zone, vacant land etc)	408
	Total	2348

The project report envisages concurrent land reclamation of mined out land.

Out of 2348 Ha total land, 1255 Ha has been identified as Quarry area and out of which 1019.61 Ha will be back filled. The reclamation is to be done in two phases.

Phase-I Physical / Technical Reclamation:

In phase-I, the mined out land area backfilled with excavated OB material up to be pre-determined level and it is leveled with dozer and grader.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.कें.-6.
झिरपानी

A layer of top soil is laid over this graded & leveled surface of backfilled mined out land.

Phase-II Biological Reclamation

Biological reclamation is the phase-II of reclamation process. Re-vegetation covers in terms of grass & trees of appropriate species are raised over the physically reclaimed land.

Phase-III Hydro Reclamation

At the end of mine life a void of 79.38 Ha will be left in the excavated zone. This void will be converted into water body. This water reservoir may be developed for pisci-culture

The reclamation of mined out land will be a concurrent with mining operations. The post mining land use at the end of mine life will be as follows :

Sl. No.	Type of land	Area (Ha)	Land Use
1	Reclaimed external OB dump area	44.61	Forest/ Green Land (1287.22 Ha)
2	Reclaimed backfilled (Internal OB dump) area	1019.61	
3	Green Belt development area	223	
4	Water body (Quarry void)	79.38	Water body (79.38 Ha)
5	Residential & commercial area (market)	204	Public use (291 Ha)
6	Infrastructural facilities (including roads, drains, garland drains, STP and other miscellaneous use etc.)	87	
7	Safety zone & Leveled area after decommissioning of structure, Mine batter etc.	690.4	Others
	Total :	2348	

GENERAL MANAGER
RINA PROJECT

18.5.2 **Water Quality Management**

The mining area on the top of the plateau is undulating rugged topography sloping towards south and west. The local drainage is mainly radial in nature. The drainage of the area is controlled by a number of nallas. Recently a drainage trench has been made in the dip side of existing Bina-Kakri Amalgamation Project along the eastern escarpment by Tippa-Jharia Nalla which discharges into GBP Sagar.

Following water quality protection measures are taken :

- Industrial effluent treatment plant for treatment of effluents;
- Sedimentation pond for treatment of mine water;
- Garland drains to arrest surface run-off flowing into mine pit;
- Intercepting drains to collect water from external dumps and
- Biological reclamation of disturbed land to arrest siltation.

During progressive mine operation of Kakri & Bina OCP, the Drinking and Effluent water quality of Kakri & Bina OCP is measured regularly as per MoEF (gazette notification GSR-742E, 25-9-2000) & IS-10500 guide line.

18.6 **HYDROGEOLOGY**

Ground water table in general follows the Surface topography. A ground water divide is running along the centre of the area from west to east, which divides the total drainage system into northerly and southerly flowing tributaries culminating into III order drains. A flat water table with a gradient of 1:760, sloping towards south east and east has been observed in this area. The aquifer units present above the working coal seams are the major sources for inflow in to present and proposed mine working. The various hydro geological units in the Bina-Kakri amalgamation OCP is given below:

GENERAL MANAGER
BINA P

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. (क्षे.सं.-6,
सिंगरौली

Hydro-geological Unit	Formation	Thickness (m)	
		Kakri	Bina
Pheratic Aquifer (Above Purewa Top seam)	Soil, Sub soil, weathered sandstone with thin clay/shale intermittent beds and thin non persistent coal seam	1- 48.6	20-155
Aquifer- Middle (In between Purewa Top & Purewa Bottom seam)	Medium grained sand stone with thin shale	36.8 – 46.83	35.8 - 46.2
Aquifer- Lower (In between Purewa Bottom & Turra seam)	Medium to coarse grained sand stone with thin shale	39.8– 51.75	40.7– 56.6

In the unconfined aquifer ground water moves laterally through the inter granular pore space in the sand stone. With the presence of intercalated shale and carboneous shale beds and reduction in permeability with depth, the lower aquifers are poor in potential. The deeper aquifers are divided in to multi aquifer system due to clay, shale beds and persistent impervious thick coal seam.

