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Volume 511

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**MARCH- 2009**

**T. NO.: C I /8656**

PROJECT REPORTFORSAKHARI-IRAWATI (PAUNI-III) OC MINEINDEX

Chapter No	Contents	Page No.
A	SUMMARISED DATA	
B	TEXT	
I	Introduction	
II	Marketability & Justification	I-1 to I-4
III	Project site information	II-1 to II-3
IV	Geology & Deposit appraisal	III-1 to III-3
V	Mine Boundaries, Reserves & Mine Life	IV-1 to IV-25
VI	Method of Mining	V-1 to V-5
VII	Mining & Dumping Strategy	VI-1 to VI-5
VIII	Mining Schedule & Equipment Phasing	VII-1 to VII-7
IX	Coal Quality	VIII-1 to VIII-5
X	Pumping & Drainage	IX-1 to IX-2
XI	Coal Handling & Despatch Arrangement	X-1 to X-5
XII	Workshop, Store & Magazine	XI-1 to XI-9
XIII	Power Supply, Illumination & Communication	XII-1 to XII-6
XIV	Civil Construction	XIII-1 to XIII-17
XV	Safety & Conservation	XIV-1 to XIV-6
XVI	Environment Management	XV-1 to XV-4
XVII	Land Requirement	XVI-1 to XVI-4
XVIII	Mine Closure Planning	XVII-1 to XVII-2
XIX	Manpower, Productivity & Training	XVIII-1 to XVIII-6
XX	Project Implementation Schedule	XIX-1 to XIX-2
XXI	Financial Evaluation	XX-1 to XX-2
XXII	A Chapter on Outsourcing (Partial Hiring Option)	XXI-1 to XXI-7
	APPENDICES (DEPARTMENTAL OPTION)	XXII-1 to XXII-11
	APPENDICES (PARTIAL HIRING OPTION)	
C	ANNEXURE	

## PRE-PLANNING INTERACTIVE PROCESS

The area for proposed Pauni-III opencast mine falls in the Rajura tehsil of Chandrapur district of Maharashtra State. The Chandrapur district township is located at the distance of about 25 km from the block.

The entire geological block is virgin one and no mining activity is in progress. The nearest working opencast mine i.e. Pauni O.C. is located east of Pauni Extn. Block. Project report for Pauni-II OCP located in Pauni Extn. Geological Block (adjacent to proposed Pauni-III OC Project) has been approved by WCL Board in the year 2006 for production capacity of 0.60Mty. Land acquisition for Pauni-II OC is under progress.

A total of 40.868 Mt. of quarriable net proved reserves of Composite Seam (Composite Top+Bottom Sections) have been established and total reserves falls in grade-D to F. The proposed Project Report envisages to mine out 24.11 Mt of coal at an average stripping ratio of 6.54 m<sup>3</sup>/t. The proposed mine would contribute 1.25 Mt of coal per annum to bridge the ever increasing gap between demand & supply.

The Draft PR for Pauni-III OCM (Nov.'08) was discussed in the Planning committee meeting held on 30.03.09 at WCL(Hq). It was decided in this meeting that the proposed project shall be renamed as Sakhari-Irawati (Pauni-III) OCP.

The important milestone dates involving preparation of this project report are as follows:

- |   |                                |
|---|--------------------------------|
| 1. Visit to the block by CMPDI team               | - 9 <sup>th</sup> March, 2008  |
| 2. Submission of Draft Project Report (1.25 Mty)  | - November, 2008               |
| 3. Presentation of Draft PR at CMPDI (Hq), Ranchi | - 19 <sup>th</sup> Jan., 2009  |
| 4. Planning Committee Meeting at WCL (Hq), Nagpur | - 30 <sup>th</sup> March, 2009 |
| 5. Submission of Project Report (1.25 Mty)        | - March, 2009                  |

The Project Report of Pauni-III OC mine has been prepared considering the Minutes of Planning Committee Meeting and the suggestions/comments received from CMPDI (HQ) and WCL. The lead team comprising of following officers was involved in preparation of this report under the overall guidance of Shri P. Guha, RD, RI-IV, Nagpur.

1. Shri S.K.Sinha, HOD (OC)/CME
2. Shri A.Choudhuri, CE (E&M)
3. Shri Krishan Kumar, Dy.CE (Civil)
4. Shri G.Moitra, Dy. CE (E&M)
5. Shri R.K.S.Chauhan, Dy.CG
6. Shri I.D.Narayan, Dy.CME
7. Shri A.D.Jamkar, SE (Env.)
8. Shri M.L.Santra, SE (E&M)
9. Shri Anjani Kumar, SE (Civil)
10. Shri Rakesh Kumar, SE (E&M)
11. Shri Kashi Vishwanathan, FM (Project Costing)
12. Shri G.S. Gahlot, SOM
13. Shri Shashidhar kumar, S.E (E&M)
14. Shri S.K.Singh, Sr.E.E (E&M)

\*\*\*\*\*

Sl. No.	
A.	GENERAL
1	Name of
2	Name of
3	Nearest R
4	Nearest N road

B.	GEOLOG
1	Name of g
2	Area (sq. m)
3	Borehole D
4	Description
Name of seam	
Top Sec.	
Parting	
Bot.Sec.	
TOTAL	

C.	TECHNICA
1	Area of the
2	Borehole d
3	Mine param
4	Description worke lon
Name of seam	Mining Area (sq. km)
Top OB	2.17
Top Sec.	1.36
Parting	1.36

JOB NO.4021291

## PR FOR SAKHARI-IRAWATI (PAUNI-III) OCP

SUMMARISED DATA

(March, 2009)

Sl. No.	Particulars		Unit				
A.	GENERAL						
1	Name of Project						
2	Name of Area / Company			Sakhari-Irawati (Pauni-III) OCP			
3	Nearest Railway Station from project		Name km	Ballarpur Area, WCL Ballarshah 10			
4	Nearest National / State Highway / Approach road		Name km	Sasti Ghugus Road 1.00			
B.	GEOLOGICAL						
1	Name of geological blocks considered		Name	West of Pauni Extn OC Block			
2	Area of the geological blocks		sq. km	2.52			
3	Borehole Density within blocks		BHs / sq.km	20			
4	Description of all coal seams within block						
Name of seam	Thickness (m)		Geological reserves(Mt)				
	Min.	Max.					
Top Sec.	5.56	13.99	20.60				
Parting	1.33	5.13	-				
Bot.Sec.	2.05	6.00	9.16				
TOTAL			29.76				
C.	TECHNICAL						
1	Area of the proposed mine block		sq. km	2.52			
2	Borehole density within mine area		BHs/sq. km	20			
3	Mine parameters						
	Extent along strike		km	2.5			
	Extent along dip (at floor)		km	0.75			
4	Description of coal seams proposed to be worked along with the parting details						
Name of seam	Mining Area (sq. km)	Thickness range considered (m)	Av. Thickness / Parting Thickness (m)	Av. Grade (UHV/ GCV)	Av. gradient	Mineable Reserves (Mt)	Volume of OB (Mm <sup>3</sup> )
Top OB	2.17	25-180	100	-	-	-	151.66
Top Sec.	1.36	5.56-13.99	10	E	1 in 6	16.69	-
Parting	1.36	1.33-5.13	4	-	1 in 6	-	5.91

Sl. No.	Particulars				Unit		
Bot. Sec.	1.48	2.05-6.00	4	E	1 in 6	7.42	
Total						24.11	157.57
5	Av. Stripping Ratio				m <sup>3</sup> /t	6.54	
6	Method of Mining					Horizontal Slicing, Shovel-Dumper combination	
7	Target Output				Mt	1.25	
	Nominal production capacity (at 100%)				Mt	1.45	
	Peak production capacity (at 115%)				Mt	1.05	
	Production capacity (at 85%)					5	
8	Year of achieving Target Production (from zero date)				Years	6	
9	Year of start of Internal Dumping (Incl. land acquisition)				Year		
10	Production Phasing (from zero date upto target year)				Mt		
Year / Coal Seam		Year 1	Year 2	Year 3	Year 4	Year 5 / Upto Target year	
Coal(Mt)		0.40	0.80	1.25	1.25	1.25	
OB(Mm <sup>3</sup> )		4.00	7.40	8.45	8.45	8.45	
11	Total Mine Life (at Nom. production capacity)					23	
	Pre-construction period				Years	2	
	Construction period				Years	2	
	Production build-up period				Years	2	
	Production period				Years	18	
	Tapering / mine closure period				Years	1	
12	Major HEMM Deployed for Coal				Nos. & Capacity	DEPTT. OPTION	PARTIAL HIRING OPTIO
	Shovel / (Diesel Hyd. B/H)				4.1m <sup>3</sup>	1	2 (2.8m <sup>3</sup> )
	Dumper				60T RD	5	9
	Drill				160mm dia.	1	1
	Dozer				320HP Dozer	1	1
13	Major HEMM Deployed for OB				Nos. & Capacity		NIL
	Shovel / Diesel Hyd. Shovel				6.1m <sup>3</sup>	6	
	Dumper				60T RD	59	
	Drill				250mm dia.	6	
	Dozer				410HP Dozer	6	
14	Total Manpower				Nos.	NIL	NIL
	Existing				Nos.	755	333
15	Overall Output per manshift (OMS)				Tonnes	6.27	14.22

Sl. No.	
16	Seam-wis (non-cokir
17	Presence (nallas, ro
18	Coal Tran
19	Surface C
20	Any Railw
21	Name of i
D.	ENVIRON
1	Civil Cons
2	Water De
3	Total Lan
4	Land to b (excavati
5	Land to b (for servi
6	Land to b
7	Net Pres
8	Habitatio
9	Cost of la
10	Capital f
11	Average
12	Make of

CMPDI

CMPDI

		Sl. No.	Particulars	Unit		
157.57			Existing	Tonnes	N.A.	N.A.
			Incremental	Tonnes	N.A.	N.A.
Shovel-Dumper ation		16	Seam-wise weighted average grade of coal (non-coking/coking)		Non-Coking, Grade 'E'	
5		17	Presence of Major Surface Constraints (nallas, road, power line, etc.)	(type)	Sakhari Nalla, Chincholi-Sakhri road,	
5		18	Coal Transport within the mine		66 kV HT Line	
5		19	Surface Coal Transport to siding		By Trucks	
		20	Any Railway Siding		By Road	
		21	Name of any Specific Customer/Industry		Sasti siding	
					MAHAGENCO/Misc.	
		D.	ENVIRONMENTAL & OTHERS		DEPTT. OPTION	Partial Hiring OPTION
Year 5 / Upto Target year		1	Civil Construction			
1.25			Residential houses	Nos.	406	183
8.45			Housing satisfaction	%	53.80	55.00
		2	Water Demand	kl	340	145
			Colony	kl	350	350
		3	Total Land to be acquired			
23			Government land	Ha	100.00	100.00
2			Tenancy land	Ha	692.03	692.03
2			Forest land (type of forest)	Ha	29.81	29.81
2		4	Land to be acquired within minetake area (excavation area)	Ha	217.40	217.40
18		5	Land to be acquired outside minetake area (for service & residential purposes)	Ha	40.00	40.00
1		6	Land to be acquired for external dumping	Ha	149.78	149.78
PARTIAL HIRING OPTIO 2 (2.8m <sup>3</sup> )		7	Net Present Value of Forest Land	Rs.Lakhs/Ha	9.00	9.00
9			Total Area	Ha	29.81	29.81
1			Total Value	Rs.Lakhs	268.29	268.29
1		8	Habitation & Rehabilitation			
NIL			No. of villages within mine boundary	Nos.	NIL	NIL
			No. of land oustees			
			No. of PAFs to be rehabilitated			
		9	Cost of land (As per Appendix-A.1)			
NIL			Total Cost	Rs. crores	63.4258	63.4258
333		10	Capital for Env. Pollution control Measures	Rs. crores	0.61	0.61
14.22		11	Average annual rainfall	mm	1000	1000
		12	Make of Water	mm/day	165	165

