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For MINISTRY OF COAL

Signed by ....R.Q.P.....

STRICTLY CONFIDENTIAL
RESTRICTED CIRCULATION

MINING PLAN

FOR

UNDERGROUND COAL PROJECT

IN

BRAHMAPURI BLOCK

(Pench – Kanhan Valley Coalfield)

Village : Bichua Pathar, Tahsil-Parasia

Dist. Chhindwara (M.P.)

OF

M/S. PUSHP STEELS & MINING (P) LTD.

751, KUNDEWALAN ST. AJMERI GATE, NEW DELHI 110 006

VOLUME – I

(TEXT, APPENDICES & ANNEXURES)

SEPTEMBER – 2008

Prepared by

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MINING PLAN FOR UNDERGROUND COAL PROJECT

IN

BRAHMAPURI BLOCK

(September 2008)

SUMMARISED DATA

1.	**Location of the block**	:	Village : Bichua Pathar Tahsil : Parasia Dist : Chhindwara State : Madhya Pradesh
2.	**Area of the block**	:	3.6 sq. kms. (as per CMPDIL)
3.	**Block explored by**	:	Mineral Exploration Corporation Ltd. (MECL) (A Govt of India Undertaking); No. of boreholes ; 36
4.	**GR (Geol. Report) prepared by**	:	MECL in September 1985
5.	**Site details**	:	The block is accessible by an all weather metalled road connecting Parasia township (150Kms. north of Nagpur by road via Chhindwara) to Shivpuri mine of WCL which is about 15 Kms. east of Parasia township. Surface is a rugged hilly terrain-max elevation 810m above MSL – comprising ridges of Deccan Trap which covers the whole block with thickness ranging from 50m to 130m.
6.	**Geological structure of the block**	:	The entire block is downthrown by 130m. between two major faults trending NE-SW and between these two major faults there are 18 faults – throw 10 to 70m which have divided the block into 21 sectors (Sector 5 to 25). These faults are aligned mostly along strike. Besides, repeated faulting, a prominent dolerite dyke 40 to 50m. thick has cut across the sedimentary formation in E-W direction. The area north of dyke is one fourth of the total area of the block and is comparatively less disturbed. The coal

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seams occur in middle Barakars overlain successively by upper Barakar (5 to 15m) Motur (rich in clay thickness > 100m) and Deccan Trap (massive & hardest – thickness 50 to 130m).

Depth of occurrence of coal seam:

North of dyke : 150/200 to 280/340.

South of dyke: 170/220 to 300/350.

7. Particulars of coal seams : A number of coal seam broadly divided into upper and lower group by parting 15 to 20m thick of sandstone, shale and carb shale has been intersected in boreholes drilled in this block. The upper group consists of seams by I, II & III and lower group consists of seam IV & V. These five seams are split into a number of section A, B & C and have developed workable thickness (+1.5m) in isolated patches. Only seam / section IC is consistently thick (thickness 2.8 to 3.5m) and has the highest mining potential. The seams strike along NE-SW to E-W (Western part) and dip at 1 in 7 to 1 in 8 towards North.

8. Quality of coal : Upper group of seams: C to E grade (generally D);
Lower group of seams: B to D grade (generally C);
Percentage of sulphur : less than 1 (generally < 0.5)
Percentage of moisture 5 to 6.

9. Geological reserves

- **as per GR** : 55 mil. tes (+0.9m thick)
- **as per Mining plan** : 38 mil. tes (+1.5m thick)

Seam	North of dyke		South of dyke		Total
	Thickness (m)	Reserves (Mt)	Thickness (m)	Reserves (Mt)	Reserves (Mt)
IC	3.49	3.78	3.21	10.51	14.29
IIA	2.15	2.18	1.79	1.76	3.94
IIB	-	-	1.65	0.62	0.64
III	-	-	1.67	1.65	1.65
IVA	2.15	1.35	1.96	5.17	6.53
VA	2.85	2.71	1.76	4.06	6.77
VB	1.85	0.58	2.06	8.60	4.18
Total		10.60		37.37	37.97

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Total		10.6		27.37	37.97 Say 38Mtes.

10. Mining technology : Underground mining through a pair of shafts (6mm dia). Semi-mechanised bord & pillar method with blasting off the solid and transport of coal by LHD belt conveyor system.

Development of contiguous seams maintaining verticality of pillars and galleries.

Simultaneous depillaring of contiguous seams by splitting, slicing and caving maintaining diagonal line of extraction.

Pillars to be left for protection of shafts and important surface features – as per Coal Mines Regulation 1957

11. Mining stages Mining to be conducted in three stages one after another through shaft landings at three different levels - all on the upthrow side of fault F24 – North of dyke.

Stage	Landing	Depth from surface (m) in shaft No.			Purpose of landing
			1	2	
I	Upper	at the floor of seam IIA	175	180	To work upper group of seams North of dyke
II	Middle	at the floor of seam VB	220	225	to work lower and upper group of seam North of dyke and upper group – south of dyke.
III	Bottom	at the floor of stone drift to connect with seam VA on downthrow side of F24	260	260	to work lower group of seams in sectors 18 & 17 and both group in all other sectors

12. Extractable reserves :

Seam	North of dyke			South of dyke			Whole Block		
	Dev.	Dep.	Total	Dev.	Dep.	Total	Dev.	Dep.	Total
IC	0.434	0.807	1.241	1.167	2.615	3.782	1.601	3.422	5.023
IIA	0.294	0.336	0.630	0.226	0.420	0.656	0.520	0.766	1.286
IIB	-		-	0.077	0.152	0.229	0.077	0.152	0.229
III	-	-	-	0.172	0.338	0.510	0.172	0.328	0.510
IVA	0.176	0.128	0.304	0.619	1.222	1.841	0.795	1.350	2.145
VA	0.207	0.256	0.473	0.551	1.083	1.634	0.758	1.349	2.107
VB	0.050	-	0.050	0.345	0.648	0.993	0.395	0.648	1.043
Total	1.161	1.537	2.698	3.167	6.488	9.645	4.318	8.025	12.343

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13. Stagewise comparison of extractable reserves :

Figs. in mil. tes.

Stage	Reserves North of dyke			Reserves south of dyke			Total for the block		
	Available Geol.	Panel	Extractable	Available Geol.	Panel	Extractable	Available Geol.	Panel	Extractable
I	4.312	2.844	1.502	-			4.312	2.844	1.502
II	5.143	2.746	1.190	2.336	1.297	0.790	7.369	4.043	1.980
III	-	-	-	24.078	14.742	8.855	24.078	14.742	8.855
Total	**9.455**	**5.590**	**2.698**	**23.304**	**16.039**	**9.645**	**35.759**	**21.629**	**12.343**

14. Extraction percentage:

	Stage I	Stage II	Stage III	Total for the block
1. Extractable : panel	52.8	49.1	60.0	57.1
2. Extractable : available geol	34.8	26.9	36.9	34.5

15. Mine capacity : 0.36 Mte/annum

16. Daily production target (TPD) : Seams +2.4m : 2No. Std. ht. LHD district 800TPD
Seams -2.4m : 2 No. low ht. LHD district 400 TPD.
The above production target can be achieved if two districts in Seam IC are in operation

17. Yearwise schedule of production :

	Year	Coal production		
		Yrly. (Mt)	Cum. (Mt)	
	01	60m	60m	Shaft sinking progress 60m
	02	150m	210m	Shaft sinking total 210m
	03	0.03	0.03	Completion of shaft – Total depth 260m Drivage for vent. connection, construction of sump in Seam IC and IIA (Stage I)
	04	0.18	0.21	Development in Seam IC & IIA
	05	0.34	0.55	Development in seam IC and IIA Drivage of drift from Sector 21 to 25
	06	0.36	0.91	Development, depillaring in seam IC & IIA in sector 25
	07	0.36	1.27	Depillaring completed in sector 25
Completion of stage I	08	0.36	1.63	Depillaring completed in sector 24
	09	0.36	1.99	Development and depillaring in seam IC, IIA, IVA & VA & VB
	10	0.36	2.35	North of dyke and seam IC, IIA
	11	0.36	2.71	South of Dyke
	12	0.36	3.07	
Completion of Stage II	13	0.36	3.43	
Start of Stage III	14			

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18. **Reserves to be liquidated upto year 30**	:	Year 1 to 10	2.35 Mtes.
		Year 11 to 20	3.60 Mtes.
		Year 21 to 30	3.60 Mtes.
		Total upto yr. 30	**9.55 Mtes.**

19. **Balance extractable reserves beyond year 30**

: 12.34 – 9.55 = 2.79 say **2.8Mtes.**

20. **Total life of the mine :** 30 – 8 = 38 say **40 years.**

21. **Proposed system of coal transport**

- From working face to gathering belt / gate belt :
  - By LHD (load haul dumper)
    - bucket 1.5m³ (Std. height)
    - bucket 1.1m³ (low height).
- From gate belt to pit-bottom
  - Gate belt : 800mm wide 1.5m/sec. 100 TPH
  - trunk belt : 1000mm wide 1.5m/sec 150 TPH
  - At pit bottom : trunk conveyor loading into 3 te mine car through strata bunker to be hauled to pit bottom either by endless haulage or locomotive.
  - Through shaft: single deck cage each carrying two mine cars at a time. 2 cars / wind : 25 winds/hour.
  - designed winding capacity : 150 TPH

22. **Degree of gassiness of coal seams :** Degree II (Subject to confirmation later by gas survey)

23. **Air quantity required to ventilate the mine :** 100 cum/sec. at 100 120mm of water guage.

24. **Pumping of mine water :** Through 250mm dia pipes connected to high capacity pumps installed at main sump underground; the delivery pipes can be fixed in vertical shafts or in large dia borehole. Rate of pumping will depend upon the make of water – may vary from 2 to 6 MLD depending upon the yield from u/g. aquifers.

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25.	**Manpower :**	Face operation for 4 districts – 360 Maintenance and transport including surveying and supervision 120 **Total U/G. 480** **Total surface 120** **600***

* excludes stone drifting, construction of stopping and surface manpower for township and services which can be outsourced.

26.	**OMS (Output / manshift) :**	• U/g. – 2.87 • **Overall – 2.3**
27.	**Surface coal handling storage and transport :**	Tippler at pit top unloading mine cars into elevating belt conveyor 1000mm wide 150 TPH capacity discharging into two O/H hoppers with twin pocket (providing storage for 4 x 100tes) with truck loading and electronic weighing arrangement.
28.	**Power supply and distribution**	
	• **Power demand :**	3500 to 4000 KVA excluding township and roads pending finalisation of assessment
	• **Transformer capacity :**	2 x 3 MVA at PF of 0.96 (pending finalisation)
	• **Incoming power :**	33 KV O/H line from nearest sub-station of MPEB at Amarwara. With standby DG set of 500KVA for main fan in case of power failure
29.	**Period of mining lease :**	30 years
30.	**Area applied for mining lease :**	360 Ha (area of coal block allotted)
31.	**Presence of forest land within Mining lease boundary :**	.... Ha belonging to .... range of .... Division.
32.	**Area to be acquired for surface rights:**	.... Ha belonging to Bichua Pathar
33.	**End use of coal :**	Captive use for manufacture of sponge iron

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34. Location of end use plant (EUP): Chattisgarh

35. Distance of EUP from the mine : Approx. 400 Kms. from the mine.

36. Proposed mode of coal transport for the mine : By road – later switching over to rail, if railway siding facilities can be made available on Chhindwara – Nagpur branch of Central Railway.

37. Suitability of coal block for proposed end use : Coal from proposed u/g. mine is suitable for manufacture of sponge iron but will meet only a part of the demand for phase II expansion 0.30 Mt/annum of sponge iron to be commissioned in 2011.

38. Scope for future revision of Mining Plan :

The Mining plan proposes underground mining of the block through a pair of vertical shafts to be located in the area – north of dyke - which is at comparatively shallow depth of 170m because of upthrow fault and has less thickness of Deccan trap (60m compared to max. of 120m south of dyke). The area north of dyke is less disturbed by faults compared to the area south of dyke. The reserves of the area north of dyke are expected to be liquidated within a period of 10 to 12 years from the start of the mine.