In opencast mine, the aquifer units lying above the bottom most portion of the working seam contributes the major inflow. Due to stratification, the individual permeable beds develop individual drawdown cones and the impact is usually limited to few hundred meters. For Kakri OCP a probable Zone of influence i.e. Radius of influence has been estimated as 100 to 300 m. For Bina OCP a Radius of influence has been estimated as 612 m.

To asses the impact of opencast mining on local water regime, a regular seasonal monitoring of ground water level and quality is being carried out by establishing a net work of 31 Nos. existing dug wells in the study area of Bina OCP and 21 nos existing dug wells in the study area of Kakri OCP.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
सिंगरौली

Analysis of ground water samples from monitoring wells around Khadia Project indicate that the water quality is generally suitable for domestic us. The pH ranges from 7.32 to 7.69 standard unit, concentration of dissolved solid, sulphate, iron, manganese, nitrate, fluorite and other heavy metals are found within the drinking standard (IS-10500).

18.7 Air Quality Management Plan

With progressive mine operation of Bina & Kakri OCP, the Ambient air quality is being monitored regularly on fortnightly basis for all seasons by measuring the concentration of SPM,RPM, SO_2, NO_x . With existing control measures, the ambient air quality of the core & buffer zone is found to be well within the permissible limit . For Bina-Kakri amalgamation OCP monitoring stations will fe selected separately

Following mitigation measures to control Air Pollution are as follows:

- At drills are fitted with dust collection arrangements
- Approach roads to mine and service roads are provided with black topping to reduce dust generation.
- Water sprinklers are provided for dust control on haul roads
- Green belts provided along roads & plantation in vacant land in industrial & township areas for dust control
- In coal Handling Plant (CHP), dust control system and automatic sprinklers are provided at coal receiving pits. Fixed sprinklers are provided for coal bunkers, transfer points and loading points.

The mine is proposed to be monitored for air quality continuously fro development to closure.

GENERAL MANAGER

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. ओ.सं.-6,

18.8 **Waste Management**

Solid waste that would be generated in course of coal mining are overburden material consisting of fragments of sandstone of assorted size. They have not been found to generate acid mine drainage or leach high quantity of heavy metals.

The Open cast mining of Bina-Kakri amalgamation project involves removal of 1395.38 Mm^3 of overburden. The spoil from dragline is proposed to sidecast in the decoaled floor of Turra seam. The OB from upper benches being handled by Shovel-Dumper system is to be stacked up to the extent possible over the dragline cast spoil within the pit. However, a part of the OB spoil is to be accommodated in External dump.

The break-up of internal & external dump is as follows :

Sl. No.	Dump Type	Dump Area Ha	OB Quantity (Mm^3)
1	Internal Dump	1019.61	1369.71
2	External Dump	44.6	25.67
	Total	**1064.21**	**1395.38**

Several mitigation measures, are proposed for stabilization of the dump and prevent siltation & erosion.

- At the foot of the dump, a toe wall has been provided
- A series of open drains have been provided on dump body to arrest surface run-off and prevent siltation.
- Grasses have been grown on slopes to minimize soil erosion.

To avoid dump slope failure internal and external OB dumps are to be formed in benches/decks.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.का.-6,
सिंगरौली

18.9 Top Soil Management

At Bina-Kakri amalgamation OCP, top soil is available in patches. Top soil will be removed from these patches before drilling, blasting. The stock piling of top soil will be under taken as follows :

a) Top soil removed will be stock-piled only when it is impractical to promptly redistribute on required area.
b) Stock piled top soil will be selectively placed on pre designed area
c) A vegetative cover will be generated immediately on the stock pile to prevent erosion.

18.10 Management of Coal Rejects from Washery

There is no proposal for Coal Washery for this mine. Crushed coal from Coal Handling Plant / Silo will be dispatched to power stations and other customer through Railway system.

18.11 Infrastructure

Several infrastructures would be provided that includes:

- Workshop facilities
- Office complex
- Townships
- Coal Handling Plants
- Railway siding for transportation of coal
- Power Network including sub-stations
- Industrial and municipal effluent treatment plants
- Community facilities

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.नि.-6,
सिंगरौली

At the end of mining operations, it is proposed to decommission the Industrial infrastructures. However, before such decommissioning other infrastructures like office complex, residential complex, roads, pipelines and transmission line & community facilities, the possibility of re-use of these infrastructures for the neighboring mines will be explored.