Sl. No.	Particulars	Unit	31601	31601
13	Total installed pumping capacity	m <sup>3</sup> /day		Sakhri nala, Lendi nala
14	Drainage of the Area (Name of river/nala)		Yes (Shown in Quarry & Surface Layout Plan)	
15	Any proposed diversion of nala or power line			
E.	FINANCIAL		DEPARTMENTAL OPTION	Partial Hiring OPTION
1	Total Capital Investment			
	Additional	Rs. crores	355.4872	173.5652
2	Specific Investment (Total)	Rs. / tonne	2843.90	1388.52
		Rs./m <sup>3</sup>	397.17	193.92
3	Total Capital Investment on P&M (Total)	Rs. crores	218.5692	54.0761
4	Specific Investment on P&M Total	Rs. / tonne	1748.55	432.61
5	Capital requirement upto target year	Rs. crores	344.1004	166.8211
6	Year of opening of Revenue account (from zero date)	Year	III	III
7	Earnings per manshift (EMS)	Rs.	1310.39	1310.39
8	Estimated Cost of Production			
	At 100% production level	Rs. / tonne	1230.90	945.23
	At 85% production level		1396.42	1013.67
9	Estimated average selling price (at 95% sales realization)	Rs. / tonne	975.50	975.50
10	Estimated Profit			
	At 100% production level	Rs. / tonne	(-) 255.40	30.27
	At 85% production level		(-) 420.92	(-)38.17
11	Financial Internal rate of return (FIRR)			
	At 100% production level	%	(-) 14.17	5.01
	At 85% production level		(-) 21.17	(-)1.18
12	Economic rate of return (only for projects to be approved by Govt.)	%		
	At 100% production level		N.A	N.A
	At 85% production level			
13	Desired av. Selling Price to yield 12% FIRR			
	At 100% production level	Rs. / tonne	1430.03	1064.29
	At 85% production level		1630.71	1153.77
14	Break-even point	%	137.42	92.76
15	Cost of Outsourcing (average)			
	OB	Rs/m <sup>3</sup>		67.93
	Coal	Rs/tonne		nil
16	Mine Closure Cost (for corpus fund) Rs./t		6.00	6.00
17	Expected Completion Capital	Rs. crores	460.4640	232.88

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## 1.1 BA

The western m geological Rajura teh township is

The The nearest Block. Proj (adjacent to the year 20 under prog geological b

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## 1.1.1 SALI

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## Chapter - I

## INTRODUCTION

## 1.1 BACKGROUND OF THE PROJECT REPORT

The present area is located west of Pauni Extn. Block, which forms the south-western most coal bearing area of eastern limb of Wardha Valley Coalfield. The geological block is named as "Area west of Pauni Extn. Block". The area falls in the Rajura tehsil of Chandrapur district of Maharashtra State. The Chandrapur district township is located at the distance of about 25 km from the block.

The entire geological block is virgin one and no mining activity is in progress. The nearest working opencast mine i.e. Pauni O.C. is located east of Pauni Extn. Block. Project report for Pauni-II OCP located in Pauni Extn. Geological Block (adjacent to proposed Pauni-III OC Project) has been approved by WCL Board in the year 2006 for production capacity of 0.60Mty. Land acquisition for Pauni-II OC is under progress. No project report has been previously approved in the proposed geological block.

TABLE 1.1 : CHRONOLOGY OF PREVIOUS APPROVED REPORTS

Year of preparation	Year of approval	Technology adopted	Production capacity (Mty)	Approved capital (Rs. Lakhs)
1	2	3	4	5
NIL	NIL	NIL	NIL	NIL

The Draft PR for Pauni-III OCM (Nov.'08) was discussed in the Planning committee meeting held on 30.03.09 at WCL(Hq). It was decided in this meeting that the proposed project shall be renamed as Sakhari-Irawati (Pauni-III) OCP.

## 1.1.1 SALIENT FEATURES OF THE LAST APPROVED REPORT

No Project Report has been approved in the proposed geological block.

### 1.1.2 RECENT STUDIES AND DEVELOPMENT

The exploration activities in area west of Pauni Extn. Block were completed in the year 2006 with the main objective of delineating the lay and disposition of coal seams, deciphering the geological structure, determining the quality and reserves of the seams. The entire cores of borehole CMWG -208 have been sent to VNIT, Nagpur for carrying out physico-mechanical tests. The results are presented in Annexure – III.

## 1.2 EXPLORATION STATUS

The detailed exploration in Area West of Pauni Extn. Block was taken up by CMPDI which commenced on 17-03-2000 and completed on 23-05-06. Total 61 boreholes (CMWG- Series) have been drilled including 4 boreholes (CMWG – 207, 209, 211 & 212) drilled outside the block with the total meterage of 6632.00 m, which proved the occurrence of potential Composite Seam (Composite Top Section and Composite Bottom Section). Following table shows year wise details of borehole drilled by CMPDI :-

TABLE 1.2 : Details of Borehole Drilled by CMPDI

Period of drilling	No. of boreholes	Meterage Drilled (m)
<b>A. BOREHOLE DRILLED WITH IN THE BLOCK</b>		
1999 – 2000	1	166.00
2000 – 2001	2	352.00
2001 – 2002	6	845.00
2003 – 2004	14	1565.60
2004 – 2005	21	2326.40
2005 – 2006	11	817.00
2006 – 2007	2	153.00
Sub-Total	57	6225.00
<b>B. BOREHOLE DRILLED OUTSIDE THE BLOCK</b>		
2006-07	4	407.00
Total	61	6632.00

A total of 40.868 Mt. of quarriable net proved reserves of Composite Seam (Composite Top+Bottom Sections) have been established and total reserves falls in grade-D to F. The entire coal reserves falls between < 1:2 to 1:17 and stripping ratio of 5.43. Borehole density is 20 boreholes per km<sup>2</sup> in the proposed geological block.

### 1.3 MINING ACTIVITIES, IF ANY

The geological block is virgin one and no mining activity has been started in the block.

### 1.4 JUSTIFICATION OF PREPARATION OF PR

The proposed Project Report envisages to mine out 24.11 Mt of coal at an average stripping ratio of 6.54 m<sup>3</sup>/t. The proposed mine would contribute 1.25 Mt of coal per annum to bridge the ever increasing gap between demand & supply.

#### 1.4.1 NECESSITY OF RECASTING THE PR

NOT APPLICABLE

### 1.5 SALIENT FEATURES OF PRESENT PR (CAPACITY, CAPITAL, ETC.)

TABLE 1.3 : Salient features of present PR

Sl. No.	Variant considered in PR	Capacity (Mty)	Capital (Rs. Crs.)	Remarks
1	Departmental Option	1.25	355.4872	Shovel-Dumper technology
2	Partial Hiring Option	1.25	173.5652	Shovel-Dumper technology

#### REPORT RECOMMENDED FOR EMP CLEARANCE (PEAK CAPACITY)

The peak capacity recommended for EMP clearance is 1.55 Mty (about 25% higher than proposed normative production of 1.25 Mty).

#### POINTS TO BE CONSIDERED UNDER "FLEXIBILITY" (OF TECHNOLOGY WITHIN APPROVED CAPITAL)

Increased number of excavators & Dumpers may be deployed with enhanced manpower and proper supervision considering safety in operation.

## ANY SPECIFIC LINKAGE OR FSA (FUEL SUPPLY AGREEMENT)

At the present stage no specific linkage or FSA exists.

### 1.6 DIFFICULTIES AND CONSTRAINTS IN MINING WITH ASSOCIATED RISK

Following difficulties and constraints are apprehended in mining :-

TABLE 1.4 : Constraints in mining with associated risk

Sl No.	Constraint	Associated Risk
1	Diversion of Nallas (Lendi Nalla, Sakri nalla & Seasonal Nallas)	Blockage of mineable reserves & damage of Inundation
2	Diversion of 66 kV HT line	Blockage of mineable reserves
3	Diversion of Road (Sakhri- Chincholi village)	Blockage of mineable reserves
4	Land acquisition	Delay in implementation

Appropriate provisions have been made in this PR to overcome these constraints. Moreover, provision for scientific studies for above purpose have also been made in this PR.

### 1.7 PROJECT OBJECTIVES AND TARGET BENEFICIARIES

The proposed Project envisages to mine out 24.11 Mt of coal. The proposed mine would contribute 1.25 Mt of coal per annum to bridge the ever increasing gap between demand & supply. The target beneficiaries would be coal consumers (power plant etc.) and local inhabitants in terms of direct & indirect employment.

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### 2.1 DEMAND

The f

Particular  
Demand

### 2.2.1 SECTION

The f  
coal, excluding

Sl. No.	
1.	Power
2.	Power
3.	Spong
4.	BRK a
5.	Ceme
6.	C ier
	Total

\*Source

### 2.2.2 AVAILABLE

The fo

WCL:

## Chapter - II

## MARKETABILITY

## 2.1 DEMAND AND SUPPLY SCENARIO (COMPANY)

The following table shows the linked demand on WCL :-

Table-2.1

## DEMAND ON WCL

Particulars	2008-09	2009-10	2010-11	2011-12	2016-17
Demand for coal in Mt	50.14	50.44	50.48	50.48	50.46

## 2.2.1 SECTOR WISE DEMAND

The following table shows the sector-wise demand for coking, non-coking coal, excluding middlings, on WCL:

Table-2.2

## SECTOR-WISE DEMAND

(Fig. in Mt)

Sl. No.	SECTOR	YEAR				
		2008-09	2009-10	2010-11	2011-12	2016-17
1.	Power (Utilities)	37.519	37.516	37.498	37.498	37.491
2.	Power (Captive)	3.090	3.140	3.230	3.230	3.230
3.	Sponge Iron/ CDI	0.340	0.340	0.340	0.340	0.340
4.	BRK and others/LTC/SSF	5.918	5.921	5.889	5.889	5.876
5.	Cement	3.250	3.500	3.500	3.500	3.500
6.	Colliery consumption	0.023	0.023	0.023	0.023	0.023
	Total Demand *	50.140	50.440	50.480	50.480	50.460

\*Source: Annual Plan for 2007-08 of WCL prepared by WCL Planning Department in September 2006.

## 2.2.2 AVAILABILITY OF COAL

The following table shows the availability of non-coking coal from the mines of WCL:

Table-2.3

## AVAILABILITY OF NON-COKING COAL

(Fig. in Mt)

Sl. No.	Class of Mines	YEAR				
		2008-09	2009-10	2010-11	2011-12	2016-17
1.	Existing mines	0.899	0.870	0.780	0.540	0.480
2.	Completed projects	35.866	31.060	27.600	23.130	10.750
3.	On-going projects	5.020	9.510	12.750	14.680	15.490
4.	Total (Sanctioned projects)	41.785	41.440	41.130	38.350	26.720
5.	Future projects (subject to approval)	0.500	1.370	2.490	5.780	17.590
	Total Availability **	42.285	42.810	43.620#	44.130#	44.310#

\*\*Source: Annual Plan for 2008-09 of WCL prepared by WCL Planning Department in December 2007.