The area to the south of dyke is affected by a series of downthrow faults at close intervals and has Deccan trap cover of 120m thick. The mining plan has provided for access to this area by a pair of level drifts (120m long) from the deep most landings of the proposed shafts 1 & 2 cutting through the dyke and downthrow fault F24 for development of working panels / districts proceeding from dip to rise at apparent dip of 1 in 9 to 1 in 10. Normally, there should be no problem in negotiating the rising gallery by LHD but if other problems viz. ventilation, water, long conveyor haul etc. are found to be difficult and cost-prohibitive then another shaft (midway between the dyke and dip side boundary) may have to be sunk to serve as a second entry for intake air and also as second outlet for coal. The decision on this second entry will depend upon a number of factors which are not possible to visualize at present. As and when, this decision is taken for sinking another shaft, the Mining Plan will be revised and submitted for fresh approval.

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MINING PLAN FOR UNDERGROUND PROJECT
IN
BRAHMAPURI COAL BLOCK
Tah. Parasia, Dist. Chhindwara (M.P.)
(September 2008)

LIST OF PLATES

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MINING PLAN FOR UNDERGROUND PROJECT
IN
BRAHMAPURI COAL BLOCK
Tah. Parasia, Dist. Chhindwara (M.P.)
(September 08)

LIST OF ANNEXURES

Annexure No.	Particulars
I.	Copy of letter No. 38011/11/2006-CA-I dated 16.07.2007 issued by Govt. of India, Ministry of Coal allocating Brahmapuri Coal block to M/s. Pushp Steels & Mining (P) Ltd.
II.	Copy of receipt No. A 13231 dated 14.03.2008 from CMPDIL Hq. Ranchi, of D.D. for Rs.1,81,98,832.00 towards the cost of Geological report.
III.	Copy of letter No. 34011/(14)/2004-CPAM dated 14.09.2004 issued by Govt. of India, Ministry of Coal granting recognition to Shri A. K. F. Haque as competent person to prepare Mining Plan for coal and lignite.
IV.	Copy of receipt dated 15.10.2007 in Form D from the District Mining Officer, Chhindwara, M.P. for application submitted for mining lease over an area of approx. 4 sq. km.s of Brahamapuri block in Pench Kanhan Valley Coalfield.

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MINING PLAN FOR UNDERGROUND PROJECT
IN
BRAHMAPURI COAL BLOCK
Tah. Parasia, Dist. Chhindwara (M.P.)

September 2008

LIST OF APPENDICES

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VC	Estimates of sectorwise geological reserves (+1.5m thick) – Seam IIB
VD	Estimates of sectorwise geological reserves (+1.5m thick) – Seam III
VE	Estimates of sectorwise geological reserves (+1.5m thick) – Seam IVA
VF	Estimates of sectorwise geological reserves (+1.5m thick) – Seam VA
VG	Estimates of sectorwise geological reserves (+1.5m thick) – Seam VB
VIA	Estimates of sectorwise reserves within panel and extractable reserves – Seam IC
VIB	Estimates of sectorwise reserves within panel and extractable reserves – Seam IIA
VIC	Estimates of sectorwise reserves within panel and extractable reserves – Seam IIB
VID	Estimates of sectorwise reserves within panel and extractable reserves – Seam III
VIE	Estimates of sectorwise reserves within panel and extractable reserves – Seam IV
VIF	Estimates of sectorwise reserves within panel and extractable reserves – Seam VA
VIG	Estimates of sectorwise reserves within panel and extractable reserves – Seam VB

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LIST OF TABLES

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IN

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MINING PLAN FOR UNDERGROUND PROJECT IN BRAHMAPURI COAL BLOCK

CHAPTER – I

INTRODUCTION

1.1 Allotment of coal block

M/s. Pushp Steels & Mining had applied to Govt. of India for allocation of coal block for captive use and the same was considered by the Central Govt. Finally, the Central Govt. allotted Brahmapuri Coal block in Pench – Kanhan Valley Coalfield of WCL command area to meet the coal requirement for the company's sponge iron plant (0.42 MT capacity) in Dist. Durg, Chattisgarh. Copy of the block allocation letter No. 38011/11/2006-CA-1 dated 16.07.2007 from Govt. of India, Ministry of Coal, New Delhi is enclosed as **Annexure-I**.

1.2 Receipt of Geological Report (GR)

Copies of the GR prepared by MECL were received from CMPDI Hq, Ranchi in March 2008 after payment of exploration charge amounting to approx. Rs.4.82 crores. Copy of the receipt of the D.D. from CMPDIL, Ranchi is enclosed as **Annexure-II**.

1.3 Appointment of RQP

The company has retained the services of Shri A. K. F. Haque, Retired CME, CMPDI, RI-IV, Nagpur to prepare the Mining Plan for Brahmapuri Coal Block. Shri Haque has been certified as Recognised Qualified Person (RQP) under rule 22(c) of Mineral Concession Rules, 1960 by Govt. of India, Ministry of Coal to prepare mining plans for coal and lignite for a period of 10 years w.e.f. 14.09.2004 vide letter No. 34011/(14) 2004-CPAM dated 14.09.2004 (Copy enclosed as **Annexure-III**).

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1.4 Application for mining lease

M/s. Pushp Steels & Mining (P) Ltd. submitted an application for mining lease over an area of approx. 4 sq. km. (400 Ha) in Brahmapuri coal block in Form D with necessary enclosures (including the block area marked on Topo sheet) to the Mining Officer, Dist. Chhindwara (MP) on 15th October 2007 – (copy of receipt enclosed as **Annexure IV**). A revised application for mining lease is under formulation on the basis of the villagewise schedule of land within the **allotted block boundary marked on the cadastral map (See plate III scale 1 : 5000)** after proper survey of the site and cross-checking the position of boreholes on corresponding plots / khasara no. on the ground.

1.5 Scope of the Report

1.5.1 The Mining Plan is based on the Geological Report (GR) of Brahmapuri coal block prepared by MECL in September 1985. As per the GR, the area of Brahmapuri block is 7.5 sq. kms. out of which 3.6 sq. km. have been allotted to M/s. PSML. Total No. of boreholes drilled in Brahmapuri block is 113 out of which 36 boreholes fall within the area allotted to M/s. PSML. The mining plan presented in this report is based on the structural interpretation, reserves and quality estimates made on the basis of data screened from 36 boreholes drilled within the block boundary.

1.5.2 As per the GR, the total proved reserves of Brahmapuri block are 102.50 million tonnes out of which the reserves (+ 0.9m thickness) within the boundary allotted to M/s. PSML are 55 million tonnes as per CMPDIL, but the breakup of these reserves sectorwise, seamwise and thicknesswise have not been provided. For the purpose of the Mining Plan the proved reserves of coal seams (+ 1.5m thickness – considered workable by u/g. method) have been estimated separately the details of which are given later in the report in Table 4.1.

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1.5.3 Because of depth and other geological reasons the mining plan proposes u/g. mining in this block and has made a modest attempt to achieve and sustain the desired level of production of 0.36 Mt. per annum (mine capacity as assessed by CMPDIL) for as long as possible with due regard to safety, conservation and protection of environment.

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CHAPTER II

GENERAL INFORMATION

2.1 Name and address of the applicant : M/s. Pushp Steels & Mining (Pvt.) Ltd.,
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2.2 Mineral which the applicant wants to mine : Non-coking coal

2.3 Proposed end use of coal : Captive consumption for manufacture of sponge iron

2.4 Status of the applicant : M/s. Pushp Steels & Mining (P) Ltd., is a company registered under Companies Act. The promoters of the company are well established businessmen having major interest in sponge iron production, coal mining and iron ore mining.

2.5 Status of E.U.P. : Existing sponge iron production unit is located in Chattisgarh and has an annual capacity of 30000 tes. The schedule of sponge iron capacity expansion and coal requirement for the same is as follow :

	Year of completion	Sponge Iron	Coal requirement
Phase I	**2009**	0.12 MTPA	0.19 MTPA
Phase II	**2011**	0.30 MTPA	0.48 MTPA
Phase III	**2012**	0.42 MTPA	0.67 MTPA

2.6 Proposed mode of transport of coal from the mine to the EUP : By road – distance approx 400 Kms.

2.7 Particulars of RQP

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Address : Milk Scheme Co. Op. Hsg. Society, Near GPO Square, 206/5, Civil Lines, Nagpur – 440 001.
Phone N. (R) : 0712-2551273
(M) : 98902 72959
Authorisation period of RQP : For a period of 10 years w.e.f. 14.09 2004. Ref. Annexure-II.

2.8 Particulars of coal block allotted

Name : Brahmapuri
Village : Bichhua Pathar
Tahsil : Parasia
District : Chhindwara
State : Madhya Pradesh
Area of block : 3.6 sq. kms. as per CMPDIL.

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2.9 Geological reserves : 55 mil. tes (+ 0.9m thickness) of proved category as per GR

2.10 Quality of coal (as per CMPDIL) :

Grade	M. Tes.
A	2.085
B	12.681
C	21.898
D	8.092
E	5.415
F	4.878
G	0.004
Total	**55.053**

2.11 Particulars of prospecting agency :

Name : Mineral Exploration Corporation Ltd. (MECL)

No. of holes : 36

Meterage : 10001.2

Period of exploration : 1979 – 1985

2.12 GR prepared by : MECL in September 1985

2.13 Proposed mining leasehold :

1. Total area : Total area applied for Mining Rights :
2. Village wise details of Mining lease area :

Table

Sl. No.	Name of village	Private land (Ha)	Govt. land (Ha).			Total (Ha)
			Non-forest	Forest	Total	
1.	Dabbua Pathar					
2.	Sirgora					
3.	Kukur Munda					
4.	Chhinda					
5	Sethia					
6.	Mandla					

2.14 Period of mining lease : 30 years

2.15 Status of mining lease application: The original application for mining lease submitted to the Dist. Mining Office, Chhindwara on 15.10.2007 is being revised on the basis of village wise schedule of land as per Govt. records within the allotted block boundary.

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2.16 Geographical location of the block and communication (Plate I): Brahmapuri block occurs in Survey of India toposheet No. 55 J/16 and is bounded by latitude 22°16'32" N to 22°17'50"N and longitude 78°50'00"E to 78°52'39"E. The block is located to the north of existing Shivpuri mine of WCL which is about 15 Kms. east of Parasia township in Chhindwara district of Madhya Pradesh.

At present, the block is accessible by all weather metalled road connecting Parasia township to Shivpuri mines in South and Sethia opencast mine to the north. Bichua village is the only populated place which is situated over the northern part of the block and is accessible by a cart track.

2.17 Physiography of the area : (Plate II)

1. The block is a rugged terrain compriaing two parallel ridges – running east-west in the central part. – elevations of which reach upto a max. of 810m. from surface level and as low 750m in the south east corner of the block. The entire area is capped by a thick cover of deccan trap 50 to more than 130m thick, having a weathered zone at a top (3 to 5m). The gullies and nallahs originating from the central ridges become active during monsoon and flow in all directions to meet the main drainage ~~streams and flow in all directions to meet the main drainage~~ channel which is Pench river flowing 2.5 to 3 kms. to the west and south of the block.
2. There is a stone quarry in the eastern part of the block having crusher, stacking and truck loading facility. The only populated area over the block is Bichua village (population approx. 500) in the north eastern part of the block which is approachable by cart track both from the northern and southern ends of the block. Opencast mining by WCL is in progress in Chhinda and Sethia blocks to the west and Shivpuri / Sirgora blocks to the south.
3. Part of the land in the northern and southern halves of the block belongs to state forest department. Some portion of the land has been leased out to private parties by the State Mining Department for stone quarries. Rest of the land is barren and cultivated in patches near Bichua village. There is no thick forest anywhere within the block.
4. Climate of the region is sub-tropical. In summer (April - May) the temperature rises to a max. of 40°C. In winter it falls to a min. of 5° to 6°C (November – January). Rainy season lasts from mid-June to mid-September. Annual rainfall generally remains within a range of 1200 to 1800m

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CHAPTER III

EXPLORTION, SURVEYING AND GEOLOGY

3.1 Exploration

The area has been explored in detail by Mineral Exploration Corporation Ltd. (MECL) – a Govt. of India enterprise during the period 1979 to 1985. 36 boreholes of series PE, PKCS and PMD have been drilled within the allotted block boundary covering a total meterage of approx. 10000 mtrs. The pattern of holes is irregular because of rugged nature of the terrain affecting the accessibility of drilling sites. The coordinates of boreholes and their depth are given in **Appendix-I**.