Salvaged materials/equipments would be used for creating infrastructures facilities for coal mines that are likely to be developed in the coalfield in future. The unusable materials will be disposed off. After decommissioning of industrial infrastructure facilities, the leasehold area will be leveled.

18.12 Disposal of Mining Machinery

The machineries that can be used would be diverted to new /existing projects. Other machineries that have exhausted its life, will dispose off by auction and removed from site.

18.13 **Safety & Security**

While carrying out all kinds of mining and allied activities in the mine, the safety rules in force as per Rules & Regulations made under Mines-Act 1952 is being observed and required safety measures are taken. There will be various elements of safety & security at the time of mine closure, which will be dealt under above Rules & Regulations. The safety & Security hazard include the followings.

Safety hazards including management of fire: In the Final mine closure plan, action for control of likely fire areas of the mines will be discussed. Action will also be suggested to cover all the safety aspects.

Management of Pit Slopes and Waste Dumps: The final quarry slopes has been so designed and then subsequently developed that after the closure of the mine, there is no likelihood of any slope failure.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षेत्र.-6,
सिंगरौली

The final slope of the quarry has been designed with above consideration. However, strict compliance with the proposed final slope of quarry would be made as given in Quarry & Surface Layout Plan and subsequent slope stability studies.

Waste Dumps: The external waste dump will be developed as per the proposed design so that slope failure do not create any safety hazard to the local community. The external dump will be formed in number of decks, Each deck will have 30 m (maximum) height & slope of 37^0 (maximum) To avoid dump slope failure , overall dump slope will be maintained within 28^0. Waste dumps will be provided with garland drains and vegetation cover on surface of these dumps.

Fencing around mined out area: To prevent illegal mining and considering safety of human & fauna, mined out area will be properly fenced and all the entries to the mine will be effectively sealed.

Management of final voids:

As per mine plan of Bina-Kakri amalgamation OCP, major portion of quarry will be back filled and reclaimed, only a area of 79.38 Ha would turn out to be void. In due course of time , dip side of void will be filled with rain & ground water. This water reservoir may be developed for pisci-culture. At the time of final closure of mine, fencing with RCC post and barbed wire will be erected around the water body.

To maintain proper depth of water, the void fill be back filled with OB dump material up to certain height. In the final mine closure plan, design of voids due to mining are to be dealt and the final land use plan will include filling of the voids for land reclamation where possible and for hydro reclamation where feasible.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक

18.14 **Economic Repercussions of Closure of Mine :**

Continued Engagement of Employees:

Near the end of the mine life, manpower will starts getting reduced. The reduction of manpower could be done as per the following options:

i) Natural retirement

ii) Retraining and redeployment of younger groups in other mine.

iii) Transfer of experienced middle aged groups to other projects.

Compensation to Employees: Since employment are to be redeployed on closure of mine, they will continue to enjoy the regular pay and other benefits. As such there is no need for additional compensation.

Satellite Occupations: Opportunity for economic activities has grown in secondary and tertiary sectors around the mine. Once the mine closes, some of these activities would be affected. But this effect would not be severe, as there are other mines and townships close to this mine.

Management of Community Facilities: The community facilities developed during the mine life like educational facilities, health facilities etc. would be continued even after the mine closure. The final closure plan will envisage interaction of mining company with the State or local bodies for running these facilities.

Repercussions on Society Expectation: The mine extends several community development facilities to the population living in this vicinity. On closure of the mine this will cease.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.-6,
बिनाझोली

Emancipation from PAPs: The project affected persons (PAPs) are provided many civic facilities on the line of the management of community facilities dealt above. The final closure plan will envisage interaction of mining company with the State or local bodies for running these facilities.