# includes production from future projects like Dhankasa U/G and Maori U/G

## 2.2.3 DEFICIT

Following table shows the deficit in availability of non-coking coal, excluding middlings from the various mines of WCL:

Table-2.4

## DEFICIT IN AVAILABILITY OF NON-COKING COAL (Fig. in Mt)

Sl. No.	Parameter	YEAR				
		2008-09	2009-10	2010-11	2011-12	2016-17
1.	Demand for coal	50.140	50.440	50.480	50.480	50.460
2.	Availability of coal from sanctioned projects	41.785	41.440	41.130	38.350	26.720
3.	Surplus/Deficit (+/-)	(-)8.355	(-)9.000	(-)9.350	(-)12.130	(-)23.740
4.	Availability of coal from future projects	0.500	1.370	2.490	5.780	17.590
5.	Surplus/Deficit (+/-)	(-)7.855	(-)7.630	(-)6.86	(-)6.35	(-)6.15

## 2.2 UTILITY OR MARKET FOR THE COAL FROM MINE / PROJECT

The mines of WCL are under constant pressure to meet the increasing demand of non-coking coal for power houses and other bulk consumers from Western as well as Southern part of country. The proposed Sakhari-Irawati (Paun III) OC project is located in Wardha Valley coalfields of WCL. The justification of this mine has been studied in the light of estimated demand for non-coking coal for power sector in Maharashtra and production forecast from existing, completed and ongoing projects of WCL.

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Table

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touch 6.55 M

Thus,  
Sakhari-Iraw  
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in Mt)

1-12	2016-17
40	0.480
130	10.750
680	15.490
350	26.720
780	17.590
130#	44.310#

CL Planning

-coking coal,

(Fig. in Mt)

2	2016-17
0	50.460
0	26.720
30	(-)23.740
0	17.590
15	(-)6.15

E / PROJECT

the increasing  
consumers from  
Sakhari-Irawati (Pauni-III)  
the justification of  
-coking coal from  
g. completed and

## 2.3 AVAILABLE LINKAGE OR FIRM FUEL SUPPLY AGREEMENT (FSA)

Coal from proposed project would be supplied mainly to MAHAGENCO. Although in present scenario of power generation MAHAGENCO is in great need of coal, there is distinct possibility that normal demand would not materialise. However, no firm fuel supply agreement/ linkage is available for proposed mine.

## 2.4 JUSTIFICATION OF OPENING THE PROJECT BASED ON MARKETABILITY

Table No. 2.4 indicates that supply of coal from WCL mines is not even sufficient to meet linked demand in 2007-08. Moreover, the deficit of coal is likely to touch 6.55 Mt in 2011-12 even when future projects are approved.

Thus, there will be no problem in marketing of coal from the proposed Sakhari-Irawati (Pauni-III) OC Project in view of deficit in availability of coal from mines of WCL in near future. Socio-economic impacts of Pauni-III OC Project have been considered and remedial measures have been provided in the project report.

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## PROJECT SITE INFORMATION

### 3.1 LOCATION

#### 3.1.1 BROAD LOCATION OF PROJECT AREA IN RELATION TO GEOLOGICAL BLOCK AND COALFIELD WITH LATITUDES AND LONGITUDES

The present area is located west of Pauni Extn. Block, which forms the south-western most coal bearing area of eastern limb of Wardha Valley Coalfield. The area falls in the Rajura tehsil of Chandrapur district of Maharashtra State. The Chandrapur district township is located at the distance of about 25 kms from the block. The area is bounded by Latitude N  $19^{\circ} 48' 19''$  and  $19^{\circ} 49' 27''$  and Longitude E  $79^{\circ} 13' 48''$  and  $79^{\circ} 15' 36''$ . The block is covered in the survey of India Toposheet No.- 55 M/5 and as per national grid the coordinates of the area is Latitude N - 1060992.510 & 1063065.889 and Departure E - 3024069.419 & 3027212.719 (Plate - I).

#### 3.1.2 AREA OF THE PROJECT IN SQ. KMS.

The area west of Pauni Extn. Block is 2.52 sq. km.

#### 3.1.3 LIMITING BOUNDARIES OF THE PROJECTISED AREA

The limits of area west of Pauni Extn. Block are as follows :

TABLE 1.1 : BOUNDARIES OF THE PROJECTISED AREA

1.	North	Fault $F_2$ (PE) - $F_2$ (PE) (at the floor of Composite Top Section)
2.	South	Fault $F_9$ - $F_9$ (at the floor of Composite Bottom Section & $F_{10}$ - $F_{10}$ (below Kamthi) and subcrop of Composite Seam (below Kamthi)
3.	East	Fault $F_2$ (PE)- $F_2$ (PE) (at the floor of Composite Top Section)
4.	West	Subcrop of Composite Seam (below Kamthi) and faults $F_3$ - $F_3$ & $F_{10}$ - $F_{10}$ (Below Kamthi)

### 3.2 ACCESSIBILITY AND COMMUNICATION

The approach to the area at present is via Sasti Colliery or Rajura, Mathra, Gauri, Pauni and Sasti villages by a fair weathered road, which is passing from north of the block boundary. The area is free from village population, since no village exist within the area of the block. Waroda village is located in the north-west outside the block boundary and connected with all weather metal road with Rajura tehsil. Delhi-Madras Grand Chord Railway line passes through Ballarpur township which is located in the NE of the block at a distance of about 10 kms. Ballarshah Railway Station is located in the NE at about 10 kms. From the area.

### 3.3 CLIMATE AND RAINFALL DATA

The area is characterised by subtropical climate. The highest day time temperature recorded is  $48^{\circ}$  C during summer and during winter season the temperature goes down to  $10^{\circ}$  C.

Monsoon are normally active during the period from 15<sup>th</sup> June to 15<sup>th</sup> September. The annual rain fall data were recorded at Pauni O.C. Mine, Rajura tehsil, district Chandrapur for the period 1991 to 2005 and it indicates the minimum 501 mm (year 2004) and maximum 1765 mm (year 1994) of total annual rainfall.

### 3.4 TOPOGRAPHY WITH DRAINAGE PATTERN OF AREA

The altitude of the area ranges between 183.25 m and 200.29 m. A 66 K High Electricity Tension Line is passing through the southern part of the area. Few seasonal nallas are passing through the block and joining easterly flowing Pauni nalla in the north, which ultimately joins Wardha river near Sasti village. The general slope of the area is from west to east. The main drainage of the area is controlled by Wardha river, which is flowing southerly and is located about 10 kms east from the area.

Few seasonal nalas are passing through the block and their flow direction is from west to east. Lendi Laoni nala is passing through the middle part of the block. These nalas joins easterly flowing Pauni nala in the north which ultimately joins Wardha river near Sasti village.

### 3.5 PRESENT LAND USE PATTERN

The entire area of the block is covered by fertile black cotton agricultural land and is presently being used for growing crops like cotton, lentils, chilli, sunflower etc. A small part of land is also demarcated as Zudpi jungle as per the land records provided by mine officials.

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or season the

June to 15<sup>th</sup>  
2. Mine, Rajura  
as the minimum  
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## Chapter - IV

## GEOLOGY AND DEPOSIT APPRAISAL

## 4.1 BACKGROUND/INTRODUCTION

Wardha Valley Coalfield has assumed importance by the virtue of its location to meet the increasing coal demand in southern and western part of the country. Wardha Valley Coalfield covers a vast area of around 4000 sq. kms. within the districts of Chandrapur and Yeotmal in Maharashtra State

The present area is located west of Pauni Extn. Block, which forms the south-western most coal bearing area of eastern limb of Wardha Valley Coalfield. The area falls in the Rajura tehsil of Chandrapur district of Maharashtra State. The Chandrapur district township is located at the distance of about 25 kms from the block. The block assessed in the present report forms a part of the south-western part of the eastern limb of the Wardha Valley Coalfield. The drilling activity to the south of the present block is under progress with the objective of proving the continuity of coal occurrence.

## 4.1.1 DIFFERENT GRS PREPARED AT DIFFERENT PERIOD FOR THE BLOCKS UNDER REFERENCE

The presence of coal in this part was earlier proved in scout boreholes drilled by CMPDI and based on boreholes drilled upto June'1984 a geological report was prepared entitled "Geological report on Gauri Block, Wardha Valley Coalfield, Dist-Chandrapur, Maharashtra, Feb' 1985". Subsequently MECL has carried out drilling for production support in Pauni O.C. area in two phases. In the first phase, during the period Oct.94 to March'96, 17 boreholes were drilled (MWPS-1 to 17) and based on these boreholes a geological note was prepared entitled "Geological note on production support drilling for coal in Pauni Opencast area, Wardha Valley Coalfield, Dist-Chandrapur, Maharashtra, Sept'1996"

In the second phase of drilling operation by MECL for production support in Pauni O.C. area, four boreholes were drilled (MWPP-1 to 4) during the period Nov'97 to Feb'98 and a geological note i.e. "Geological note on exploration for coal Pauni PS (97-98), Wardha Valley Coalfield, Dist - Chandrapur, M.S., March'98 was prepared. Subsequently, CMPDI has prepared a geological report entitled "Geological report on quarriable potentiality of Pauni Extension Block, Wardha Valley Coalfield, Dist - Chandrapur, Maharashtra, March'2002" based on 16 boreholes drilled by CMPDI and one borehole drilled by MECL. Geological Report of Area West of Pauni Extension Block (Pauni-III), Dist. Chandrapur, M.S., CMPDI, Nov.2006 is based on 57 boreholes.

#### 4.1.2 BLOCK BOUNDARIES

The area west of Pauni Extn. Block is 2.52 km<sup>2</sup> and is located in the south-western part of eastern limb of Wardha Valley Coalfield. The limits of area west of Pauni Extn. Block are as follows :

1. North - Fault F<sub>2</sub> (PE) - F<sub>2</sub>(PE) (at the floor of Composite Top Section)
2. South - Fault F<sub>9</sub> - F<sub>9</sub> (at the floor of Composite Bottom Section & F<sub>10</sub>- F<sub>10</sub> (below Kamthi) and subcrop of Composite Seam (below Kamthi)
3. East - Fault F<sub>2</sub> (PE)- F<sub>2</sub> (PE) (at the floor of Composite Top Section)
4. West - Subcrop of Composite Seam (below Kamthi) and faults F<sub>3</sub>-F<sub>3</sub> & F<sub>10</sub>-F<sub>10</sub> (Below Kamthi)

#### 4.1.3 ANY OTHER RELEVANT DETAILS

During the course of exploration in Pauni Extn. Block, the quarriable potentiality of the Pauni Extn. Block upto 170 m depth was established in the 1<sup>st</sup> phase. Subsequently boreholes were drilled at desired locations for proving faults, subcrop of Composite Seam and non-coal bearing area. Due to positive occurrence of coal seam in the area, the detailed exploration has been carried out in the area west of Pauni Extn.

Block initially on 400 x 400 m grid to locate the shallower quarriable area and subsequently boreholes were drilled at desired locations to prove the subcrop of Composite Seam and precise delineation of faults. Due to continuity of coal occurrence further in the south of the area, drilling is continuing to locate the shallower coal occurrence and afterwards to take-up detailed drilling for proving of Composite Seam.

## 4.2 EXPLORATION STATUS

The present assessment is based on the data of 61 boreholes. As part of the present investigations in Area West of Pauni Extension Block total 57 boreholes were drilled with in area west of Pauni Extn. with the total meterage of 6225.00 m during the period from 17-03-2000 to 19-05-06 and in addition 3 boreholes (CMWG – 207, 209 & 211) were drilled in Pauni Extn. Block for delineation of fault  $F_2$  (PE) -  $F_2$  (PE) and one borehole (CMWG-212) in the further west of the present area for confirmation of non-coal bearing area & subcrop of Composite Bottom Section has been encountered in the borehole. More boreholes will be required to prove the continuity of coal occurrence around borehole CMWG – 212.

### 4.2.1 DENSITY OF BOREHOLES

In the Geological Block and in adjoining area 61 boreholes amounting to a metreage of 6632 were drilled in an area 3 km<sup>2</sup>. Borehole density is 20. In Pauni-III Mining Block and adjoining area, 43 boreholes amounting to a metreage of 3724.20 were drilled in an area 2.17 km<sup>2</sup>. Borehole density is 20. All the boreholes were drilled by CMPDI.

### 4.2.2 NUMBER OF BOREHOLES ANALYSED

#### A. COAL ANALYSIS

The details of the coal samples analysed at CFRI Laboratory, Nagpur and CMPDI Laboratory, Ranchi for boreholes considered are given below in Table – 4.1.