3.2 Survey:

The area has been surveyed by MECL. The reference point of surface RL is the Bench Mark known as Jupiter (value 713.35m) located SW of Shivpuri incline. The reference points of coordinates of boreholes have been taken from the base line joining the following two stations located in Rawanwara Khas Colliery

	Latitude	Departure
Station A.7	20555.992	20349.683
Station A.9	19130.940	20902.730

3.3 Geology

3.3.1 Lithological sequence in Brahmapuri block

The borehole wise list of formations intersected in Brahmapuri block and their thickness range is given in **Appendix-II**. The geological succession of the rock formations in Brahmapuri block is given in the following Table 3.1

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Table 3.1

Sequence of rock formations intersected in Brahmapuri block

Age	Formation	Lithology	Thickness range (m)	
			South of dyke	North of dyke
Sub recent to recent	Soil	Sandy and clayey soil	Nil to 5.50	Nil to 5
Upper cretaceous to Eocene	Deccan trap with inter-trappean beds	Basalt, clay clay stone (inter trappean)	44.90 to 124	46.39 to 142.52
	Dolerite dyke	Basic intrusion	-	7.65 to 10.00
		Unconformity		
Jurassic	Jabalpur	Gritty sandstone and clays with red jaspar	Nil to 16.23	Nil to 7.56
		Unconformity		
Permian	Moturs	Brick red to greyish clay / clay stone / sandstone bands at places – no coal	80.70 to 149.19	38.00 to 147.00
Permian	Barakars	Sandstone with Kaolinised feldspars interbeded with shale, carb shale and coal seams	29.40 to 83.25	36.40 to 119.40
Lower Permian	Talchirs	Fine grained argillaceous sandstone and splintery shale	Nil	Nil

From the above list of formations it can be seen that coal bearing Barakar formations in Brahamapuri block are overlain by Moturs which are clayey (impervious to water) and followed successively by Jabalpur sandstone (porous in character) and basalt (of igneous origin and very hard and massive in character. Lithologs of important boreholes, more or less representative of individual sectors are shown in **Plate V**.

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3.3.2 Geological structure

The sedimentary formations of Brahmapuri block below Deccan Trap have been downthrown by 130m between two major faults viz. F.2(A) in the north and F.1.(S) in the south in relation to Sethia / Mandla block to the north and Shivpuri / Sirgora block to the south. In between these two major faults, the block has been affected by a series of faults (F11 to F28) at frequent intervals (100 to 300m) which have divided the block into 21 sectors (Sectors 5 to 25). These faults are aligned mostly in E.W. and NE-SW direction which incidentally are the strike directions of the sedimentary formations and have throw varying within a range of 10 to 70m. The alignments of these faults are shown in the geological plan (**Plate IV**) which also show the iso-pachytes of Deccan Trap at 10m intervals. Four cross sections viz. A,

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B, C, D in dip rise direction showing the effect of repeated faulting, thickness of coal seams and the strata overlying them are given in **Plate VIA and VIB.** Presence of so many faults, affecting the coal seams, may render some of the sectors unapproachable and uneconomic to work because of high cost of stone drifts besides making the roof conditions unpredictable and unsafe.

3.3.3 Presence of Dyke

A prominent dolerite dyke 40 to 50m thick has cut across the sedimentary formations of the block in E-W direction right in the middle where the block narrows down towards the North – thus dividing the whole block into two distinct geological identities which can only be connected by drivage of drifts as explained later in the report. Area to the north of dyke is smaller but less disturbed by faults as compared to the area south of dyke. However, this requires to be confirmed by drilling of additional boreholes before coming to a firm conclusion.

3.4 Description of coal seams

3.4.1 Middle Barakar

A series of coal seams of varying thickness and coal [illegible] into two major groups viz. upper and lower - (the upper group consisting of seams I, II and III and lower group consisting of seams IV & V) separated from each other by a non coal bearing parting of fine grained sandstone, shale and carb shale 15 to 20m thick, occur in Middle Barakars which is the most important part of Barakar formations from mining point of view. The coal seams srrike along E-W in the central part of the block but take a swing towards NE SW direction in the northern and southern part of the block. The gradient of the coal seam is generally 1 in 7 to 1 in 8 and dip is towards North (Central part) and NW (rest of the area). The total thickness of coal column including upper group, parting and lower group varies from 60 to 70m in this block.

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3.4.2 Upper and lower Barakars

The column above seam IA and upto the Motur / Barakar contact is termed as upper Barakars. This column varies in thickness from 10 to 15 m and consists of fine grained sandstone with intervening shale and carb shale bands. The column below seam VC and upto Barakar / Talchir contact is termed as lower Barakars. This horizon consists of coarse grained sandstone with presence of thin bands of coal and shale at places.

3.4.3 Sequences of coal seam

The sequence of coal seams as identified and correlated from the borehole intersections as well as analytical results is enumerated below in the following Table 3.2.

Table 3.2

Sequence of coal seams in Brahmapuri block

	Seam / Parting	Thickness range (m)	Remarks
Upper group of seams	IA	0.05 to 1.31	generally less than 0.9m
	Parting	0.13 to 2.44	
	IB	0.21 to 2.16	Seams IB and IC can be combined at places into one seam to increase the thickness for higher production with slight deterioration in coal quality
	Parting	0.16 to 0.99	
	IC	1.49to 3.63	
	Parting	1.33 to 4.74	
	IIA	0.10 to 2.50	Seams IIA and IIB also occur at places in the composite form with thickness generally ~1.5m.
	Parting	0.31 to 2.15	
	IIB	0.49 to 1.79	
	Parting	1.99 to 3.51	
	III	0.15 to 1.82	
	Parting	15 to 20	fine grained sandstone with shale and carb shale bands
Lower group of seam	IVA	0.8 to 2.8	
	Parting	2 to 7	
	VA	0.56 to 2.94	
	Parting	7 to 12	
	VB	0.42 to 2.98	
	Parting	1 to 4.5	
	VC	mostly less than 0.5m	

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Note :

1. The parting between seams and sections generally consists of shale / carb shale and intercalation of shale and sandstone.
2. Only seam IC is available throughout the block in +1.5m thickness which is the minimum thickness required for

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mechanization of u/g. mining. Seams IA and VC have failed to develop minimum workable thickness of 1.5m and are, therefore, unworkable. Other seams have developed + 1.5m thickness in patches and are, therefore, workable only in selected places provided they are accessible, and can be connected to the u/g. main stream for transport of coal and ventilation.

3. The boreholewise and sectorwise correlation of seams intersected in the block is listed in **Appendix-III**.

3.4.4 Quality of coal:

1. Delineation of seams / section:

The seams / sections have been delineated on the basis of analytical results of coal core samples obtained from Coal Survey Laboratory, Nagpur. The following norms have been adopted as per the standard practice, for definition of coal and bands.

(ash + moisture) % upto 40	:	coal
(ash + moisture) % > 40 upto 55	:	shaly coal
(ash + moisture) % > 55 upto 75	:	carb shale
(ash + moisture) % > 75	:	grey shale (obvious dirt band)

2. In-situ quality of coal:

Seamwise in-situ quality of coal (based on results of proximate analysis as given in Appendix VI of GR) for the borehole falling within the block boundary are given in **Appendix-IV**. The results of proximate analysis given in the GR are based on equilibrated basis i.e. 60% R.H. and 40°C as is normally used for grading of coal. The generalized range of variation of in-situ coal quality as compiled from the data given in the GR is presented in the following Table 3.3.

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Table 3.3

Seamwise details of in situ coal quality

Area to the South of dyke

Seam	Thickness (m)	M%	Ash %	CV (Kcal/kg)	UHV (Kcal/kg)	Grade	Remarks
IB	0.7 to 1.8	4 to 6	28 to 35	-	0000 to 3300	E to F	15 boreholes
IC	2.6 to 3.5	3 to 5	25 to 30	4945 to 5200	4500 to 5400	C to D	Coal quality may fall to E if IB an IC are combined to increase the thickness
IIA	1.5	6	37.5	-	2863	F	Only one borehole (Sector 10) needs further testing
IIB	1.5 to 1.8	5 to 7	18 to 25	4680 to 5680	4000 to 5500	C to D	16 boreholes
IIA + IIB	2 to 2.5	4 to 5	18 to 20	--	5500 to 6000	B to C	13 boreholes
III	1.5 to 2	4 to 8	16 to 20	5165	4700 to 5700	B to D	4 boreholes
IV	1.5 to 2.6	5 to 8	15 to 21	5165 to 6160	4600 to 5900	B to D	21 boreholes
VA	1.5 to 2.8	5 to 6	15 to 18	5200 to 6110	4700 to 6100	B to D	25 boreholes
VB	1.5 to 3.0	6 to 9	14 to 20	5600	5100 to 5700	B to C	5 boreholes

Area to the North of Dyke

Seam	Thickness (m)	M%	Ash %	CV (Kcal/kg)	UHV (Kcal/kg)	Grade	Remarks
IB	0.5 to 2.0	5.5	32	4810	2800 – 3800	E to F	3 boreholes
IC	3.2 to 0.8	2 to 5	22 to 39	-	3200 – 5400	C to F	4 boreholes
IIA + IIB	1.8 to 2.5	3 to 5	13 to 17	-	6000 6500	A to B	4 boreholes
IV	2 to 2.4	3.5 to a	27 to 28	-	4450 – 4670	C to D	2 boreholes in sector B-21
VA	3.20	4.3	18.30	-	5781	B	Only one borehole
VB	1.41	6.05	13.78	-	6081	B	Only one borehole

3. Results of ultimate analysis

The seamwise results of ultimate analysis for BH No. PE-59 and PE-62 on equilibriated basis i.e. 60% R.H. and 40°C as given in Appendix-VI of GR (page 845 C) are as follow:

Table 3.4

Results of ultimate analysis

BH No.	Thickness	Seam	C%	H%	Total sulphur%	N%
PE-59	2.78	IC	NA	NA	1.32	NA
PE-62	2.87	IC	53.59	3.27	0.71	NA
PE 62	2.20	II	63.13	3.56	0.41	NA
PE-62	0.65	III	42.47	2.46	0.38	NA
PE-59	2.29	IVA	NA	NA	0.34	NA
PE 62	1.00	IVA	49.2	2.78	0.47	NA
PE-59	0.99	VA	NA	NA	0.49	NA
PE-62	3.20	VA	64.37	3.65	0.53	NA
PE-62	0.61	VB	65.04	3.70	0.33	NA

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4. **Special tests**

Ash fusion temperature range of coal seams intersected in BH No. PE 62 (Sector 25 North of dyke) as given in Appendix VI of GR (page 845 D) is as follows :

Table 3.5

Ash fusion temperature of coal seams

BH No.	Thickness	Seam	Ash fusion temperature		
			Initial Deformation	Hemispherical	Flow
PE 62	2.57	IC	1160°C	over 1400°C	over 1400°C
	2.20	II	1200°C	over 1400°C	over 1400°C
	0.65	III	1220°C	over 1400°C	over 1400°C
	1.00	IVA	1220°C	over 1400°C	over 1400°C
	3.20	VA	1250°C	over 1400°C	over 1400°C
	0.61	VII	1280°C	over 1400°C	over 1400°C

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CHAPTER IV

ESTIMATES AND DISTRIBUTION OF RESERVES

GR VS. MINING PLAN

4.1 Estimation of Reserves in the GR

4.1.1 As mentioned in Chapter I (Para 1.5), Brahmapuri block allotted to M/s. PSML is only a sub block of the original Brahmapuri block covered in the GR prepared by MECL in September 1985. As per the GR Brahmapuri sub-block consists of 25 sector (B-1 to B-25) and has 67.472 mil. tes. of coal reserves. Before allotment of this sub-block to M/s. PSML, sectors B-1, B-2, B-3, B-4 and part of sectors B-5, B 9, B-10, B 12, B-14 and B 15 were removed leaving only 55 mil. tes. of reserves within the boundary demarcated by CMPDIL. GR for this sub-block does not mention the serctorwise or seamwise distribution of reserves. Only the allotment letter issued by Ministry of Coal gives the gradewise distribution of 55 mil. tes. (Please see details in para 2.10 – Chapter II). Correspondence with CMPDIL Hq. on this matter has not produced any favourable response.