18.14.1 Time scheduling for Mine Closure :

Mine closure in terms of progressive internal and external dumping, technical & biological reclamation is concurrent with the mining process. With present rate of production, life of Bina-Kakri amalgamation OCP Expansion (10 Mtpa) is expected to be up to the year 2038-39. Detailed mine closure plan will be prepared & submit before closure. However a tentative closure activities at the time of mine closure are scheduled below:

Sl. no	Activities	Year after closure				
		1st Year	2nd Year	3rd Year	4th Year	5th Year
	Mine Pit & Dump Management	-----				
	Pit water body Management	-----	------	------	------	------
	Plantation and its after care	-----	------	------		
	Disposal of Mining Machinery	-----	------	----		
	Infrastructure Dismantling		-----	------	----	
	Environmental Monitoring	-----	------	----		
	Fencing			-----	------	

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. (भा.स.)
सिंगरौली

18.14.2 **Abandonment Cost :**

The estimated cost of various mine closure activities are given below :

Sl no	Closure Type	Activities	Closure Amount (₹in Lakhs)	Type of Expenditure
1	Final	Barbed wire fencing of mines area	Rs 64935.33	Closure fund Escrow Account)
2		Infrastructure decommissioning		
3		Disposal of Mining Machineries		
4		Development of de-coaled voids in to safe water body		
5		Post environmental monitoring &, supervision charges for 3 years		
6		Power cost, protective and rehabilitation measures cost etc		

Activities 1 to 3 - To be implemented in course of mining operations. Investment will funded through capital budget .

Activity No. 4 - To be implemented in course of mining operations. Expenditure will be funded through revenue budget

Activities 5 to10 – In Bina-Kakri amalgamation OCP for a lease area of 2348 Ha, to carry out different mine closure activities such as barbed wire fencing, dismantling / demolition of structure, cleaning of mining sites, rehabilitation of mining machineries, physical & biological reclamation, landscaping, filling of de-coaled voids, post environmental monitoring cost for

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.सं.–6,
सिंगरौली

3 years, supervision charges for 3 years, power cost, protective and rehabilitation measures including their maintenance and monitoring, miscellaneous charges etc. cost of ₹64.93 crores has been estimated. This cost has been estimated based on the guide line provided by Ministry of Coal i.e. ₹6.77 lakhs per Hectare of the mine lease hold area of 2348 Ha. However this is subject to modification based on wholesale price index as notified by Govt. of India from time to time.

The above fund will be generated annually over the mine life of 25 years from 2011-12. The annual closure cost is computed considering the total lease hold area at the above mentioned rate and divided same by mine life. An amount equal to the annual cost is to be deposited each year through out the mine life compounded @5% annually.

18.14.3 **Financial Assurance:**

Northern Coalfield Ltd. will open a Escrow Account for closure fund. The above annual closure cost compounded @ 5% annually will be deposited annually for 25 years.

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्षे.स.–6,
सिंगरौली
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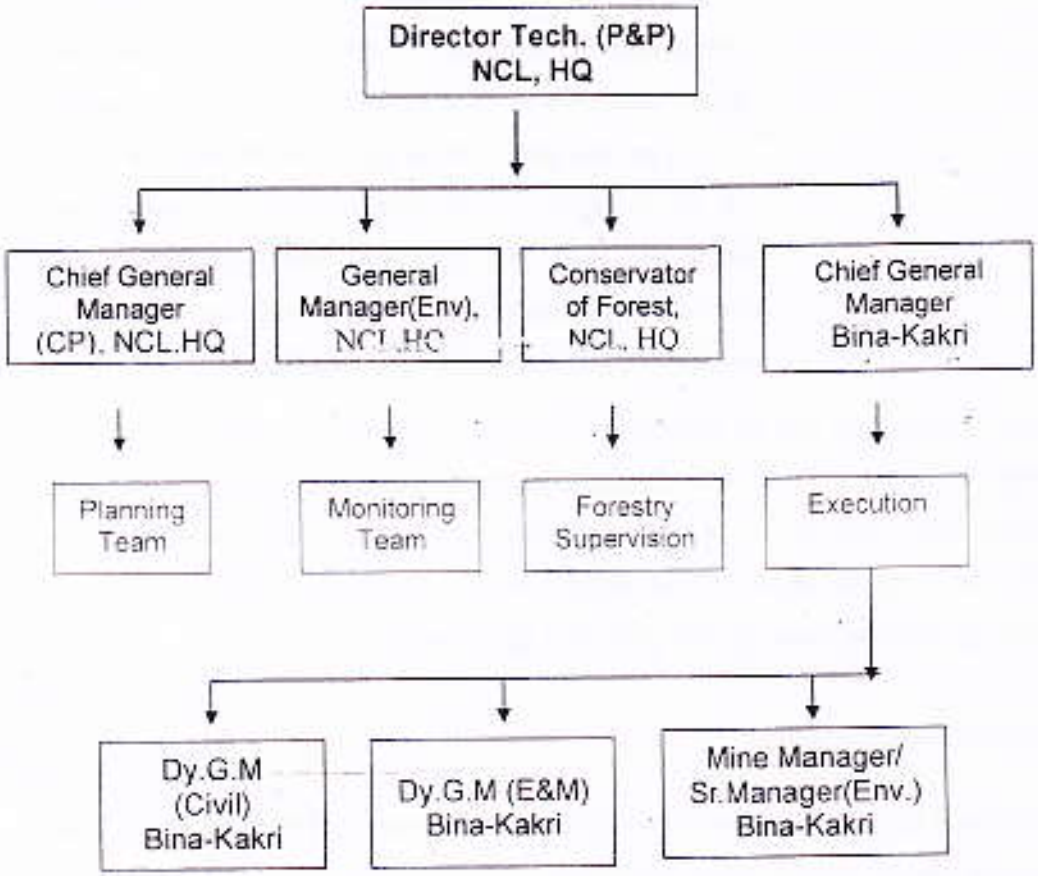
18.14.4 **Responsibilities of Mine Closure :**