TABLE - 4.1

DETAILS OF COAL ANALYSIS EXECUTED, AREA WEST OF PAUNI EXTN. BLOCK

Sl. No.	Parameter	Composite Top Section		Composite Bottom Section		Composite Top + Bottom Sections		Agency
		No. of B.H.	No. of determination	No. of B.H.	No. of determination	No. of B.H.	No. of determination	
1.	Moisture %	27	29	40	41	27	31	CFRIN /CMPDI
2.	Ash %	27	29	40	41	27	31	-d
3.	V.M. %	27	29	40	41	27	31	-d
4.	G.C.V.	27	29	40	41	27	31	-d
5.	Ultimate Analysis	4	4	4	4	6	6	-d
6.	Total Sulphur	24	24	37	37	20	20	-d
7.	Sulphur Distribution	4	4	4	4	4	4	-d
8.	HGI	1	1	1	1	1	1	-d
9.	Mineralogical analysis	4	4	4	4	4	4	-d
10.	Coal Petrography/ (Random Vitrinite Reflectance )	-	-	-	-	2	2	-d
		(4)	(4)	(4)	(4)	(4)	(4)	

Note : Moisture%, Ash%, VM% and Ultimate Analysis determined on 60% RH & 40° C

## B. FOR PHYSICO MECHANICAL STUDIES

- i) No. of boreholes - 1 borehole (CMWG -208) ii) Core length - 73.00 m

C. GEOPHYSICAL LOGGING Geophysical logging in none of the boreholes has been carried out.

## 4.2.3 RELIABILITY OF DATA AND DEGREE OF CONFIDENCE

- a) The structural framework of the block was initially interpreted mainly by drawing floor contours at the floor of Composite Bottom Section. This subsequently used to generate floor contours for Composite Top Section as well as Composite Bottom Section through 'MINEX SOFTWARE'. The assessment of reserves has been done by utilizing planimeter.

b) No on the surface, data e.g. missing abrupt difference 12 faults have been few minor faults

c) The have 60° dip. All have been proposed Composite Seam entire borehole physico-mechanical based on vitrinite

d) Ins been satisfactory Therefore, as per of seam is less than estimation. However interpretation.

e) Vari isograds have been The analysis of sandstone, which available. Therefore these lithologies (%). As desired Composite Seam reserves have been including all dirt b

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EXTN. BLOCK

b) No rock exposures are found in the area. Since, faults are not exposed on the surface, interpretation is based on the evidence obtained from the borehole data e.g. missing part thickness of coal seams, abrupt reduction in the parting and abrupt difference in the floor level of coal seams on either side of the faults. A total of 12 faults have been interpreted to occur within the block. In addition, the occurrence of few minor faults can not be ruled out.

c) The faults are considered to be normal gravity faults and assumed to have 60° dip. All the faults are considered to be Pre-Kamthi faults and hence, all faults have been projected upto the floor of the Kamthi Formation. The subcrop of Composite Seam have been drawn at the floor of the Kamthi Formation. Since the entire borehole cores of CMWG-208 were sent to VNIT, Nagpur for carrying out physico-mechanical tests, the seam correlation, depth and thickness of borehole are based on visual megascopic observations.

d) Inspite of the best efforts the coal core recovery in few boreholes has not been satisfactory owing to the inherent nature of the strata/drilling difficulties. Therefore, as per prevailing practice, the data of such boreholes, where the recovery of seam is less than 65%, have been excluded for qualitative assessment and reserve estimation. However, the data of all these boreholes have been utilised for structural interpretation.

e) Various contour plans i.e. floor contours, isoparting, isochores and isograds have been drawn through computer on the assumptions of gradual change. The analysis of the obvious dirt bands of sandstone, shale, alternate shale and sandstone, which have been included in calculation of quality data of seams, are not available. Therefore, the following values of moisture and ash have been assumed for these lithologies for calculating the equilibrated analysis (M % 2.5 % and Ash % 85 %). As desired by mine planners of CMPDI, RI-IV, Nagpur, the overall quality of Composite Seam (Composite Top and Composite Bottom Sections) and estimation of reserves have been done after considering the entire thickness of coal seams including all dirt bands (If?) irrespective of their thickness (roof to floor).

te Sections	Agent
if deter- nation	
31	CFRI N /CMPDI
31	-d
31	-d
31	-d
6	-d
20	-d
4	-d
1	-d
4	-d
2	-d
(4)	-d

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f) The occurrence of subcrop of Composite Bottom Section has been observed in borehole CMWG -212, which is located about 500 m west of borehole CMWG - 187 and falling outside the area in the northern part. More boreholes are required to be drilled around this borehole to prove the further continuity of coal occurrence. In the present report the data of 3 boreholes (CMWG-207, 209 & 211) as desired by WCL, have been drilled for production support to delineate the position of fault F2 (PE) – F2 (PE), which forms the eastern boundary of the present geological report. The data of above 3 boreholes have been also incorporated in the present report along with borehole CMWG -212.

g) The detailed hydrogeological studies are required to be carried out before the commencement of mining operation, as only water level in boreholes and rainfall data from 1991 to 2005 could be incorporated in this report. Due to narrow small area of Sector – E, which is falling between two major faults (F<sub>2</sub> (PE) – F<sub>2</sub> (PE) & F<sub>2</sub> – F<sub>2</sub>), the reserves have not been estimated.

Age
Recent / Sub – Recent
Upper Permian Lower Triassic
Lower Permian
Upper Carboniferous
Lower Permian
Pre-Cambrian

### 4.3 GEOLOGY AND STRUCTURE OF BLOCK AREA

#### 4.3.1 BRIEF GEOLOGICAL SETTING ALONG WITH GENERALIZED SEQUENCE WITHIN THE BLOCK/COALFIELD

The area west of Pauni Extn. Block under report is geologically located in the south-western part of Main Rift Basin of Wardha Valley Coalfield. It lies west of Pauni Extn. Block. The block under report is no exception to the general characteristic of Wardha Valley Coalfield and is capped by the thick cover of weathered mantle. None of the Gondwana lithological units are exposed on surface in the area under report. The geological succession therefore, has been deciphered from the subsurface data of 57 boreholes drilled in the block by CMPDI.

The details of thickness of different formations viz. Soil, Kamthi, Barak, Talchirs and Vindhya as intersected in boreholes drilled in the block are given in Annexure -II. The geological succession in the block as worked out from the borehole data and the thickness range of different formations are given in Table – 4.2.

#### 4.3.2 GEOLOGICAL SETTING

The geological setting of the block is described from borehole data. The block is situated in the south-western part of the Main Rift Basin of Wardha Valley Coalfield. The block is bounded by faults F<sub>1</sub> – F<sub>2</sub> and F<sub>2</sub> – F<sub>3</sub>.

#### 4.3.3 COAL SEQUENCES

Barak

#### 4.3.4 SEQUENTIAL STRATIGRAPHY

The sequential stratigraphy of the block is described from borehole data. The block is situated in the south-western part of the Main Rift Basin of Wardha Valley Coalfield.

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TABLE - 4.2

## GEOLOGICAL SUCCESSION, AREA WEST OF PAUNI EXTN. BLOCK

Age	Formation	Thickness range (m)		Lithology
		Minimum	Maximum	
Recent / Recent	Detrital Mantle	4.00 (CMWG - 124 & 210)	7.50 (CMWG - 96)	Black cotton soil/sandy soil
Upper Permian / Lower Permian	Kamthi	9.85 (CMWG- 175)	37.85 (CMWG - 166)	Yellow to brown fine to coarse grained sandstones, shale and variegated clays.
UNCONFORMITY				
Lower Permian	Barakar	18.00 (CMWG- 187)	176.90 (CMWG - 170)	Grey to white fine to coarse grained sandstones, thin clay bands, shale, intercalation of shale and sandstone, sandy, shale, shaly sandstone, carb. shale, shaly coal and coal
Upper Carboniferous / Lower Permian	Talchir	(+) 3.19 (CMWG-124)	(+) 10.46 (CMWG - 173)	Greenish shale.
UNCONFORMITY				
Pre-Cambrian	Vindhyan	(+) 4.54 m (CMWG-173)		Limestone

## 4.3.2 GEOLOGICAL STRUCTURE

The area under report is covered by thick layer of soil/Kamthi rocks. The geological structure therefore, as depicted in the floor contour plans for Composite Top and Composite Bottom Sections are based on the subsurface data generated from boreholes. Structurally the area is highly faulted. The block exhibits the presence of total 12 numbers of faults. Most of the faults are oblique faults running across the strike of the strata except faults  $F_5 - F_5$  &  $F_{11} - F_{11}$  are dip faults and faults  $F_6 - F_6$  and  $F_8 - F_8$  are strike faults.

## 4.3.3 COAL BEARING FORMATIONS

Barakar is coal bearing formation.

## 4.3.4 SEQUENCE OF COAL SEAMS

The sequence of coal seams encountered in the boreholes drilled by CMPDI in the area west of Pauni Extn. Block in ascending order are furnished below in Table-4.3

TABLE - 4.3  
SEQUENCE OF COAL SEAMS, AREA WEST OF PAUNI EXTN. BLOCK

Coal seam/ Parting	Thickness range (m)		Generalised thickness range (m)
	Minimum	Maximum	
Composite Top Section	5.56 (CMWG - 151)	13.99 (CMWG - 174))	8.00 - 12.00
Parting	1.33 (CMWG - 174)	5.13 (CMWG - 180)	
Composite Bottom Section	2.05 (CMWG - 174)	6.00 (CMWG - 176)	2.00 - 6.00

It could be seen from the above table that the seams encountered in the area west of Pauni Extn. Block are potential and persistent in nature in the entire area of the block.

### 4.3.5 STRUCTURAL SETTING WITHIN THE PROJECT AREA

#### 4.3.5.1 DIP AND STRIKE

The general strike of the coal seam as determined from the floor contour plan of Composite Top and Bottom Sections is WSW - ESE with minor swing to NNW - SSE in the north western part of the area. However, local minor swing in the strike has also been observed in the area. The dip of the strata ranges from  $6.5^{\circ}$  to  $14^{\circ}$  (gradient 1 in 4 to 1 in 8.5) and dipping towards east. The northern and southern part of the area generally having less gradient (1 in 8.5) as compare to remaining part of the block. The attitude of the seams are presented in floor contour plans.

#### 4.3.5.2 FAULT

The area of the block is traversed by 12 total numbers of faults. All the faults are oblique faults, cutting across the strike of the strata. The major fault,  $F_2$  (PE) - (PE) is continuing from the eastern adjoining block i.e. Pauni Extension Block and fault number has been retained as mentioned in the geological report prepared by CMPDI. This major fault ( $F_2$  (PE) -  $F_2$  (PE)) also demarcates northern/eastern the area of the block. The position of all faults below Kamthis are shown in geological plan. The floor position of faults are shown in floor contour / iso-parting/seam folio plans.

Due to surface. There generated through evidences, i.e. seams and in side of the fault their surface details of the in

Fault No.	Extent (km)
$F_1 - F_1$	75
$F_2$ (PE) - $F_2$ (PE) (Pauni Extn. Block)	3
$F_2 - F_2$	1
$F_3 - F_3$	10
$F_4 - F_4$	7
$F_5 - F_5$	5
$F_6 - F_6$	3
$F_7 - F_7$	5
$F_8 - F_8$	3
$F_9 - F_9$	11
$F_{10} - F_{10}$	4
$F_{11} - F_{11}$	6

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Due to thick cover of Soil/Kamthi rocks none of the faults are visible on the surface. Therefore, their presence has been interpreted from the direct evidence generated through boreholes drilled in the area. Faults have been interpreted by direct evidences. i.e. omission of full or part of seam, reduction in parting between the seams and indirect evidence. i.e. through difference in floor reduced levels on either side of the fault. All the faults have been considered as Pre-Kamthis and therefore, their surface position has been projected below the floor of Kamthi Formation. The details of the individual faults are given in the following Table - 4.4.