4.1.2 Study of GR indicates that :

1. 0.9 m has been considered as the minimum workable thickness of coal seam for reserve estimation.
2. the reserves have been estimated for 9 seams / sections viz. IA, IB, IC, II/IIA, IIB, III, IVA/IVA2, VA/VA1, VB/VB2. For split seam/sections viz. II/IIA, IVA/IVA2, VA/VA1, VB/VB2 the reserves have been estimated together.
3. Reserves have been estimated for thickness range 0.9 to 1.2m and more than 1.2m.
4. Reserves have been calculated sectorwise based on [illegible] pattern.
5. Reserves have been calculated separately for depth range upto 250m from surface and beyond 250m from the surface.

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6. Reserves have also been estimated for different grades of coal viz. A, B, C, D, E, F and G. The specific gravity of different grades of coal considered for reserve estimation is as follows :

Grade	Hu (Kcal/kg)	Sp. Gravity
A	> 6200	1.40
B	5600 – 6200	1.45
C	4940 – 5600	1.50
D	4200 – 4940	1.55
E	3360 – 4200	1.60
F	2400 – 3360	1.68
G	1300 – 2400	1.76

7. Area within the heave zone of faults has been excluded during estimation of reserves
8. A factor of 0.9 has been applied to gross geological reserves to arrive at the net geological reserves – to allow for variation due to geological uncertainties.

4.2 Estimation of reserves in the Mining Plan :

1. The mining plan has considered 1.5m as the min. thickness of coal seam / section for reserve estimation because 1.5m is the min. thickness required for mechanization of u/g. mining as per the norm adopted by CMPDIL for CIL mines.
2. Within the area covered by +1.5m iso-chore in the folio-plan of coal seam, the reserves have been calculated for each geological sector by applying the following standard formula:

   $R = A \times T \times G \div 100$

   Where R = reserves in mil. tes.
   A = area in hectares
   T = average thickness of coal in metres.
   G = specific gravity of coal (varying with grade)

3. Gross reserves have been multiplied by 0.9 (to allow for geological uncertainties) to arrive at the net geological reserves.

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4. Seam IA has been excluded because the thickness of seam / section is less than 1.5m.

5. Seam IB has been combined with seam IC at some places to increase the thickness of Seam IC beyond 3m. to improve conservation and also to increase the parting to at least 3m between IC and Seam IIA for the purpose of safety as provided for in Coal Mines Regulations (CMR, 1957).

4.3 Seamwise and areawise distribution of geological reserves in the Mining Plan:

The areawise (North and South of dyke) and seamwise distribution of geological reserves as measured and calculated in the Mining Plan are given in the following Table. 4.1

Table 4.1

Seamwise geological reserves (+1.5m) as estimated in the Mining Plan (September 08).

Seam	North of dyke			South of dyke			Total for the block		
	Area (Ha)	Thickness (m)	Reserves (Mt)	Area (Ha)	Thickness (m)	Reserves (Mt)	Area (Ha)	Thickness (m)	Reserves (Mt)
IC	77.95	3.48	3.784	239.25	3.21	10.508	317.20	3.276	14.292
IIA	77.95	2.15	2.182	74.80	1.79	1.756	152.75	1.990	3.938
IIB	-	-	-	27.68	1.66	0.624	27.68	1.659	0.624
III	-		-	73.85	1.67	1.654	73.85	1.6720	1.654
IVA	46.62	2.15	1.362	195.52	1.96	5.171	242.14	1.995	6.523
VA	72.74	2.93	2.708	176.90	1.76	4.060	249.64	2.077	6.768
VB	23.97	1.85	0.580	129.25	2.06	3.597	153.02	2.020	4.177
Total	**77.95**	**2 to 3.5**	**10.606**	**239.25**	**1.7 to 3.2**	**27.370**	**317.25**	**1.7 to 3.5**	**37.976 say 38**

4.4 Observation

From table 4.1, it can be seen that the net geological reserves of workable thickness +1.5m within the block area allotted to M/s. PSML are estimated to be 37.98 say 38 mil. tes. The Mining Plan under approval deals with the liquidation of these reserves to achieve and sustain the targeted production of 0.36 mil te/annum by adopting method of mining with due regard to safety and conservation.

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CHAPTER – V

METHOD OF MINING

5.1 Selection of Mining Technology

5.1.1 Opencast Option

In Brahmapuri block, the coal bearing horizon / column in Barakar formations is about 50 to 60m. thick, out of which the combined thickness of all coal seams / section measures out to approx. 15 to 18m. At the shallowest point of the block below Bichua village, the depth upto the bottom most seam VB is about 200m. Coal : OB cut off ratio at this point works out to 17:183 i.e. 1 : 10.8 which considering the Deccan Trap thickness of 60m (which is the hardest of all rocks), though technically feasible, will prove to be highly uneconomic. The only factor which favours opencast in this area is conservation and safety. All other factors viz. availability of land for excavation and OB dump, stripping ratio, cost of mining, environmental protection etc. do not support opencast mining in this block. Therefore, the only option for coal mining in this block is underground mining.

5.1.2 Underground option

Presence of 60 to 120m thick hard Deccan Trap followed by soft clayey formation of Moturs 45 to 140m (generally more than 100m) combined with extremely faulted nature of Barakar formations do not support longwall method of mining. Therefore, bord and pillar method of mining – either with blasting off the solid or with blasting free technology is suitable for this block. Since river bed sand for stowing is not available in the area, either splitting of pillars or depillaring with caving of goaf has to be adopted as the final method of liquidation. **The success of u/g. mining in this block will depend, a great deal, on the availability of good roof, workable (at least 1.5m preferably more than 2m) thickness of coal seam, absence of hidden faults, faster drivages through coal and stone and a properly aligned and efficiently working trunk transport system**

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for both coal and stone through u/g. road ways as well as through shaft.

5.2 Mine entries

5.2.1 Justification of entry through shafts and their location:

Entry through shafts on the upthrow side of fault F24 is proposed because it will involve min. thickness of Deccan Trap not more than 60m – and shallowest point of intersection of seam IC (3m) and IIA (2m) (upper group) which can be developed simultaneously for quicker build up of production. Drivage of inclines as mode of entry will not be cost effective in this block because of long drivage through deccan trap and unnecessary blockage of coal which should be avoided. Seams on either side of fault F24 can be accessed through a set of landings which can be constructed in different stages viz. stage I, II and III details of which are given in the next paragraph.

5.2.2 Details of shaft 1 & 2

Entries through a pair of shafts (finished dia. 6m) – one for intake air and coal and the other for man / material winding and return air are proposed. The pair of shafts is proposed to be located at a distance of 140m from each other near Bichua village on surface where the depth upto the bottom most seam VB on the upthrow side of fault F24 is estimated to be 760 – 540 = 220m. Three landings are proposed for each shaft.

The details of the landings are as follows

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Table 5.1

Details of landings for shaft 1 & 2

(See Plate VIB–cross section along AB-A'B')

Shaft sinking stage	Landing on upthrow side of Fault F24 (North of dyke)		Depth from surface (m)	
			Shaft No. 1 (intake air and coal winding) dia 6m.	Shaft No. 2 (Return air & man/material winding) dia 6m.
I	• Upper	at the floor of seam IIA	175	180
II	• Middle	at the floor of seam VB	220	225
III	• Bottom	at the floor of stone drift to connect with seam VA on downthrow side of fault F24	260	260

5.2.3 Purpose of shaft landings I, II, and III

Shaft sinking stage	Landing	Purpose of landing
I	Upper	To work upper group of seams in sector 21 and 25 – North of dyke
II	Middle	To work lower group of seam in sector 21 & 25 and upper group of seam in sectors 23 & 24 – North of dyke. To work upper group of seams in sectors 18 and 17 – South of dyke
III	Bottom	To work lower group of seam in sectors 18 and 17 and both group of seam in all other sectors – South of dyke.

5.3 Layout of roadways and panels

The layout of roadway and panels on either side of the dyke in seams IC (IIA, IIB, III), IV, VA and VB are shown in plates VII, A, B, C, D, E (Scale 1 : 4000). It may be seen from the individual seam plans that the 5 heading main dip. drivage for all the seams in the block are vertically below one another – this is so because of the need to have a common trunk transport conveyor (one each for upper as well as lower group of seam) and also to maintain vertically of pillars and galleries to ensure safety during depillaring operations as per Coal Mine Regulations 1957. Panels / districts have been laid out in mining sectors on both sides of the main dip/rise headings and numbered

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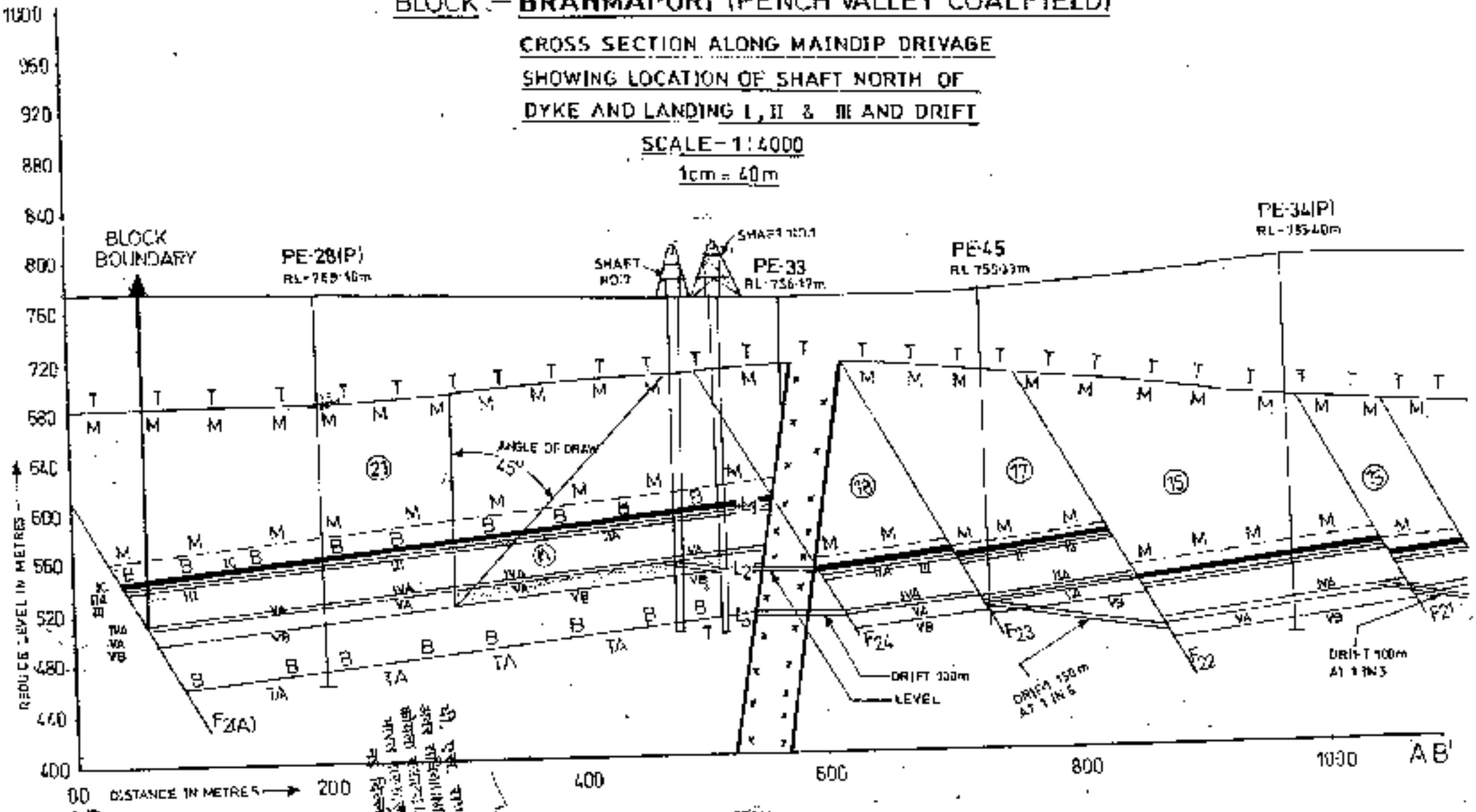
BLOCK :— BRAHMAPURI (PENCH VALLEY COALFIELD)