The above organization structure will be in vogue for both progressive & final mine closure.

Chief General Manager: Chief General Manager of Bina-Kakri amalgamation OCP will have overall responsibilities for mine progressive & final closure. General Manager (Env), NCL will provide technical & other assistance from corporate level.

Dy.G.M (Civil) : Dy.GM (Civil) will have following responsibilities:

1. Plantation work for Green belt development & Biological reclamation;

2. Measures for control of erosion, siltation, water/ effluent treatment etc.;

GENERAL MANAGER
BINA PROJECT

क्षेत्रीय निदेशक
सी.एम.पी.डी.आई. क्ष.सं.-6,
सिंगरौली

3.Ground water monitoring & rain water harvesting;

4. Dismantling / demolition operation;

5. Cleaning of mining sites, Landscaping, barbed wire fencing.

Dy. GM (E&M) : Dy. GM (E&M) will have following responsibilities:

1. Pumping & dewatering operation

2. Environmental control measures in Industrial struciures & CHP

3.Lighting arrangement

Mine Manager/Sr. Manager (Env.): Mine Manager/ Sr. Manager(Env.) will have following responsibilities:

1. Progressive & final technical reclamation of land , void & dump.

2. Environmental monitoring & control in the mines

3. Post environmental monitoring for 3 years

4. Disposal of Mining Machineries

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CHAPTER-XIX

MANPOWER, PRODUCTIVITY & TRAINING

19.1 Manpower Assessment – Project Report for Bina-Kakri Amalgamation OCP (10 Mtpa) has been prepared for four options namely:

Option-I : Departmental Variant with the existing Draglines;

Option-II : Departmental Variant considering replacement of old 10m3/66mR Dragline with new 24m3/88mR Dragline;

Option-III : Partial OB outsourcing i.e. outsourcing of the total OB above Purewa Top Seam with existing draglines.

Option-IV : Partial OB outsourcing i.e. outsourcing of the total OB above Purewa Top Seam with replacing 10m3/66mR Dragline with new 24m3/88mR Dragline.

Manpower requirement for all the three options have been calculated separately for rated coal output of 10.00 Mtpa with 330 days annual working schedule.

The existing total manpower in Bina-Kakri Amalgamation OCP (10 Mtpa) as on 01.04.2010 is 1443.

Norm of manpower calculation has been taken into consideration for arriving at the manpower need of the mine for both the options.

Scale/Grade/Category-wise manpower assessment with their respective strength and consolidated annual wages & benefits has been given in Appendix-B, B.1 & B.2.