TABLE - 4.4  
DESCRIPTION OF FAULTS, AREA WEST OF PAUNI EXTN. BLOCK

Fault No.	Extent of faults (m)	Trend	Throw		Evidence
			Direction	Amount (m)	
F <sub>1</sub> - F <sub>1</sub>	750 m	NW - SE	SW	0-20	Difference in floor reduced level on both sides of the fault.
F <sub>2</sub> (PE) - F <sub>2</sub> (PE) (Pauni Extn. Block)	3300	WNW-ESE	WSW	About 80-150	Talchir and Vindhyan contact is faulted in CMWG - 173, Composite Top + Bottom Sections are omitted in CMWG - 124, 181 & 207 and Composite Top Section omitted and roof of Composite Bottom Section is faulted in CMWG - 211.
F <sub>2</sub> - F <sub>2</sub>	1300	WNW-ESE	NNE	About 90	Composite Top Section omitted and roof of Composite Bottom section is faulted in CMWG-119 & Composite Top & Bottom Sections are omitted in CMWG - 106
F <sub>3</sub> - F <sub>3</sub>	1000	NW - SE	NE	0 - 40	Difference in floor reduced level on both sides of the fault.
F <sub>4</sub> - F <sub>4</sub>	700	E - W	N	0 - 15	Roof of Composite Top Section is faulted in CMWG - 107 and Composite Bottom Section is omitted in CMWG - 154.
F <sub>5</sub> - F <sub>5</sub>	500	N - S	E	25 - 60	Floor of Composite Bottom Section is faulted in CMWG - 170 & difference in FRL on both sides of the fault.
F <sub>6</sub> - F <sub>6</sub>	350	NW - SE	NE	70 - 80	Difference in floor reduced level on both sides of the fault
F <sub>7</sub> - F <sub>7</sub>	500	E - W	S	0 - 15	Roof of Composite Top Section is omitted in CMWG - 164.
F <sub>8</sub> - F <sub>8</sub>	350	NW - SE	NE	50	Difference in floor reduced level on both sides of the fault.
F <sub>9</sub> - F <sub>9</sub>	1100	E - W	S	About 40	Difference in floor reduced level on both sides of the fault and floor of Composite Top Section is faulted and Composite Bottom Section is omitted in CMWG - 101.
F <sub>10</sub> - F <sub>10</sub>	400	NW - SE	NE	About 60	Composite Bottom Section is omitted in CMWG - 165.
F <sub>11</sub> - F <sub>11</sub>	675	NNW - SSE	WSW	About 10	Roof of Composite Top Section is faulted in CMWG - 142.

## 4.3.5.3 PRESENCE OF DYKE, SILLS (IGNEOUS INTRUSIVES), ETC.

These are not encountered in any part of this coalfield.

## 4.4 DESCRIPTION OF COAL SEAMS

## 4.4.1 COMPOSITE BOTTOM SECTION

Composite Bottom Section is the lowermost workable seam of Barakar Formation. The details of the seam are given below :

Sl No.	A. Depth of roof intersection	B. Floor Reduced level
i)	Shallowest - 27.04 m (CMWG - 189)	Minimum - (-) 17.58 m (CMWG - 102)
ii)	Deepest - 212.00 m (CMWG - 170)	Maximum - 157.16 m (CMWG - 189)

## C. Thickness (m)

Range	Stratigraphic thickness range (m)	No. of boreholes considered
Minimum	2.05 (CMWG - 174)	42
Maximum	6.00 (CMWG - 176)	
General	2.00 - 6.00	

Thickness range (m)	No. of B.H.	Percentage
2.00 - 3.00	6	14.29
3.00 - 4.00	17	40.48
4.00 - 5.00	14	33.33
5.00 - 6.00	5	11.90
Total	42	100

D. Composite Bottom Section is subcropping in the western part of the a and it has been demarcated below the Kamthi Formation.

## E. PARTING (With Composite Top Section)

- i) Minimum - 1.33 m (CMWG - 174)  
 ii) Maximum - 5.13 m (CMWG - 180)

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TC.

## F. ROOF LITHOLOGY

Particulars	Immediate Roof	Within 3.00 m lithology
i) Dominant	Fine grained sandstone, medium grained sandstone	Fine grained sandstone, medium grained sandstone
ii) Subordinate	Carb. shale & alternate shale and sandstone	Alternate shale and sandstone and shale

Name of Barakar

## G. FLOOR LITHOLOGY

Particulars	Immediate Roof	Within 1.00 m lithology
i) Dominant	Shale, sandy shale and carb. shale	Shale and sandy shale
ii) Subordinate	Fine grained sandstone and alternate shale and sandstone	Fine grained sandstone and alternate shale and sandstone

level

m (CMWG - 102)

m (CMWG - 189)

## H. DIRT BANDS

No. of boreholes (full seam thickness) devoid of dirt bands - 15 boreholes.

Dirt Bands	No. of boreholes	No. of dirt bands	Total thickness range (m)	Percentage
Combustible (up to 1.00 m)	27	1 - 3	0.11 - 0.87	2.50 - 21.79
Obvious bands	3	1 - 2	0.18 - 0.42	4.86 - 8.47
Total combustible + obvious bands	29	1 - 3	0.11 - 0.89	2.50 - 21.79

No. of boreholes considered

42

Percentage

1.29

0.48

3.33

1.90

100

## I. PROXIMATE ANALYSIS ON 60% RH &amp; 40° C

TABLE - 4.5

PROXIMATE ANALYSIS ON 60% RH &amp; 40° C, COMPOSITE BOTTOM SECTION

Particulars	Minimum	Maximum
Moisture %	6.3 (CMWG-187)	9.5 (CMWG-96)
Ash %	18.7 (CMWG - 164)	34.7 (CMWG -128)
VM %	23.1 (CMWG-178)	30.6 (CMWG-164)
	(34.4) CMWG-138	(41.8) CMWG-166

Eastern part of the area  
tion.

FC %		35.9 (CMWG-128)	43.5 (CMWG-164)
GCV (K.Cal./Kg)		4072 (CMWG-128)	5339 (CMWG-164)
		(7166) CMWG-151	(7908) CMWG-117
UHV (K.Cal./Kg)		3159 (CMWG - 128)	6214 (CMWG - 129)
G R A D E	(General range)	C - F	
	(Prevalent range)	(D - E)	

NOTE: Values of VM% & GCV given in brackets are on DMMF basis

## J. ULTIMATE ANALYSIS

Ultimate Analysis for Composite Bottom Section is available for 4 borehole and is given below :

TABLE - 4.6  
ULTIMATE ANALYSIS, COMPOSITE BOTTOM SECTION

B.H. No.	Ultimate Analysis (60 % RH & 40° C)			
	C %	H %	N %	S %
CMWG - 138	47.6 (81.1)	3.2 (5.4)	1.0 (1.7)	0.5 (0.8)
CMWG - 140	52.2 (78.6)	2.7 (4.1)	1.3 (1.9)	1.5 (2.2)
CMWG - 155	47.7 (78.5)	2.5 (4.1)	1.1 (1.8)	1.6 (2.6)
CMWG - 167	46.9 (78.1)	2.5 (4.2)	1.2 (2.0)	1.2 (2.0)

NOTE - Figures within brackets are on unit coal basis

## K. SULPHUR

Total Sulphur analysis for Composite Bottom Section is available for boreholes and distribution of Sulphur are available for 4 boreholes details are given below :

B.H. No.

CMWG-138

CMWG- 140

CMWG- 155

CMWG- 167

L. C

Random

(CMWG- 138 & 140)

and its values

M. M

Mineral

167) and borehole

M

B.H.NO.

CMWG -138

CMWG -140

CMWG -155

CMWG -167

Note : Q- Qual

Pyr - P

N. HGI

HGI is available

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TABLE - 4.7  
SULPHUR DISTRIBUTION, COMPOSITE BOTTOM SECTION,

B.H. No.	Total Sulphur %	Pyritic Sulphur %		Sulphate Sulphur %		Organic Sulphur %	
		Coal basis	Sulphur basis	Coal basis	Sulphur basis	Coal basis	Sulphur basis
CMWG-138	0.5	0.42	80.7	0.07	13.4	0.03	5.7
CMWG-140	1.5	0.83	57.2	0.29	20.0	0.33	22.8
CMWG-155	1.6	0.76	47.5	0.40	25.0	0.44	27.5
CMWG-167	1.2	0.73	60.8	0.23	19.1	0.24	20.1

#### L. COAL PETROGRAPHY

Random Vitrinite Reflectance study has been carried out for 4 boreholes (CMWG-138 0.62, CMWG -140 0.52, CMWG -155 0.53 & CMWG-167 0.51) samples and its values varies between 0.51 (CMWG - 167) to 0.62 (CMWG - 138).

#### M MINERALOGICAL ANALYSES

Mineralogical analysis is available for 4 boreholes (CMWG - 138, 140, 155 & 167) and boreholewise details are given below in Table - 4.8 :

TABLE - 4.8  
MINERALOGICAL ANALYSIS, COMPOSITE BOTTOM SECTION,

B.H.NO.	Mineral phase present (%)							
	Q	K	I	O	Dick	Sid	Pyr	Cal
CMWG -138	6.2	9.7	3.3	4.9	2.7	0.5	0.6	0.7
CMWG -140	10.0	11.2	-	0.9	1.9	1.4	-	-
CMWG -155	13.8	14.3	-	-	2.4	1.3	-	-
CMWG -167	10.4	11.1	-	7.8	1.9	0.6	-	1.2

Note : Q- Quartz, K - Kaolinite, O - Orthoclase, Dick - Dickit, Sid - Siderite, Pyr - Pyrite, Cal - Calcite

#### N. HGI

HGI is available for one borehole (CMWG - 167) and its value is 74

## 4.4.2 COMPOSITE TOP SECTION

## REFERENCE TO DOCUMENTATION

The Composite Top Section is the uppermost workable seam of Barakar Formation.  
The details of the seam are given below :

Sl No.	A. Depth of roof intersection	B. Floor Reduced level
i)	Shallowest - 23.06 m (CMWG - 189)	Minimum - (-) 22.10 m (CMWG - 17)
ii)	Deepest - 196.17 m (CMWG - 170)	Maximum - 163.65 m (CMWG - 18)

## C. Thickness

Range	Stratigraphic thickness range (m)	No. of boreholes considered
Minimum	5.56 (CMWG - 151)	33
Maximum	13.99 (CMWG - 174)	
General	8.00 - 12.00	

Thickness range (m)	No. of B.H.	Percentage
5.00 - 6.00	1	3.03
6.00 - 7.00	-	-
7.00 - 8.00	1	3.03
8.00 - 9.00	6	18.18
9.00 - 10.00	9	27.27
10.00 - 11.00	10	30.31
11.00 - 12.00	4	12.12
12.00 - 13.00	1	3.03
13.00 - 14.00	1	3.03
Total	33	100

D. Composite Top Section is subcropping in the western part of the area and it has been demarcated below Kamthi Formation. The strike length of the subcrop is a 3000 m.

## E. PARTING

i) Minimum -

## F. ROOF

Particulars

i) Dominant

ii) Subordinate

## G. FLOOR

Particulars

i) Dominant

ii) Subordinate

## H. DIRT BAND

No.