CROSS SECTION ALONG MAINDIP DRIVAGE SHOWING LOCATION OF SHAFT NORTH OF DYKE AND LANDING I, II & III AND DRIFT

SCALE – 1 : 4000

1cm = 40m



- SHAFT NO.1 FOR INTAKE AIR & COAL WINDING
- SHAFT NO.2 FOR MATERIAL WINDING & RETURN AIR.
- AREA TO BE LEFT STANDING ON PILLARS TO PROTECT SHAFT & VILLAGE

	12 COAL SEAM
(P)	INDICATES PROJECTION
	DYKE
T	TRAP
M	MOTOR
B	BARAKAR
TA	TALCHIR
21	MINING SECTOR
PE-45	BOREHOLE WITH R.L. (in m)

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FOR COMPLETE CROSS SECTION PLEASE SEE PLATE VIB IN VOLUME-II

serially for identification. North of the dyke, the main dip headings are dipping away from the shaft while south of the dyke, the main headings are to be driven towards the rise at a gradient of 7° to 8° (1 in 7 to 1 in 8). For depth more than 240m but more than 150m, pillar size is 45m x 45m and depth less than 240m, pillar size is 35m x 35m for gallery width of 4.8m. In the layout drawn for upper and lower group of seams verticality of pillars and galleries has been maintained as far as practicable though the parting between the two groups is more than 9m (see correlation chart of seams in Appendix III). It is important to note that in the mining plan, layout of panels / districts for individual seams has been drawn only in the area where the thickness of seam is at least 1.5m which is the minimum thickness required for mechanization as per norm adopted by CMPDIL. It is also important to note, that the main dip drivage south of dyke are against the dip direction. This alternative though unconventional, is not going to pose any serious problem because of mild inclination of the coal seam and shorter length of drivage due to the repeated occurrence of downthrow faults.

5.4 Drivage of stone drifts

Drivage of headings (in the dip rise direction) through coal seams both in upper and lower group of seams will involve crossing of faults - trending mostly parallel to the strike and having downthrow varying within a range of 55 m to as low as 10m. Major faults which have been identified during interpretation of geological structure of the block have been listed in detail in the GR and shown in cross section along A-A', B-B', C-C', D-D' and AB-A'B' in plates VIA and VIB. It may be seen that drivage of stone drifts will be an unavoidable part of mine development during all the stages viz. stage I, II and III. However, it will be a major activity during the development of lower group of coal seams in stage III. A brief description of the stone drifts to be driven during various stages of development is given in the following table 5.2

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Table 5.2

Stagewise details of important stone drifts in Brahmapuri u/g. mine

Development stage	Fault	Down throw (m)	Sector to sector	Drift particulars	Gradient of drift	Length (m)	Nature of strata
Stage I	F25 & F28	55	21 to 25	Belt	1 in 5	280	Motur
			Seam IV/IIA to	Haulage	1 in 5	280	Motur
			Seam IC/IIA	Return air	1 in 5	280	Motur
Stage II	F24 & Dyke	5	Shaft bottom to seam IC & IIA South of dyke Sector 21 to 18	Belt	1 in 16	80	Barakar and dyke
				Haulage	1 in 16	80	
				Return air	1 in 16	80	
Stage III	F24 & Dyke	4	Shaft bottom to seam IVA and VA sector 21 to 18	Belt	1 in 25	100	Barakar and dyke
				Haulage	1 in 25	100	
				Return air	1 in 25	100	
Stage III	F23 & F22	30	Seam IVA/VA to IVA/VA	Belt	1 in 6	150	Barakar and Talchir
				Haulage	1 in 6	150	
				Return air	1 in 6	150	
Stage III	F21 & F19	20	Seam IVA/VA to seam IVA/VA Sector 16 to 13	Belt	1 in 5	100	Barakar and Talchir
				Haulage	1 in 5	100	
				Return air	1 in 5	100	
Stage III	F17 & F14	42	Sector 13 to 5 through Sector-11 IVA & VA/VB to IVA & VA/VB	Belt	1 in 4.8	200	Barakar and Talchir
				Haulage	1 in 4.8	200	
				Return air	1 in 4.8	200	

The above list of drifts, though important is not comprehensive and some more drifts, particularly for upper group of seams, may be required. Therefore, it can be safely concluded that the proposed u/g. mine should have well experienced and well equipped organisation for stone drifting – without which it will be difficult to sustain the mine's production. Needless to print out, the mine should also have a reliable and efficient haulage system upto shaft No. 2 (up cast) which can be used for winding and disposal of blasted material from stone drifts on a regular basis.

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5.5 Estimation of reserves within panels

5.5.1 As mentioned in Para 5.3, panel / districts have been laid out in the workable (+ 1.5 m thickness) portion of the coal seams leaving barriers of coal against adjacent panels, mining lease boundary and faults

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both in upper and lower group – as shown in plans VIIA to VIIE. Within the panels, the reserves have been calculated on the basis of the following formula:

Reserves within panel (Mt) = A x T x G x 0.9 : 100

Where, A = Area in hectares

T = Av. thickness of seam in metres

G = Sp. gravity of coal (based on grade)

0.9 = factor to allow for variation in thickness and undetected faults.

5.5.2 The seamwise and sectorwise details of estimated reserves within panels separately for the area to the north and south of dyke – are given in App. VIA to VIG. The same are summarized below in the following Table 5.3

Table 5.3

Seamwise geological reserves (+1.5m) within panel as estimated in the Mining Plan (September-08)

Seam	North of dyke			South of dyke			Total for the block		
	Area (Ha)	Thickness (m)	Reserves (Mt)	Area (Ha)	Thickness (m)	Reserves (Mt)	Area (Ha)	Thickness (m)	Reserves (Mt)
IC	43.36	3.57	2.159	140.50	3 to 3.4	5.173	183.95	3 to 3.8	8.332
IIA	43.36	2.18	1.232	47.62	1.9 to 2.0	1.120	90.98	1.980	2.352
IIB	-	-	-	16.45	1.5 to 1.8	0.383	16.45	1.670	0.382
III		-	-	35.62	1.6 to 1.7	0.850	35.62	1.710	0.850
IVA	22.75	2.21	0.679	114.86	1.98	3.070	137.61	2.023	3.749
VA	36.59	2.78	1.938	120.25	1.73	2.732	156.84	1.980	4.060
VB	8.15	1.90	0.192	57.26	2.21	1.712	65.42	2.210	1.904
Total	**43.36**	**2.2 to 3.6**	**5.59**	**140.59**	**1.5 to 3.4**	**16.040**	**183.95**	**1.7 to 3.8**	**21.629**

5.5.3 Observation

From the above Table, it can be seen that seams IC, IVA and VA together account for 75% of the reserves within panels and Seam IC alone provides for almost 40% of the reserves within panels because of its persistent nature and consistency of +3m thickness throughout the extent of the block. The mining plan deals with the liquidation of these reserves first by development into pillars and then by depillaring with caving wherever possible in a safe and systematic manner.

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5.6 Distribution of reserves in different stages of mine development

The mining plan proposes u/g. mining in this block in three different stages viz. stage I, II & III as explained in para 5.2. Before proceeding further, it is appropriate to distribute the mineable reserves into these three stages so that the production from the mine can be scheduled to achieve the target in the quickest possible time and can be sustained during the transition period from one stage to another. The seamwise distribution of both geological as well as panel reserves for three different stages of the mine life are compared in the following Table 5.4.

Table 5.4
Comparison of seamwise reserves in three different stages of the mine life.

Seam	Stage I				Stage II				Stage III			
	Geological		Panel		Geological		Panel		Geological		Panel	
	Area (Ha)	Reserves (Mt)	Area (Ha)	Reserves (Mt)	Area (Ha)	Reserves (Mt)	Area (Ha)	Reserves (Mt)	Area (Ha)	Reserves (Mt)	Area (Ha)	Reserves (Mt)
NORTH OF DYKE												
IC	55.42	2.735	36.59	1.817	16.5	0.832	6.8	0.342	-	-	-	-
IA	55.42	1.557	36.59	1.028	16.5	0.493	6.8	0.203	-	-	-	-
IVA					37.90	1.130	22.70	0.679	-	-	-	-
VA					94.20	3.108	28.80	1.328	-	-	-	-
VB					23.80	0.580	8.20	0.192	-	-	-	-
Total	**55.42**	**4.312**	**36.59**	**2.844**	**139.90**	**5.143**	**73.30**	**2.746**	-	-	-	-
SOUTH OF DYKE												
IC					36.50	1.631	21.3	0.942	202.75	8.790	119.48	5.231
IA					25.1	0.592	15.1	0.355	49.70	1.164	32.52	0.755
IIB						-	-	-	27.68	0.624	10.45	0.382
II						-	-	-	71.91	1.654	36.62	0.859
IVA						-	-	-	195.52	5.112	119.92	3.079
VA									176.90	4.007	120.25	2.732
VB									129.75	2.727	57.26	1.712
Total	-	-	-	-	**61.6**	**2.226**	**36.20**	**1.297**	**853.71**	**24.078**	**494.50**	**14.742**
Grand total	**55.42**	**4.312**	**36.59**	**2.844**	**200.80**	**7.369**	**109.5**	**4.043**	**853.71**	**24.078**	**494.50**	**14.742**

5.7 Comparison of mining potential of three different stages

5.7.1 The seamwise distribution of reserves in three different stages can be summarized to compare the mining potential of one stage with the other. Both available geological and panel reserves of each stage are presented in a summarized form in the following Table 5.5 for the purpose of comparison.

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Table 5.5

Comparison of reserves for the different stages of mining in Brahmapuri u/g. block

Fig. in mil. tes.

Stage of mining	North of dyke		South of dyke		Total for the block	
	Available Geol.	Within panel	Available Geol.	Within panel	Available geol.	Within panel
I	4.312	2.844		-	4.312	2.844
II	5.143	2.746	2.226	1.297	7.369	4.043
III	-	-	24.078	14.742	24.078	14.742
Total	**9.455**	**5.590**	**26.304**	**16.039**	**35.759**	**21.629**

5.7.2 Conclusion

Following conclusions can be drawn from the above comparison of mining potential of each stage based on the relevant seam plans

Stage I :	Reserve potential is low but this stage is at the shallowest depth of 175m. Drifting through stone is nil at the beginning but reaching sector 25 from sector 21; by drifting will take time and may prove to be cost-prohitive for only 0.6Mt of reserves of seam IC and IIA within the panel in sector 25.
Stage II:	Reserve potential is higher than stage-I but still very less. Depth 225m to 300m; drifting through dyke is required to reach the seams IC and IIA south of dyke. More number of districts can be opened to yield higher production.
Stage III:	Reserve potential is highest (68% of the panel reserve). Depth 260 to 300m from surface; Max. No. of seam to be worked; require lot of drifting, pumping, ventilation and coal transport will add to the high cost of mining. One more shaft for coal winding and intake air may be necessary mid-way between the dyke and the southern limit at a future date. Experience gained in Stages I and II will help, a great deal, in understanding and solving the problems in stage III.