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The break-up of total manpower of target achievement year for both the options is given below:

Table No.19.1

Sl. No.	Particulars	No. of Persons			
		Option-I	Option-II	Option-III	Option-IV
1	OB	858	812	503	455
2	Coal	432	432	432	432
3	Common	1304	1259	1025	1001
4	Land Reclamation	37	37	32	32
	Total	2631	2540	1992	1920

19.2 Break-up of total manpower of target achievement year for both the options in various groups is given below:

Table No.19.2

Sl. No.	Particulars	No. of Persons			
		Option-I	Option-II	Option-III	Option-IV
1	Executive	182	174	135	135
2	Monthly Rated	553	545	462	458
3	Daily Rated	1896	1821	1395	1327
	Total	2631	2540	1992	1920

19.3 PRODUCTIVITY

OMS for 10.00 Mtpa productions for all the three options has been worked out as:

Table No.19.3

Particulars	Productivity (t)
Option-I	15.21
Option-II	15.71
Option-III	20.32
Option-IV	21.31

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19.4 SERVICES PROPOSED TO BE OUTSOURCED

The following services have been proposed to be outsourced for better results and improved efficiency in daily operations for both the options. For each service to be outsourced, suitable funds have been provided so that they can be managed in a better manner.

The services to be outsourced are:

- ✓ Security Services (partially)
- ✓ Canteen Services
- ✓ Rest House Services
- ✓ Colony Maintenance Services
- ✓ Reclamation Services (partially)
- ✓ Sweepers

Considering the provisions for outsourcing, manpower in the project have been accordingly proposed for both the options.

19.5 MANPOWER PHASING

The year-wise manpower phasing for all the three options till the achievement of target production is given below:

Table No.19.4

Year	No. of Persons			
	Option-I	Option-II	Option-III	Option-IV
Existing as on 31.3.10	1443	1443	1443	1443
2010-11	1443	1443	1443	1443
2011-12	1443	1443	1443	1443
2012-13	1684	1626	1275	1229
2013-14	2210	2134	1673	1613
2014-15	2631	2540	1992	1920

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19.6 TRAINING

Bina-Kakri Amalgamation OCP is an amalgamation of existing mines where there is adequate arrangement of Vocational Training facilities at VTC. The training will be provided for all the mine employees engaged in the mines that also includes contractor's persons. Refresher training for new person will be mandatory, which will be given by a project authority within time frame work. Periodic training will be provided for safety rules, regulations and developments.

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CHAPTER-XX

PROJECT IMPLEMENTATION SCHEDULE

20.1 INTRODUCTION

Bina-Kakri Amalgamation OCP (10 Mtpa) is an amalgamation of existing mines. The PR for Bina-Kakri Amalgamation OCP (10 Mtpa) is expected to be sanctioned by June 2011. The target capacity of 10 Mtpa of ROM coal is expected to be achieved in the 4th year i.e. 2014-15.

The total life of the project has been estimated as around 26 years including build-up period and tapering period. The implementation schedule deals with the major activities like planning, approval, construction/modification and initial mining operation till achieving the targeted production of 10 Mtpa. This schedule has been proposed considering the objective of achieving the target as early as possible with a minimum initial development by gainful utilization of all the assets of existing Bina Extn OCP. Accordingly, most likely time frame for each activity has been proposed.

20.2 PROJECT SCHEDULE

The zero date of project implementation is the beginning year counted after the approval of PR by the Competent Authority. The details of the major activities for project construction/implementation have been shown in the BARCHART. Immediately after the approval and finalization of financing arrangements, the construction schedule be re-defined and firmed up to suit local site conditions and to update the schedule considering unforeseen slippages if any, that may take piace.

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The project needs special attention in respect of procurement and commissioning of replacement and additional HEMM, Commissioning of workshop and CHP, power supply arrangement, construction of haul road for proposed 190 T rear dumpers and other developmental activities.

20.3 BAR CHART OF MAJOR ACTIVITIES

A Bar Chart of Bina-Kakri Amalgamation OCP (10 Mtpa) has been drawn, showing major development and construction works and is given in Chart-1.

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BAR CHART-I

PR for Bina-Kakri Amalgamation OCP (10 Mtpa)

SCHEDULE OF MAJOR ACTIVITIES

Sl. No.	Particulars	2011-12	2012-13	2013-14	2014-15	2015-16
1	Sanction of PR	10/11				
2	Land Acquisition					
3	Power Supply					
4	CHP Expansion					
5	Railway Siding					
6	Workshop Expansion					
7	Worshop Expansion					
8	Buildings					
	- Service Buildings					
	- Residential Buildings					
9	Mine Development					
10	HEMM					
11	Coal Production (Mt)	6.00	6.00	8.00	10.00	10.00
12	OB Removal (Mm3)	31.40	31.40	55.10	59.82	49.84

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