Dirt Band

Combustible (up to 1

Obvious bands

Total combustible +

## I. PROXIMATE

PROXIMATE

Particulars

Moisture

Ash %

VM %

FC %

GCV  
(K.Cal./

CMPDI

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## E. PARTING (With Composite Bottom Section)

- i) Minimum - 1.33 m (CMWG - 174)      ii) Maximum - 5.13 m (CMWG - 180)

## F. ROOF LITHOLOGY

Particulars	Immediate Roof	Within 3.00 m lithology
i) Dominant	Carb. shale and shale	Shale and carb. shale
ii) Subordinate	Clay	Clay and medium grained sandstone

d level

10 m (CMWG - 174)

## G. FLOOR LITHOLOGY

5 m (CMWG - 180)

Particulars	Immediate Roof	Within 1.00 m lithology
i) Dominant	Carb. shale	Alternate shale and sandstone, shale & carb. shale
ii) Subordinate	Shale & sandy shale	Sandy shale and fine grained sandstone

of boreholes  
considered

## H. DIRT BANDS

No. of boreholes (full seam thickness) devoid of dirt bands - NIL.

Dirt Bands	No. of boreholes	No. of dirt bands.	Total thickness range (m)	Percentage
Combustible (up to 1.00 m)	35	1 - 6	0.11 - 1.92	1.07 - 17.78
Obvious bands	14	1 - 2	0.15 - 0.91	1.39 - 7.68
Total combustible + obvious bands	36	1 - 6	0.17 - 2.35	1.68 - 19.85

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3.03

18.18

27.27

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42.12

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3.03

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## I. PROXIMATE ANALYSIS ON 60% &amp; 40° C

TABLE - 4.9

PROXIMATE ANALYSIS ON 60% RH &amp; 40° C, COMPOSITE TOP SECTION

Particulars	Minimum	Maximum
Moisture %	5.7 (CMWG -155)	9.0 (CMWG -153)
Ash %	20.2 (CMWG -167)	40.0 (CMWG -155)
VM %	23.9 (CMWG-166) (38.2) CMWG - 122 & 125	30.2 (CMWG-153) (41.8) CMWG - 153
FC %	31.7 (CMWG-166)	43.8 (CMWG-167)
GCV (K.Cal./Kg)	3796 (CMWG-166) (7198) CMWG -137	5073 (CMWG-167) (7792) CMWG-105

UHV (K.Cal./Kg)		2593 (CMWG -155)	4981 (CMWG -167)
GRADE	(General range)	C - F	
	(Prevalent range)	(D - F)	

NOTE: Values of VM% & GCV given in brackets are on DMMF basis

#### J. ULTIMATE ANALYSIS

Ultimate Analysis for Composite Top Section is available for 4 boreholes.

TABLE - 4.10

#### ULTIMATE ANALYSIS, COMPOSITE TOP SECTION,

B.H. No.	Ultimate Analysis (60 % RH & 40° C)			
	C %	H %	N %	S %
CMWG - 138	49.5 (77.8)	2.9 (4.5)	1.2 (1.9)	0.5 (0.8)
CMWG - 140	44.4 (78.4)	2.8 (4.9)	1.1 (1.9)	0.7 (1.2)
CMWG - 155	39.6 (79.5)	2.3 (4.6)	0.9 (1.8)	0.7 (1.4)
CMWG - 167	54.0 (78.3)	2.8 (4.1)	1.3 (1.9)	0.4 (0.6)

NOTE - Figures within brackets are on unit coal basis

#### K. SULPHUR

Total sulphur analysis for Composite Top Section is available for 4 boreholes and distribution of sulphur are available for 3 boreholes. The details given below :

TABLE - 4.11

#### SULPHUR DISTRIBUTION, COMPOSITE TOP SECTION,

B.H. No.	Total Sulphur %	Pyritic Sulphur %		Sulphate Sulphur %		Organic Sulphur %	
		Coal basis	Sulphur basis	Coal basis	Sulphur basis	Coal basis	Sulphur basis
CMWG-138	0.5	0.26	53.0	0.06	12.2	0.17	
CMWG- 155	0.7	0.37	55.2	0.09	13.4	0.21	
CMWG- 167	0.4	0.29	67.4	0.04	9.3	0.10	

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Table -

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B.H.NO.

CMWG -138

CMWG -140

CMWG -155

CMWG -167

N. HGI

HGI is

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4.5.1 Borehol  
Table-4

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VG -167)**COAL PETROGRAPHY**

Random Vitrinite Reflectance study has been carried out for 4 boreholes samples (CMWG - 138 0.63, CMWG -140 0.54, CMWG -155 0.54 & CMWG -167 0.53) and its values varies between 0.53 (CMWG - 167) to 0.63 (CMWG - 138).

e on DMMF basis

le for 4 boreholes. M.

**MINERALOGICAL ANALYSES**

Mineralogical analysis (BCS, I-30, I-100 & IP) is available for 4 boreholes (CMWG - 138, 140, 155 & 167) and boreholewise details are given below in Table - 4.12 :

TABLE - 4.12

MINERALOGICAL ANALYSIS, COMPOSITE TOP SECTION, AREA WEST OF PAUNI EXTN. BLOCK

B.H.NO.	Mineral phase present (%)							
	Q	K	I	O	Dick	Sid	Pyr.	Cal
CMWG -138	5.8	10.0	6.3	6.4	3.1	0.7	1.0	0.9
CMWG -140	5.6	6.3	5.7	2.8	1.7	1.0	-	-
CMWG -155	14.5	19.3	-	0.6	3.0	2.4	0.3	-
CMWG -167	4.5	9.3	4.9	-	1.3	1.1	-	0.8

Note : Q- Quartz, K - Kaolinite, O - Orthoclase, Dick - Dickit, Sid - Siderite, Pyr - Pyrite, Cal - Calcite

**N. HGI**

HGI is available for one borehole (CMWG - 167) and its value is 55

**4.5 OVERALL QUALITY**

4.5.1 Boreholewise quality parameters were estimated, details of same are given in Table-4.13.

Table-4.13- Boreholewise quality parameters

Sl. No.	BOREHOLE NAME	From (m)	To (m)	Thickness (m)	Total Thickness (m)				
						M %	A %	UHV (k.Cal/kg.)	GR
COMPOSITE TOP + BOTTOM SECTIONS									
1	CMWG - 117	92.43 106.19	102.70 110.80	10.27 4.61	14.88	8.2	29.1	3753	E
2	CMWG - 120	86.00 100.90	96.40 104.52	10.40 3.62	14.02	8.2	29.1	3753	E
3	CMWG - 122	140.15 154.50	150.44 158.75	10.29 4.25	14.54	7.7	25.3	4346	D
4	CMWG - 125	102.71 116.14	112.85 120.04	10.14 3.90	14.04	7.9	27.0	4084	E
5	CMWG - 126	55.72 69.20	67.46 74.29	11.74 5.09	16.83	7.2	29.0	3094	E
6	CMWG - 127	45.28 60.37	56.00 65.00	10.72 4.63	15.35	7.6	25.7	4305	D
7	CMWG - 137	91.10 106.00	102.52 110.46	11.42 4.46	15.88	7.2	28.9	3918	E
8	CMWG - 128	62.28 75.83	72.07 79.67	9.79 3.84	13.63	6.7	28.0	4111	E
9	CMWG - 140	49.00 63.40	59.52 67.05	10.52 3.65	14.17	7.8	29.6	3739	E
10	CMWG - 152	140.54 156.45	151.53 160.85	10.99 4.40	15.39	7.0	27.0	4208	D
11	CMWG - 155	47.65 61.50	59.49 66.80	11.84 5.30	17.14	6.3	36.3	3021	F
12	CMWG - 161	149.18 161.81	158.35 164.47	9.17 2.66	11.83	7.8	25.6	4291	D
13	CMWG - 162	79.77 92.00	90.34 95.65	10.57 3.65	14.22	7.5	25.8	4305	D
14	CMWG - 167	48.10 60.52	56.42 64.42	8.32 3.90	12.22	7.5	22.7	4732	D
15	CMWG - 169	68.14 81.27	77.36 85.40	9.22 4.13	13.35	7.5	26.6	4194	E
16	CMWG - 174	103.14 118.46	117.13 120.51	13.99 2.05	16.04	6.9	31.6	3587	E
17	CMWG - 175	117.25 130.24	127.11 133.75	9.86 3.51	13.37	7.8	27.8	3987	E
18	CMWG - 180	35.99 46.82	41.69 51.70	5.70 4.88	10.58	7.2	29.2	3877	E
19	CMWG - 184	83.00 96.11	91.40 100.01	8.40 3.90	12.30	7.2	27.4	4125	E

Particulars  
Overall Quality Par  
(Undiluted)  
Overall Quality Par  
0.05m at each con  
Overall Quality Par  
0.15m at each con

#### 4.6 GEO-TE

##### 4.6.1 GEO-TEC

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VNIT, Nagpur f  
Annexure-III.

##### 4.6.2 I JR

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studies are requ

##### 4.6.3 GEO

No. Geop

#### 4.7 GEOLC

##### 4.7.1 BASI

a) Both sea  
potential  
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b) The ass  
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Table-4.13 A - Overall quality parameters

Particulars	M%	Ash%	UHV(k.Cal/kg)	Grade	GCV (k.Cal/kg)
Overall Quality Parameters (Undiluted)	7.5	28.08	3990	E	4830 (Calculated)
Overall Quality Parameters (Diluted, 0.05m at each contact point)	7.4	29.30	3835	E	4725 (Calculated)
Overall Quality Parameters (Diluted, 0.15m at each contact point)	7.2	31.78	3520	E	4510 (Calculated)

## 4.6 GEO-TECHNICAL AND HYDRO-GEOLOGICAL INFORMATION

### 4.6.1 GEO-TECHNICAL DATA

The borehole cores (coal and non-coal) of borehole CMWG - 208 was sent to VNIT, Nagpur for carrying out physico-mechanical tests. Results are enclosed in Annexure-III.

### 4.6.2 HYDROGEOLOGICAL STUDIES

Before the commencement of mining operation, detailed hydro-geological studies are required to be carried out.

### 4.6.3 GEOPHYSICAL STUDIES

No. Geophysical study was carried out in the boreholes.

## 4.7 GEOLOGICAL RESERVES

### 4.7.1 BASIC ASSUMPTIONS AND NORMS FOLLOWED

- Both seams sections i.e. Composite Top and Composite Bottom Sections are potential and attained workable thickness ( $> 0.90$  m) in the entire area of the block. Hence, both potential sections of Composite Seam have been considered for estimation of quarriable reserves.
- The assessment of reserves for both sections of Composite Seam have been made in proved category. The net proved quarriable reserves have been estimated thicknesswise, sectorwise, gradewise, depthwise and coal : overburden ratiowise as well as sectorwise and depthwise overburden volume measurement have been carriedout through planimeter.

- c) Floor contour, roof contour, isochores, isograd, coal : OB ratio, iso-overburden, isoquarry depth lines of Composite Seam and geological cross sections have been prepared through "MINEX SOFTWARE".

- d) Isochores of Composite Top, Composite Bottom and Composite Top + Composite Bottom Sections have been drawn at 1.00 m interval through "MINEX SOFTWARE". Iso-quarry depth lines have been drawn through "MINEX SOFTWARE" for Composite Seam considering that both sections of the seam shall be mined as single quarry.

- e) Area falling in heave zone of the faults have been excluded while measuring the area for reserve estimation.

- f) Wherever, core recovery of the seam is less than 65%, its thickness have not been considered for drawing isochores and estimation of reserves.

#### 4.7.2 CATEGORIZATION OF RESERVES

The detailed exploration of the area has been carried out for proving geological structure and subcrops of Composite Seam. The entire quarriable reserves of the area have been estimation under proved category.