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5.8 Estimation of extractable reserves

5.8.1 By development

The mining plan proposes development of panels by semi-mechanised bord & pillar method of winning coal by blasting off the solid and loading by standard height Load Haul Dumper (LHD) for height 2.1m and above and low height/SDL for height less than 2.1m. The extraction percentage for the following pillar sizes and gallery width 4.8m specified by Coal Mine Regulation 1957 (Reg. 99) works out as follows:

Table 5.6

Norms for percentage extraction by bord and pillar development as per CMR 1957

Depth of cover (m)	Gallery width (m)	Pillar size (m x m)	Percentage extraction
> 90 but not more than 150	4.8	25.5 x 25.5	34.10 x (T_E/T_A)
> 150 but not more than 240	4.8	31.5 x 31.5	25.89 x (T_E/T_A)
> 240m but not more than 360m	4.8	45 x 45	20.20 x (T_E/T_A)
> 360	4.8	48 x 48	19.00 x (T_E/T_A)

Note : T_A is actual thickness of coal seam

T_E is extracted thickness of coal seam.

Based on the above norms, the extractable reserves in each panel by development have been calculated and the same are tabulated seamwise and sectorwise in Appendix-VIA to VIG.

5.8.2 By depillaring

5.8.2.1 Safe thickness of cover for caving (below surface features)

Pending the confirmation of constant K for tensile strain over super critical width of panel, the report considers the value as 0.25 in view of the unusually thick layer of Deccan Trap (50 to 120m) overlying the Moturs and max. W/H ratio in the block as 1 (in seam IC near Bichua village). On the basis of the following formula.

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$$E_{max} = \frac{k.a.h.ex1000}{H}$$

Where E_{max} = permissible max. tensile strain 5mm/m for Moturs

k = constant for tensile strainover super critical width of panel (0.25)

a = subsidence factor (0.5 for caving)

h = total extracted thickness of seam (13m)

e = extraction factor with caving (0.6)

H = Safe thickness of cover in metres.

Putting the value of E_{max}, k, a, h and e.

$$H = \frac{0.25x0.5x13x0.6x1000}{5}$$

$$= \frac{975}{5}$$

= 195 say 200m

5.8.2.2 Extraction percentage by depillaring

On the basis of the above assumption, the Mining Plan proposes the following as the final method of extraction:

1. Splitting of pillar below surface features (to be protected) if the depth is less than 200m.
2. Splitting, slicing and caving if the depth is more than 200m and there are no important surface features. Extraction percentage by splitting and caving of goaf as calculated for different pillar sizes in the block is given in the following table 5.7.

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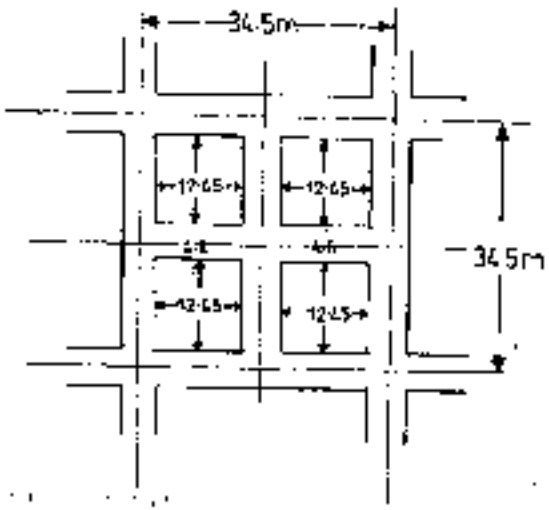
DEPTH OF SEAM FROM SURFACE
>150 BUT NOT MORE THAN 240m

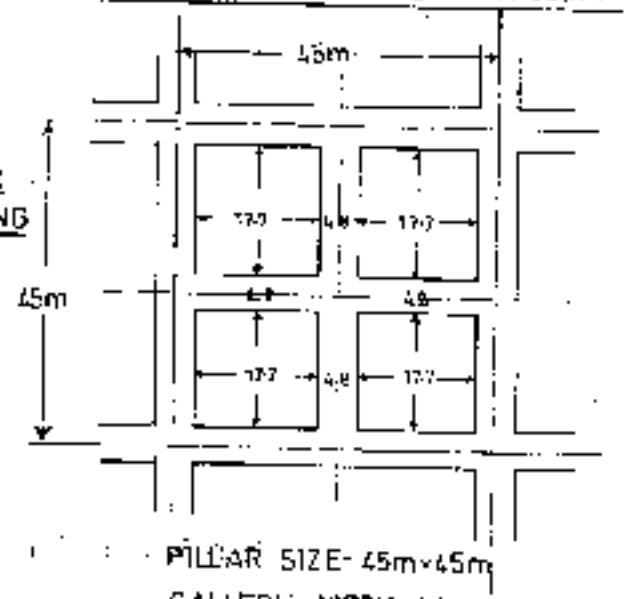


PILLAR SIZE 34.5m x 34.5m
GALLERY WIDTH- 4.8m

SKETCH SHOWING PILLAR
EXTRACTION BY SPLITTING

SCALE- 1mm = 1m
1 : 100

DEPTH OF SEAM FROM SURFACE
>240m BUT NOT MORE THAN 360m



PILLAR SIZE- 45m x 45m
GALLERY WIDTH- 4.8m

BY DEVELOPMENT = $\frac{34.5 \times 34.5 - 29.7 \times 29.7}{34.5 \times 34.5}$

= $\frac{308.16}{1190.25}$

= 25.89%

BY SPLITTING

= $\frac{29.7 \times 29.7 - 4 \times 12.45 \times 12.45}{29.7 \times 29.7}$

= $\frac{262.08}{882.09}$

= 29.71%

OVER ALL

$\frac{34.5 \times 34.5 - 4 \times 12.45 \times 12.45}{34.5 \times 34.5}$

= $\frac{570.24}{1190.25}$

= 47.91%

say 48

BY DEVELOPMENT = $\frac{45m \times 45m - 40.2 \times 40.2}{45m \times 45m}$

= $\frac{408.96}{2025}$

= 20.195%

SAY - 20.20

BY SPLITTING

= $\frac{40.2 \times 40.2 - 4 \times 17.7 \times 17.7}{40.2 \times 40.2}$

= $\frac{362.86}{1615.04}$

= 22.45%

OVER ALL

= $\frac{45 \times 45 - 4 \times 17.7 \times 17.7}{45 \times 45}$

= $\frac{777.64}{2025}$

= 38.1755

SAY - 38.18%

SAY - 38

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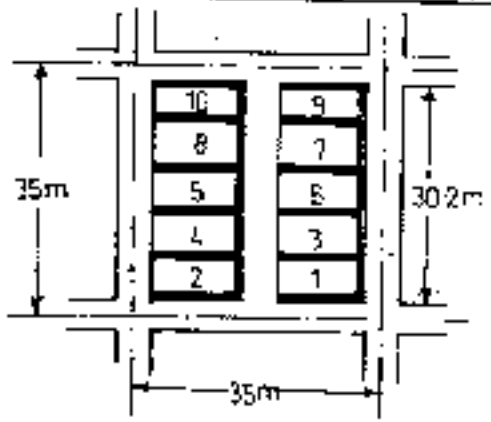
MAX. AREA OF ROOF EXPOSED OVER SLICE :- 79.8m²



RIB OF COAL 1.5m WIDE TO BE LEFT AGAINST GOAF.

2. I. D. NO. OF SLICE

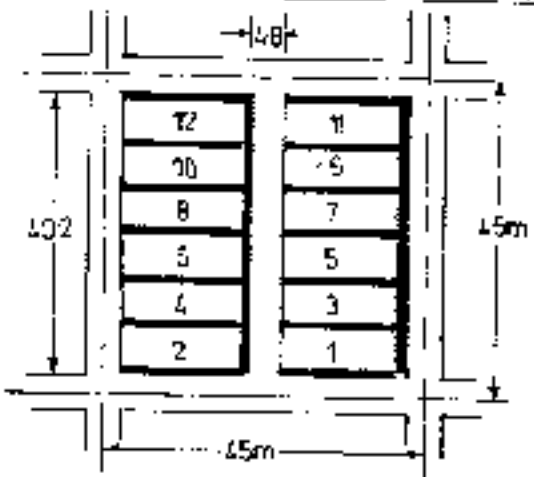
PILLAR SIZE 35m x 35m

NO. OF SLICES / PILLARS - 2 x 5 = 10

SIZE OF SLICE : LENGTH - 12.7m - 1.5 - 11.2m

WIDTH - 4.8m

MAX. AREA OF ROOF EXPOSED OVER SLICE - 200.32m²



RIB OF COAL 1.6m WIDE TO BE LEFT AGAINST GOAF.

2. I. D. NO. OF SLICE

PILLAR SIZE 45m x 45m

NO. OF SLICES / PILLARS - 12

SIZE OF SLICE LENGTH-17.7-1.6=16.1

WIDTH - 4.8m

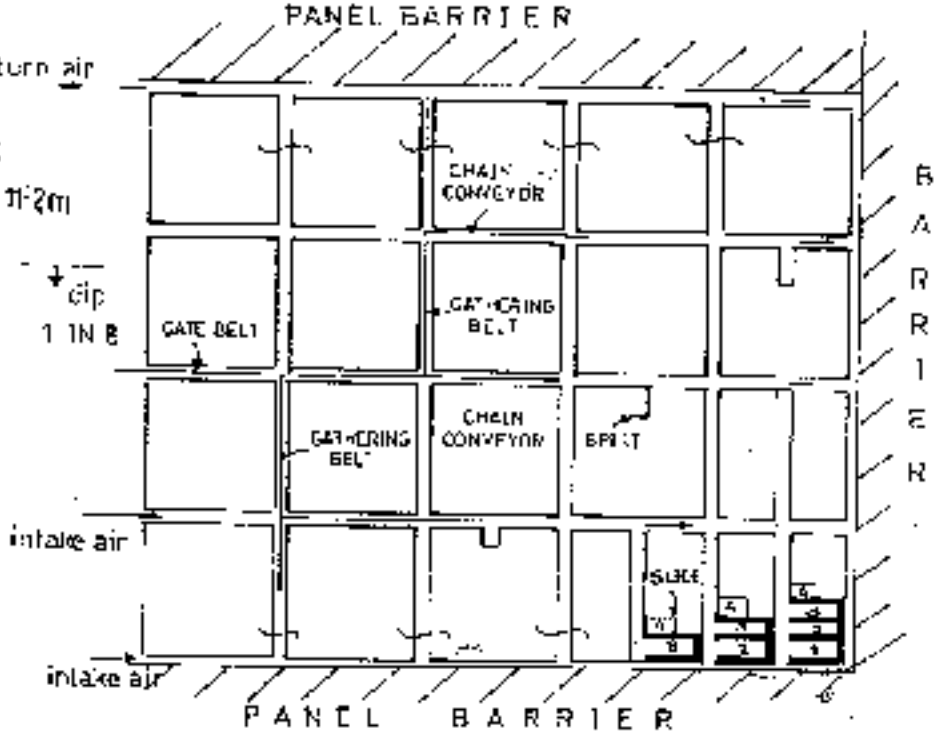


FIG.1 SHOWING SEQUENCE OF EXTRACTION OF SLICES AND LAYOUT OF FACE, GATHERING AND GATE BELTS IN A 5 LEADING PANEL.

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Table 5.7

Pillar size	Gallery width	Extraction percentage			Extraction percentage		
		By Dev.	By splitting	Overall	By dev.	By slicing	Overall
35 x 35	4.8	25.55	22.02	47.91 Say 48	25.55	44.19	69.7 say % (TE/TA)
45 x 45	4.8	20.20	17.92	38.12 Say 38	20.20	39.80	60 % (TE/TA)

Note : T_A is actual thickness of coal seam.

T_E is extracted thickness of coal seam.

5.8.3 Seamwise and sectorwise extractable reserves.

Based on the above norms, the extractable reserves both by development and depillaring for each seam and sector (workable) have been calculated and the same are tabulated in Appendix VIA to VIG.