#### 4.7.3 PROCEDURE

##### 4.7.3.1 Geological Block Boundary

The Area West of Pauni Extn. Block is about 2.52 sq. km and is located in south-western part of eastern limb of Wardha Valley Coalfield. The limits of Area West of Pauni Extn. Block are as follows :

Direction	
North	Fa
South	Fa F <sub>10</sub>
East	Fa
West	Su

##### 4.7.3.2 S

block has  
subcrop o

Sector	
A	Fault & F <sub>2</sub>
B	Fault
C	Fault
D	Fault F <sub>2</sub> (P
E	Fault

Due to m  
(PE) - F<sub>2</sub>

##### 4.7.3.3 M

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Section	Boundary
North	Fault $F_2$ (PE) - $F_2$ (PE) at the floor of Composite Top Section
South	Fault $F_9$ - $F_9$ (at the floor of Composite Bottom Section & $F_{10}$ - $F_{10}$ (below Kamthi) and Subcrop of Composite Seam (below Kamthi)
East	Fault $F_2$ (PE) - $F_2$ (PE) (at the floor of Composite Top Section)
West	Subcrop of Composite Seam (below Kamthi) and faults $F_3$ - $F_3$ & $F_{10}$ - $F_{10}$ (below Kamthi)

#### 4.7.3.2 Sector

For the suitable estimation of net proved quarriable reserve, the area of the block has been divided into 5 sectors (A to E) based on fault pattern of the area and subcrop of Composite Seam. The details of the sector boundaries are given below :

Sector	North	South	East	West
A	Fault $F_2$ (PE) - $F_2$ (PE) & $F_2$ - $F_2$	Fault $F_4$ - $F_4$	Fault $F_5$ - $F_5$	Fault $F_3$ - $F_3$ & subcrop of Composite Seam
B	Fault $F_4$ - $F_4$	Fault $F_7$ - $F_7$	Fault $F_8$ - $F_8$	Fault $F_3$ - $F_3$ & $F_{10}$ - $F_{10}$
C	Fault $F_7$ - $F_7$	Fault $F_9$ - $F_9$	Fault $F_8$ - $F_8$	Fault $F_{10}$ - $F_{10}$
D	Faults $F_2$ - $F_2$ & $F_2$ (PE) - $F_2$ (PE)	Fault $F_9$ - $F_9$	Fault $F_2$ (PE) - $F_2$ (PE) & $F_{11}$ - $F_{11}$	Faults $F_5$ - $F_5$ , $F_6$ - $F_6$ & $F_8$ - $F_8$
E	Fault $F_2$ (PE) - $F_2$ (PE)	Fault $F_2$ - $F_2$	Fault $F_2$ (PE) - $F_2$ (PE)	Fault $F_2$ - $F_2$

Due to narrow small area of Sector - E, which is falling between two major faults  $F_2$  (PE) -  $F_2$  (PE) &  $F_2$  -  $F_2$ , the reserves have not been estimated.

#### 4.7.3.3 Methodology

The reserves estimation has been done through planimeter. The area between consecutive isochores has been measured with the help of planimeter and average seam thickness has been evolved for calculation of reserves.

To arrive at net proved geological reserve, 10% deduction has been made from gross reserves to account for losses due to unforeseen geological variation.

The following average gradewise specific gravity has been considered for reserves estimation of non-coking coal of Barakar Formation :

TABLE-4.14

Grade	UHV (k.cal./kg.)	Specific gravity
B	> 5600 – 6200	1.45
C	> 4940 – 5600	1.50
D	> 4200 – 4940	1.55
E	> 3360 – 4200	1.60 (considered)
F	> 2400 – 3360	1.68

#### 4.7.4 DESCRIPTION OF RESERVES

The estimation of quarriable reserves have been made under depthwise and sectorwise.

- 4.7.4.1 Depthwise and gradewise quarriable net proved geological reserves are given below in Table-4.15 :

TABLE -4.15  
DEPTHWISE AND GRADEWISE QUARRIABLE NET PROVED RESERVES,  
AREA WEST OF PAUNI EXTN. BLOCK

Depth (m)	Grade			Total reserves (mt)
	D	E	F	
Upto 50 -	0.782	1.570	--	2.352
50 - 100	5.515	9.182	0.826	15.523
100 - 150	2.489	9.325	--	11.814
150 - 200	4.757	6.541	0.173	11.471
> 200	1.233	1.258	--	2.491
Total	14.776	27.876	0.999	43.651

- 4.7.4.2 Sectorwise, depthwise and gradewise quarriable net proved reserves, Are west of Pauni Extn. Block.

SECTORWISE

SECTOR - A

A) Subcrop Zone

GRADE - D

GRADE - E

GRADE - F

Sub Total

B) Full Thickness

GRADE - D

GRADE - E

GRADE - F

Sub Total

TOTAL SECTOR

SECTOR - B

A) Subcrop Zone

GRADE - D

GRADE - E

GRADE - F

Sub Total

B) Full Thickness

GRADE - D

GRADE - E

GRADE - F

Sub Total

TOTAL SECTOR

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TABLE -4.16

SECTORWISE, DEPTHWISE AND GRADEWISE QUARRIABLE NET PROVED RESERVES, AREA WEST OF PAUNI EXTN. BLOCK.

Grade	Depth (m)					Total reserves (Mt.)
	Upto 50	50-100	100 - 150	150 - 200	> 200	
<b>SECTOR - A</b>						
<b>A) Subcrop Zone</b>						
GRADE - D	0.610	0.074	--	--	--	0.684
GRADE - E	0.647	0.057	--	--	--	0.704
GRADE - F	--	--	--	--	--	
Sub Total	1.257	0.131	--	--	--	1.388
<b>B) Full Thickness</b>						
GRADE - D	0.050	5.328	0.648	1.862	0.093	7.981
GRADE - E	--	7.883	8.121	0.688	--	16.692
GRADE - F	--	0.826	--	--	--	0.826
Sub Total	0.050	14.037	8.769	2.550	0.093	25.499
TOTAL SECTOR - A	1.307	14.168	8.769	2.550	0.093	26.887
<b>SECTOR - B</b>						
<b>A) Subcrop Zone</b>						
GRADE - D	0.057	--	--	--	--	0.057
GRADE - E	0.437	--	--	--	--	0.437
GRADE - F	--	--	--	--	--	--
Sub Total	0.494	--	--	--	--	0.494
<b>B) Full Thickness</b>						
GRADE - D	0.065	0.113	--	--	--	0.178
GRADE - E	0.205	0.404	--	--	--	0.609
GRADE - F	--	--	--	--	--	--
Sub Total	0.270	0.517	--	--	--	0.787
TOTAL SECTOR- B	0.764	0.517	--	--	--	1.281

CMF

Grade	Depth (m)					n	
	Upto 50	50-100	100 - 150	150 - 200	> 200		
<b>SECTOR - C</b>							
<b>A) Subcrop Zone</b>							
GRADE - D	--	--	--	--	--		
GRADE - E	0.095	--	--	--	--	0	
GRADE - F	--	--	--	--	--		
Sub Total	0.095	--	--	--	--	0	
<b>B) Full Thickness</b>							
GRADE - D	--	--	--	--	--		
GRADE - E	0.186	0.838	--	--	--	1	
GRADE - F	--	--	--	--	--		
Sub Total	0.186	0.838	--	--	--		
TOTAL SECTOR - C	0.281	0.838	--	--	--		
<b>SECTOR - D</b>							
<b>A) No Subcrop Zone</b>							
<b>B) Full Thickness</b>							
GRADE - D	--	--	1.841	2.895	1.140		
GRADE - E	--	--	1.204	5.853	1.258		
GRADE - F	--	--	--	0.173	--		
Sub Total	--	--	3.045	8.921	2.398		
TOTAL SECTOR - D	--	--	3.045	8.921	2.398		
G. TOTAL SECTOR A+B+C+D	1.846	0.131	--	--	--		
A. SUBCROP ZONE							
B. FULL SEAM THICKNESS	0.506	15.392	11.814	11.471	2.491		
G. TOTAL	2.352	15.523	11.814	11.471	2.491		

**4.8 RECOM**

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**4.8.3 SLUGGE**

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**4.8.4 UTILITY**

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**4.9 DEPOSIT**

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4.7.4.3 Pauni-III mining block has been projected in Sec. -A, Sec. B and Sec. C. Geological reserves estimated in the Pauni - III mining block is 29.017 Mt.

4.7.4.4 No coal reserve is under fire.

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200	> 200	res
--	--	0
--	--	0
--	--	1
--	--	1
--	--	1
1.140		5
1.258		6
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.398		1
2.398		1
--		
2.491		4
2.491		4

## 4.8 RECOMMENDATION

4.8.1 To prove the continuity of coal occurrence in the north western part around borehole CMWG – 212 and in the southern part of the area, further exploration may be carried out to identify potential areas for future exploitation.

## 4.8.2 FUTURE EXPLORATION REQUIREMENT

To prove continuity of coal occurrence around CMWG-212, for data generation for slope stability analysis for structure proving as and when required, a provision for 2000 m has been given.

## 4.8.3 SUGGESTION FOR SECTIONAL MINING, IF ADVANTAGEOUS

As both the sections of Composite Seam have diluted Grade 'E', there is no advantage in sectional mining.

## 4.8.4 UTILITY OF COAL E.G. POWER/STEEL/CEMENT/ANY OTHER INDUSTRY

Diluted grade of coal is Grade 'E'. It may be used in mainly power sector.

## 4.9 DEPOSIT MODELLING

As the Geological Report has been prepared through MINEX Software, the basic geological model for deposit is available.

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Sec. B and Sec.  
s 29.017 Mt.

## Chapter - V

## MINE BOUNDARY, RESERVES AND MINE LIFE

## 5.1 INTRODUCTION

The present area is located west of Pauni Extn. Block, which forms the south-western most coal bearing area of eastern limb of Wardha Valley Coalfield. The geological block is named as "Area West of Pauni Extn. Block". The block contain a single seam splitted into two sections i.e. Top section (approx 10 m thick) and bottom section (approx 4 m thick) separated by a parting of about 4 m.

## 5.2 PIT FORMULATION STRATEGY

The geological block is bounded by faults in three directions & sub-crop of seam in fourth direction. The block is divided in to five sectors i.e. 'A', 'B', 'C', 'D' & 'E' as detailed in table 5.1. The proposed mine is envisaged to mine coal in sectors 'A', 'B' & 'C' only, considering the geo-mining parameters, stripping ratio, etc. Exploration is being carried out near sector 'D' and no geological reserves have been projected in sector 'E' as it is having negligible width bounded with two major faults.

The mining reserves in sector 'A', 'B' & 'C' have been considered upto dip side major fault  $F_2-F_2$  (max. depth about 200m). Faults namely  $F_5-F_5$ ,  $F_6-F_6$  &  $F_8-F_8$  which exist towards east side of the property, make the eastern boundary of the proposed mine. Reserves east of these faults (in Sector D) have not been considered in this report as the extension of eastern side is still under geological investigation. Subcrop of the bottom section of seam makes the southern & western boundary of proposed mine. The proposed mine envisages to extract 24.11 Mt of coal at an average stripping ratio of  $6.54 \text{ m}^3/\text{t}$ .

Although sector 'D' have been excluded from the property of proposed mine but an exercise have been carried out to work the mineable reserve of this sector also. The sector D is having 13.52 Mt of coal at an stripping ratio of 13.30 m<sup>3</sup>/t.

If the reserves of sector D is included in proposed mine, the total reserves works out to 37.63 Mt at an average stripping ratio of 8.98 m<sup>3</sup>/t.

### 5.3 MINE BOUNDARIES

- DELINEATION OF SECTORS AS PER GR, IF ANY.

The area of the geological block has been divided into 5 sectors (A to E) based on fault pattern of the area and subcrop of Composite Seam. The details of the sector boundaries are given below :

TABLE -5.1  
GEOLOGICAL SECTORS IN BLOCK

Sector	North	South	East	West
A	Fault F <sub>2</sub> (PE) -F <sub>2</sub> (PE) & F <sub>2</sub> - F <sub>2</sub>	Fault F <sub>4</sub> - F <sub>4</sub>	Fault F <sub>5</sub> - F <sub>5</sub>	Fault F <sub>3</sub> - F <sub>3</sub> subcrop Composite Seam
B	Fault F <sub>4</sub> - F <sub>4</sub>	Fault F <sub>7</sub> - F <sub>7</sub>	Fault F <sub>6</sub> - F <sub>6</sub>	Fault F <sub>3</sub> - F <sub>3</sub> & F <sub>10</sub> - F <sub>10</sub>
C	Fault F <sub>7</sub> - F <sub>7</sub>	Fault F <sub>9</sub> - F <sub>9</sub>	Fault F <sub>8</sub> - F <sub>8</sub>	Fault F <sub>10</sub> - F <sub>10</sub>
D	Faults F <sub>2</sub> - F <sub>2</sub> & F <sub>2</sub> (PE)-F <sub>2</sub> (PE)	Fault F <sub>9</sub> - F <sub>9</sub>	Fault F <sub>2</sub> (PE) -F <sub>2</sub> (PE) & F <sub>11</sub> - F <sub>11</sub>	Faults F <sub>5</sub> - F <sub>5</sub> , F <sub>6</sub> & F <sub>8</sub> - F <sub>8</sub>
E	Fault F <sub>2</sub> (PE)-F <sub>2</sub> (PE)	Fault F <sub>2</sub> - F <sub>2</sub>	Fault F <sub>2</sub> (PE)-F <sub>2</sub> (PE)	Fault F <sub>2</sub> - F <sub>2</sub>

- REASONS FOR SELECTING/OMITTING SECTORS.

The proposed mine is envisaged in Sector 'A', 'B' & 'C' as it yields mineable reserves of 24.11 Mt at an average stripping ratio of 6.54 m<sup>3</sup>/t. These reserves are sufficient to project a mine with 1.25 Mty coal for a life about 20 years. Moreover, stripping ratio may prove economical with present grade of coal with partial hire option considering cost plus basis.

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Sectors 'D' & 'E' have been omitted from proposed mine. Sector 'E' is having width of only 25 m in dip rise direction. No geological reserves have been indicated in this Sector. Sector 'D' has also not been considered as the extension of eastern side of this block is still under geological investigation. Moreover, this sector is having coal at very high stripping ratio (about 13.30 m<sup>3</sup>/t).

REASONS FOR SELECTING/OMITTING SEAMS/SECTIONS.

Full composite bottom and top sections have been considered in this report.

REASONS FOR ADDITIONAL AREA ANNEXED (IN CASE OF EXPANSION PR).

Not applicable

BRIEF DETAILS OF ADJOINING BLOCK/AREAS AND REASONS FOR NOT CONSIDERING THE SAME.

Not applicable

MINE BOUNDARY SHOULD BE DEFINED AS NORTH, SOUTH, EAST AND WEST.

TABLE -5.2 - Mine Boundaries

Sl. No.	NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
1	2	3	4	5
1	Fault F <sub>2</sub> -F <sub>2</sub>	Sub crop of bottom section	F <sub>5</sub> -F <sub>5</sub> , F <sub>6</sub> -F <sub>6</sub> & F <sub>8</sub> -F <sub>8</sub>	Sub crop of bottom section & Fault F <sub>1</sub> -F <sub>1</sub>

VERTICAL MINE BOUNDARY. REASONS FOR SELECTION OF SEAM AS BASE OF QUARRY.

The bottom seam section has been considered as base of quarry as no seam exists vertically below this seam section.

5.4 MINEABLE RESERVES:

Mineable reserves have been tabulated as below

**TABLE -5.3**  
**SEAMWISE DETAILS OF MINEABLE RESERVES.**

NAME OF SEAM	Floor or surface area Considered in Ha.	Thickness variation 'm'	Geological Reserves Mt	Geological Losses Mt	Mining Losses Mt	Mining Losses in batter/other Loses if any.	MINEABLE RESERVES Mt
1	2	3	4	5	6	7	8
BOTTOM SECTION	148.50	2.05 to 6.00	9.16	0.92	0.82	-	7.42
TOP SECTION	136.55	5.56 to 13.99	20.60	2.06	1.85	-	16.79
TOTAL			29.76	2.98	2.67	-	24.11

ADDITIONAL MINEABLE RESERVES FOR ANNEXING ADDITIONAL AREA (FOR EXPANSION PR) :

Not applicable

BALANCE MINEABLE RESERVES IN EARLIER APPROVED PR :

Not applicable

**SECTOR & SECTION WISE MINEABLE RESERVES:**

**TABLE 5.3 – MINEABLE RESERVES**

Sector Name	COAL (Mt) Bottom Section	COAL (Mt) Top Section	Total COAL (Mt)	PARTING (Mm <sup>3</sup> )	TOP OB (Mm <sup>3</sup> )	TOTAL OB (Mm <sup>3</sup> )
BOX CUT	0.07	0.33	0.40	0.19	3.81	4.00
>160 m	0.21	0.71	0.92	0.30	7.93	8.23
160-140 m	1.94	3.56	5.50	1.29	35.48	36.77
140-120 m	1.19	3.10	4.29	1.07	21.42	22.49
120-100 m	1.22	2.33	3.55	0.85	19.81	20.66
100-80 m	0.71	1.75	2.46	0.56	21.62	22.18
80-60 m	0.53	1.95	2.48	0.44	20.18	20.62
60-40 m	0.63	1.44	2.07	0.56	14.17	14.73
40-20 m	0.50	0.96	1.46	0.41	6.23	6.64
20-0 m	0.42	0.56	0.98	0.26	0.99	1.25
Total	7.42	16.69	24.11	5.93	151.64	157.57

**5.4 TARGET OUTPUT & MINE LIFE:**

The mine is proposed for nominal production 1.25 Mty and peak production 1.55 Mty. The total life of the mine would be 23 years at 1.25 Mty capacity, where the revenue life of the mine would be 21 years.

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-	16
-	24

The zero date of the project may be considered as the date of land acquisition (physical possession), PR & EMP approval and other necessary clearances whichever is later. Two years period before start of mining activity has been considered for acquisition of required land. The zero date of the mine may be tentatively April, 2011, if the land acquisition is started in the beginning of financial year 2009-10.

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**MINE LIFE:**

The mine life for nominal production is 23 years including two years of land acquisition. The breakup is as under :

- **CONSTRUCTION PERIOD.**  
Construction period has been estimated as two years.
- **PRODUCTION BUILD-UP PERIOD.**  
Production build – up period has been estimated as two years
- **PRODUCTION PERIOD.**  
Production period has been estimated as eighteen years
- **TAPERING PERIOD.**  
Tapering period has been estimated as one year.
- **TOTAL PERIOD**  
Total period has been estimated as Twenty three years.

OP OB (m <sup>3</sup> )	TOTAL OB (Mm <sup>3</sup> )
3.81	4.00
7.93	8.23
35.48	36.77
21.42	22.49
19.81	20.66
21.6	22.18
20.18	20.62
14.17	14.73
6.23	6.64
0.99	1.25
151.64	157.57

**5.6 FUTURE EXPANSION POTENTIAL, IF ANY**

The project is having future expansion potential as the reserves left west of fault F<sub>5</sub>-F<sub>5</sub>, F<sub>6</sub>-F<sub>6</sub> & F<sub>8</sub>-F<sub>8</sub> (sector D) may be mined after expiry of mine life of proposed Pauni-III OC.

**5.7 ANY FURTHER EXPLORATION REQUIRED (WITH TOTAL METERAGE AND NUMBER OF BOREHOLES TO BE DRILLED AND AREA OF FURTHER DRILLING )**

To prove the sub crop zone further exploration is required . For this about 400 m drilling & about 10 numbers of boreholes will be required to be drilled.

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## Chapter - VI

## METHOD OF MINING

## 6.1 GENERAL

The target of proposed quarry is 1.25 Mty. Considering this production from two seam sections having steep gradient of 1 in 6, deployment of dragline & Surface miner would not prove to be effective and economical. The parting of about 4m between two seam sections is also not suitable for Surface miner. Combination of technology involving Shovel dumper & Surface miner for parting and coal extraction respectively will not be suitable due to inter dependence of working in both parts. Hence, only shovel-dumper combination is recommended.

## 6.2 GEO-MINING CHARACTERISTICS

## 6.2.1 SEAM GRADIENT - VARIATION, AV. GRADIENT OF QUARRY FLOOR

The seam gradient of bottom and top seam section varies from 1 in 4 to 1 in 8.5. The average gradient of quarry floor is 1 in 6.

## 6.2.2 GEOLOGICAL DISTURBANCES - NOS. OF FAULTS IN TABULAR FORM

TABLE - 6.1  
DESCRIPTION OF FAULTS, AREA WEST OF PAUNI EXTN. BLOCK

Sl. No.	Fault No.	Extent of faults (m)	Trend	Throw	
				Direction	Amount (m)
1.	F <sub>1</sub> - F <sub>1</sub>	750 m	NW - SE	SW	0-20
2.	F <sub>2</sub> (PE) - F <sub>2</sub> (PE) (Pauni Extn. Block)	3300	WNW-ESE	WSW	About 80-150
3.	F <sub>2</sub> - F <sub>2</sub>	1300	WNW-ESE	NNE	About 90
4.	F <sub>3</sub> - F <sub>3</sub>	1000	NW - SE	NE	0 - 40
5.	F <sub>4</sub> - F <sub>4</sub>	700	E - W	N	0 - 15
6.	F <sub>5</sub> - F <sub>5</sub>	500	N - S	E	25 - 60
7.	F <sub>6</sub> - F <sub>6</sub>	350	NW - SE	NE	70 - 80
8.	F <sub>7</sub> - F <sub>7</sub>	500	E - W	S	0 - 15
9.	F <sub>8</sub> - F <sub>8</sub>	350	NW - SE	NE	50
10.	F <sub>9</sub> - F <sub>9</sub>	1100	E - W	S	About 40
11.	F <sub>10</sub> - F <sub>10</sub>	400	NW - SE	NE	About 60
12.	F <sub>11</sub> - F <sub>11</sub>	675	NNW - SSE	WSW	*About 10

### 6.2.3 PRESENCE OF IN-SEAM BAND SEAM-WISE (NUMBERS AND THICKNESS OF EACH BAND, TOTAL BAND THICKNESS)

Presence of in-seam band is evident in both the Seam section. Details of in seam bands in each seam-sections are as follows:

#### (i) Bottom Seam Section

No. of boreholes (full seam thickness) devoid of dirt bands – 15 boreholes.

Dirt Bands	No. of boreholes	No. of dirt bands	Total thickness range (m)	Percentage
Combustible (up to 1.00 m)	27	1 - 3	0.11 – 0.87	2.50 – 21.79
Obvious bands	3	1 - 2	0.18 – 0.42	4.86 – 8.47
Total combustible + obvious bands	29	1 - 3	0.11 – 0.89	2.50 – 21.79

#### (ii) Top Seam Section

No. of boreholes (full seam thickness) devoid of dirt bands – NIL.

Dirt Bands	No. of boreholes	No. of dirt bands	Total thickness range (m)	Percentage
Combustible (up to 1.00 m)	35	1 - 6	0.11 – 1.92	1.07 – 17.7
Obvious bands	14	1 - 2	0.15 – 0.91	1.39 – 7.6
Total combustible + obvious bands	36	1 - 6	0.17 – 2.35	1.68 – 19.8

### 6.2.4 DETAILS OF SEQUENCE OF COAL SEAM AND PARTING

Details of sequence of coal seam and parting are tabulated as below:

Name of Seam/Parting	Thickness of Coal/Parting (m) with range
Bottom seam section	8 - 12
PARTING	2 - 4
Top seam section	2 - 6

### 6.3 MINE F

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Sl. No.	
1.	A
a)	O
b)	O
2.	D
a)	In
b)	Fi
3.	A
4.	A
	T
	B
5.	A
6.	V
7.	V
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10.	T
11.	A

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