5.8.4 Summary of extractable reserves (Seamwise – North & South of dyke)

The seamwise extractable reserves as calculated on the basis of the norms (mentioned in Para 5.8.1 and 5.8.2) for the whole block – separately for the area North and South of dyke are summarized in the following Table 5.8.

5.8.5 Seamwise & stagewise extractable reserves – for stages I, II, III

Since u/g. mining operations is proposed to be conducted in this block in stages (due to varying depth of the deposit) from a common pair of shafts – the extractable reserves – North and South of dyke – have been grouped into 3 stages viz. stage I, II & III. The same are shown in Tables 5.9, 5.10 & 5.11 separately for each seam. The geological, panel and extractable reserves for stage I, II and III are compared in Table 5.12.

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Table No. 5.8

Seamwise extractable reserves (+1.5m) as estimated in the Mining Plan (August 08)

Seam	North of dyke			South of dyke			Total for the block			Extraction %	
	Dev.	Dep.	Total (Mt)	Dev.	Dep.	Total (Mt)	Dev.	Dep.	Total (Mt)	Panel Reserves	Geol. reserves
IC	0.434	0.807	1.241	1.167	2.615	3.782	3.122	3.422	5.023	60.3	35.1
IIA	0.294	0.336	0.630	0.226	0.430	0.656	0.520	0.766	1.286	54.7	32.6
IIB	-	-	-	0.077	0.152	0.229	0.077	0.152	0.229	60.0	36.7
III	-	-	-	0.172	0.338	0.510	0.172	0.338	0.510	60.0	30.8
IVA	0.176	0.128	0.304	0.619	1.222	1.841	0.795	1.350	2.145	57.2	32.88
VA	~~[illegible]~~ 0.207	~~[illegible]~~ 0.266	~~[illegible]~~ 0.473	0.551	1.083	1.634	0.758	1.349	2.107	51.9	31.2
VB	0.050	-	0.050	0.345	0.648	0.993	0.395	0.648	1.043	54.8	25.0
Total	**1.161**	**1.537**	**2.698**	**3.157**	**6.488**	**9.645**	**4.318**	**8.026**	**12.343**	**57.1**	**32.5**

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Table No. 5.9

Seamwise details of Extractable Reserves – Stage-I

Seam	Thickness	Geological		Panel		Extractable Reserves			Extraction %	
		Area (Ha)	Reserves (Mt)	Area (Ha)	Reserves (Mt)	Dev. (Mt)	Dep. (Mt)	Total (Mt)	Panel	Geological
North of dyke										
IC	3.50 to 3.80	55.42	2.755	36.59	1.817	0.377	0.618	0.995	54.8	36.1
IIA	2.1 to 2.5	55.42	1.557	36.59	1.027	0.253	0.254	0 507	49.4	32.6
	2.1 to 3.5	**55.42**	**4.312**	**36.59**	**2.844**	**0.630**	**0.872**	**1.502**	**52.8**	**34.8**

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Table No. 5.10

Seamwise details of Extractable Reserves – Stage-II

Seam	Thickness	Geological		Panel		Extractable Reserves			Extraction %	
		Area (Ha)	Reserves (Mt)	Area (Ha)	Reserves (Mt)	Dev. (Mt)	Dep. (Mt)	Total (Mt)	Panel	Geological
A. North of dyke										
IC	3.6	16.5	0.832	6.8	0.342	0.057	0.189	0.246	71.9	29.5
IIA	2.35	16.5	0.493	6.8	0.205	0.041	0.082	0.123	60.0	24.9
IVA	2.21	37.9	1.130	22.7	0.679	0.176	0.128	0.304	44.8	26.9
VA	2.67	44.2	2.108	28.8	1.328	0.207	0.266	0.473	35.6	22.4
VB	1.80	23.8	0.580	8.2	0.192	0.050	-	0.050	26.0	8.6
Sub-Total of A		**138.9**	**5.143**	**73.3**	**2.746**	**0.531**	**0.665**	**1.196**	**43.5**	**23.2**
B. South of dyke										
IC	3.1	36.5	1.634	21.1	0.942	0.182	0.395	0.577	61.2	35.3
IIA	1.76	25.1	0.592	15.1	0.355	0.072	0.141	0.213	60.0	36.0
Sub-Total of B		**61.6**	**2.226**	**36.7**	**1.297**	**0.254**	**0.536**	**0.790**	**60.9**	**35.5**
Total A + B			**7.369**		**4.043**	**0.785**	**1.201**	**1.986**	**49.1**	**26.9**

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Table No. 5.11

Seamwise details of Extractable Reserves – Stage-III

Seam	Thickness	Geological		Panel		Extractable Reserves			Extraction %	
		Area (Ha)	Reserves (Mt)	Area (Ha)	Reserves (Mt)	Dev. (Mt)	Dep. (Mt)	Total (Mt)	Panel	Geological
South of dyke										
IC	3.00 to 3.40	202.75	8.790	119.48	5.231	0.985	2.220	3.205	61.3	36.5
IIA	1.50 to 2.0	49.70	1.164	32.52	0.765	0.154	0.289	0.443	57.9	24.8
IIB	1.36 to 1.80	27.68	0.624	16.45	0.382	0.077	0.152	0.229	60.0	36.7
III	1.50 to 1.75	71.91	1.654	35.62	0.850	0.172	0.338	0.510	60.0	30.1
IVA	1.50 to 2.50	195.52	5.112	112.92	3.070	0.619	1.222	1.841	60.0	35.6
VA	1.50 to 2.60	176.90	4.007	120.25	2 732	0.551	1.083	1.634	59.8	40.2
VB	1.50 to 2.25	129.25	2.727	57.26	1.712	0.343	0.648	0.993	58.0	27.6
Total	**1.50 to 3.40**		**24.078**		**14.742**	**2.903**	**5.952**	**8.855**	**60.0**	**36.8**

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Table No. 5.12

Comparison of geological and extractable reserves for Stage I, II and III

Figs. in mil. tonnes.

Stage	Reserves North of Dyke (Mt)			Reserves of South of Dyke (Mt)			Total for the block		
	Available Geological	Panel	Extractable	Available Geological	Panel	Extractable	Available Geological	Panel	Extractable
I	4.312	2.844	1.502	-	-	-	4.312	2.844	1.502
II	5.143	2.746	1.196	2.226	1.297	0.790	7.369	4.043	1.986
III	-	-	-	24.078	14.742	8.855	24.078	14.742	8.855
Total	**9.455**	**5.590**	**2.698**	**26.304**	**16.039**	**9.645**	**35.759**	**21.629**	**12.343**

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CHAPTER VI

PRODUCTION PLANNING AND SCHEDULE

6.1 Production parameters

6.1.1 Development

With solid blasting, coal yield / blast can be calculated as follows:

Coal yield / blast = width of gallery (m) x height of gallery (m) x pull (m) x sp. gravity of coal x efficiency

Putting the values for gallery width and height 4.8m and 3m respectively, the production / blast works out to 4.8 x 3 x 1.1 x 1.55 (grade D) x 0.8 = 19.64 say 18 to 20 tes. Production / day (TPD) from a development district will depend upon the no. of rounds blasted / day which will depend inter alia on the no. faces available for blasting. Generally, it is seen that more the no. of headings in a panel – more is the availability of faces but it is the problem of water, roof condition, ventilation and rate of loading of blasted coal ultimately determines the availability of faces in the production district. For the purpose of planning, the following norms of availability of faces is considered.

No. of headings in a panel	No. of faces available / shift
6	7 to 8
5	6 to 7
4	5
3 (dip)	3

Based on the above norms, the average daily production from a development district will be as follows :

Table 6.1

Average daily output from a development district with solid blasting

Gallery width (m)	Gallery height (m)	Pull (m)	No. of headings	Production efficiency	Daily output	
					Max TPD	Average TPD
4.8	3	1.1	6	0.80	400	375
4.8	3	1.1	5	0.80	350	325
4.8	2.4	1.1	5	0.80	300	280
4.8	2.1	1.1	5	0.80	240	220
4.8	1.8	1.0	5	0.70	180	160
4.8	1.5	0.9	5	0.65	120	100

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6.1.2 Depillaring with caving

Daily production from a depillaring district will depend upon the no. of splits and slices in operation. With average yield per blast of 20 tonnes, (due to improved pull in a slice) and no of faces (6 to 7 – 4 splits – 3 slices) the average daily output from a depillaring district will vary within a range of 390 to 400 tes from seam thickness of 3m and 5 to 6 heading panel. For the purpose of planning, the daily output from a depillaring district is considered the same as that of a development district because of problems & delay associated with roof support.

6.2 Production capacity / target of the mine

Study of extractable potential – seamwise and stagewise – and production norms based on the thickness of seam and size of panel indicate that an annual production capacity of 0.36 MT which works out to an average of 1200 TPD will be a reasonable target and can be handled and managed efficiently also by the u/g. transport system as well as by the coal winding system through the vertical shaft proposed for the mine. Needless to mention, the material transport in and out of the mine (including material produced by stone drilling) should be coursed through the return air shaft which will also can be used for man winding.

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6.3 Yearwise production schedule

6.3.1 Stage I (Production Target)

Yearwise production schedule has been drawn up considering stage I as the initial phase which can produce 0.36 Mt of coal / annum from four working districts – two in Seam IC (thickness 3.5 to 3.8m) and two in Seam IIA (thickness 2.1 to 2.2m). However, this can be sustained only when all the four districts have seam thickness within a range of 2.1 to 3m, at least 5 headings proceeding in the direction of strike and no major problem of roof or water. In other words, with reduction in seam thickness or in the no. of headings and / or in case

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of serious problem associated with roof condition or unusual make of water – the production cycle may be disrupted which will adversely affect the output from the mine. As per the mining plan, the combination and sequence of panels has been selected to achieve and sustain a production of 0.36 MTPA.

6.3.2 Stage I (Production Schedule)

Yearwise production schedule drawn up for stage – 1 – considering year of start of shaft sinking as '0' date – is presented in the following table 6.2

Table 6.2

Yearwise production schedule for stage I (area north of dyke)

Year	Major activity	Production (MT) Yearly	Production (MT) Cum.	Remarks
1. 2010-11	Shaft sinking (shaft 1 & 2) dia. 6m.	60m	60m	Target 60m, mostly deccan trap with lining and collar
2. 2011-12	Shaft sinking	150m	210m	Target 150m (Motur 100m + Barakar 50m) with landing of Stage I at 170m depth
3. 2012-13	1. Completion of shaft sinking.	50m	260m	1. Target 50m upto floor of landing level of stage II.
STAGE-I	2. Ventilation connection of stage I			2. Ventilation connection through Seam IIA between shafts 1 & 2
	3. Drivage of main dip in seam IC & IIA (Stage I)	**0.08**	**0.03**	3. Main dip drivage to start after construction of main sump, over flow gallery and installation of main pump.
4. 2013-14	1. Main dip and panel 21/3 in Seams IIA and IC	**0.18**	**0.21**	

Days	Panel ID	Seam IIA	Seam IC
225	M.Dip	0.020	0.032
	P21/3	0.031	0.047
75	P21/1	0.020	0.030
		0.071	**0.109**

Days	Panel ID	Seam IIA	Seam IC
300	P21/1	0.070	0.102
180	P21/2	0.039	0.058
120	P21/4	0.028	0.043
		0.137	**0.203**

	2. Development of panels 21/1, 21/2 & 21/4 in seams IC & IIA					
6. 2015-16	1. Drivage of main dip in sector 25 panel 25/1 (Dev. & Dep). part and 25/2 (Dev. & Dep) Dep. 21/4.	**0.36**	**0.91**	**Days**	**Panel ID**	**Seam IIA**	**Seam IC**
				65	MD	0.009	0.010
				235	P25/1	0.077	0.094
				150	P25/2	0.030	0.061
				150	P21/4	0.022	0.054
						0.138	**0.222**
7. 2016-17	Completion of depillaring in sector 25; depillaring of panels in Sector 21 in progress	**0.36**	1.27		**Seam IIA**	**Seam IC**	**Total**
				MD/25	0.017	0.041	0.058

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Year	Major activity	Production (Mt) Yearly	Production (Mt) Cum.	Remarks			
				21/4	0.041	0.101	0.142
				21/3	0.044	0.111	0.155
				21/MD	0.002	0.003	0.005
				Total	**0.104**	**0.256**	**0.360**
8. 2017-18	Depillaring of panels in progress in sector 21	**0.36**	**1.63**	21/2	0.06	0.138	0.194
				21/1	0.035	0.084	0.119
				MD	0.013	0.034	0.047
	STAGE-I COMPLETED			**Total**	**0.104**	**0.256**	**0.360**
STAGE-II							
9. 2018-19	Completion of depillaring in panels of sector 21; start of development in seams IVA and VA in sector 21 North of dyke Stage II	**0.36**	**1.99**	**Seam**	**VA**	**IVA**	
			Stage-II	21/MD	0.024	0.022	0.046
				21/3	0.022	0.027	0.049
				Seam	**IIA**	**IC**	
				23/MD	0.009	0.005	0.014
				23/1+ 23/2	0.019	0.029	0.048
				24/1	0.018	0.023	0.041
				Seam	**VA**	**IVA**	
				25/MD	0.012		0.012
				Total	**0.254**	**0.106**	**0.360**
10. 2019-2030		**0.36**	**2.35**	**Seam**	**VA**	**IV**	
				25/1	Dev. 0.036		0.036
					Dep. 0.075		0.075
				Seam	**IIA**	**IC**	
				Dev. 24/1	0.018	0.072	0.090
				Dev. 23/1 + 23/2	0.019	0.095	0.114
				Seam	**VA**	**IVA**	
				Dev. 21/4	0.020	0.031	0.051
				Total	**0.168**	**0.198**	**0.366**

6.3.3 Observation

The production schedule as drawn up in the mining plan indicates the following:

1. If sinking of shafts is started and completed upto the landing level of stage III and ventilation connection between shafts 1 & 2 can be established within 3 years in stage I, then regular coal production can be started from the mine in year-4, from two production districts - one each in seam IIA and IC at an initial rate of 600TPD i.e. 0.18 MTPA.
2. The mine can achieve its targetted capacity of 0.36 MTPA from 4 districts - 2 each in seams IC and IIA from the area north of dyke -

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MINING PLAN (SEPT 08) FOR BRAHMAPURI U/G COAL PROJECT

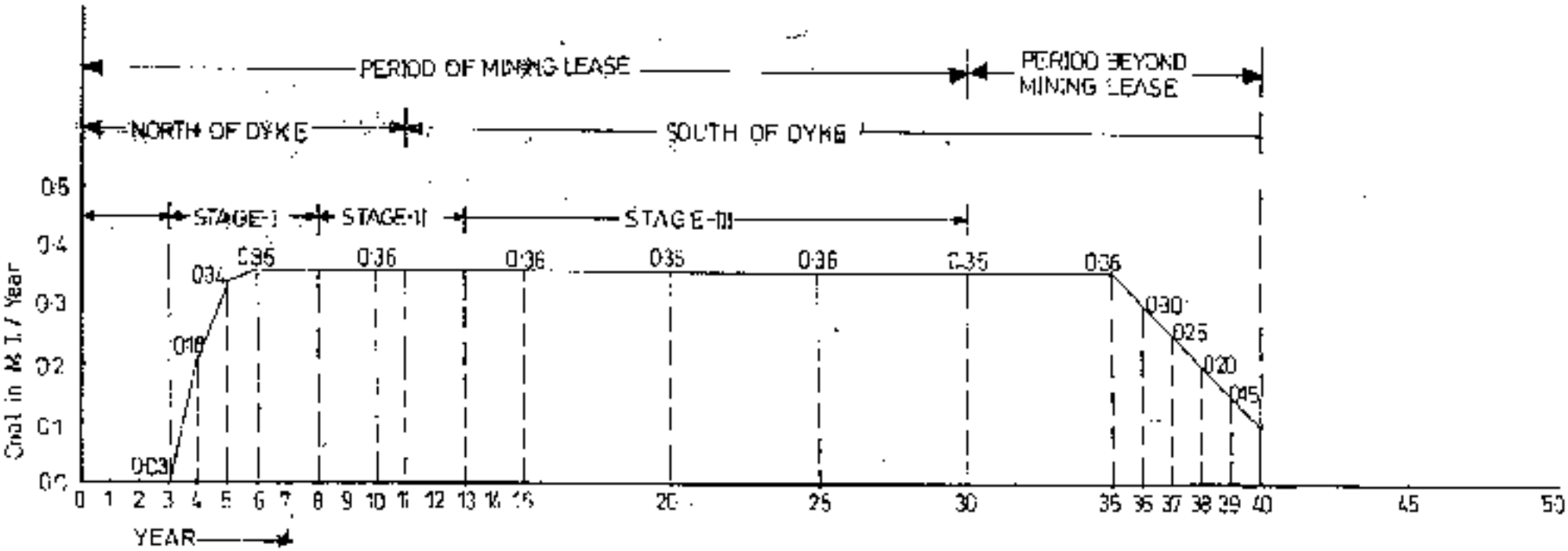

FIG.

SUBJECT :- YEARWISE PRODUCTION SCHEDULE OF PROPOSED U/G COAL PROJECT

SHAFT LANDING STAGE-I :- UP TO THE FLOOR OF SEAM IIA (NORTH OF DYKE)
DEPTH OF SHAFT NO.1 — 175m

SHAFT LANDING STAGE-II :- UP TO THE FLOOR OF SEAM VA (NORTH OF DYKE)
DEPTH OF SHAFT NO.1 — 220m

SHAFT LANDING STAGE-III :- UP TO THE FLOOR OF STONE DRIFT (NORTH OF DYKE)
DEPTH OF SHAFT NO.1 — 260m

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PLEASE SEE CROSS SECTION A B - A'B' (PLATE V5B)

the upper seam with LHD and lower seam with low height SDL/LHD technology – during year 6. However, this is subject to the confirmation of geological structure, interpreted by MECL, by additional boreholes in the area north of dyke which is crucial for the project's success

3. The reserves of the area north of dyke in stage I will be exhausted within 5 to 6 years. Therefore, all preparation to start mining in lower group of seams of stage II viz. ventilation connection between the shafts, pit bottom layout, main sump etc. must be completed in time so that output of 0.36 MTPA can be sustained during the transition period.
4. In the mining plan (Stage I) daily output of 1200 TPD is derived on an average, from the following combination.

Two districts in seam IC @ 400 TPD –	800 TPD
Two district in seam IIA @ 200 TPD =	400 TPD
Total four districts	1200 TPD

As the thickness of seams below seam IC varies within a wide range, both vertically as well as laterally, it is advised to have an inbuilt organization within the mine to drill holes in advance from the top seam floor to prove the consistency of lower seam thickness & parting.

5 Harmonogram of major activities involving both planning and production upto completion of stage I is enclosed as a separate chart to help in monitoring the progress of the project.

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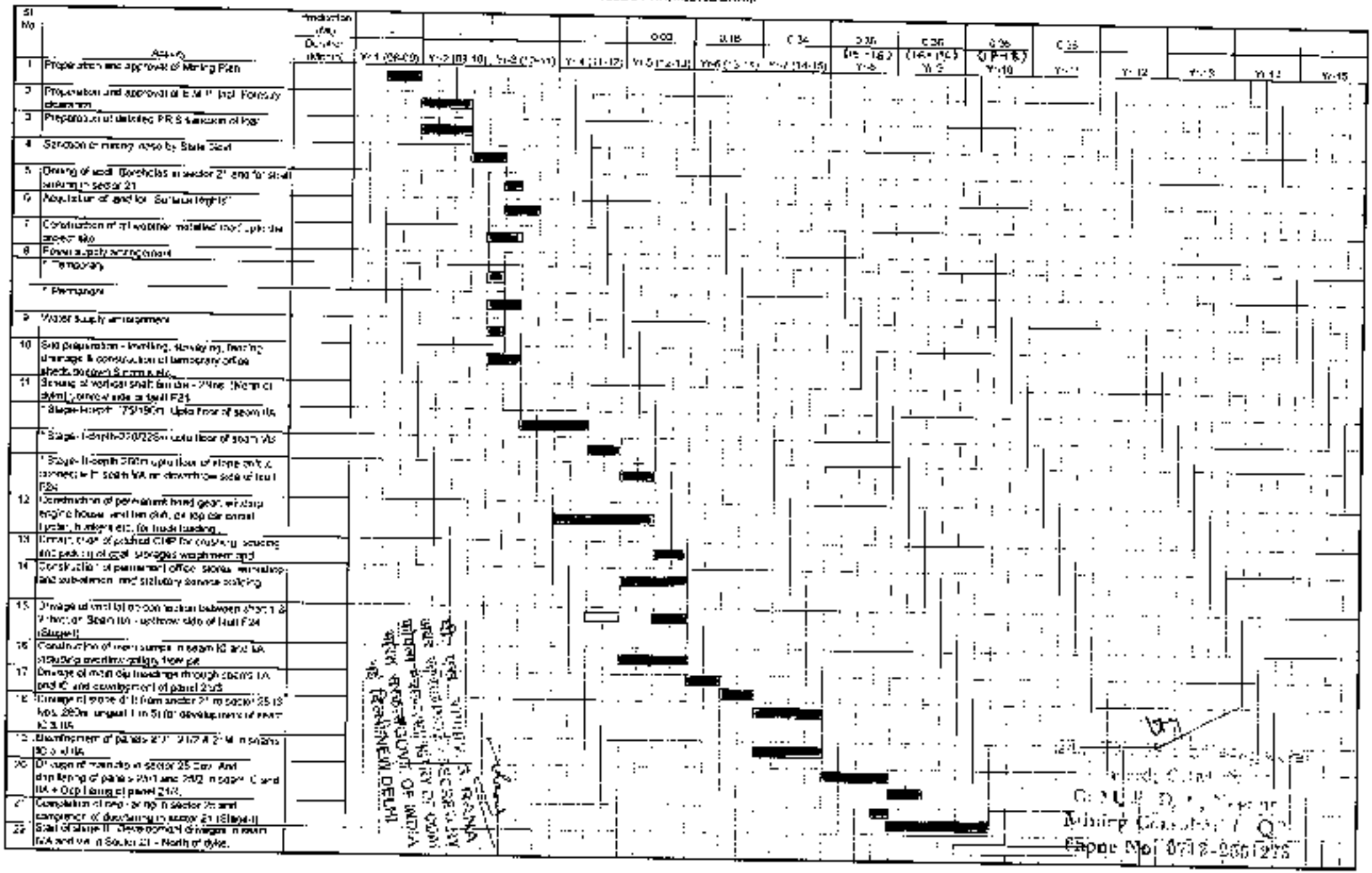
BRAHMAPURA UNDERGROUND MINE (PIT 1 & 2)
PROJECT HARMONOGRAM



CHAPTER VII

FACE MECHANISATION, COAL TRANSPORT, VENTILATION, PUMPING ETC.

7.1 Coal face mechanization

7.1.1 L.H.D. (Load Haul Dumper) district:-

List of major plant and machinery for coal winning, loading roof support, coal transport, ventilation etc. is enumerated below.

Sl. No.	Particulars of P & M	No. of units For one district	No. of units For two districts	Remarks
A.	**Coal winning, loading & support**			
1.	LHD standard ht. operator driven, 1.5m³ bucket, tyre mounted, 37 KW motor, FLP, 550V with cable reel, GEB and all accessories	2	4 + 1 spare	* to be deployed in Seam IC gallery ht. >2.4m – generally 3m.
2.	LHD low height 1.1m³ bucket with side tip device	2	2 + 1 spare	* to be used in seams IIA, IVA, VA and VB; gallery height - < 2.4m generally 1.8 to 2.1m.
3	Roof bolting machine capable of drilling upto 6m (hydraulic drive)	2	4 + 2 spare	* spare LHD can also be used for material supply
4.	Grouting machine for roof bolt	2	4 + 2 spare	
5.	Hydraulic power pack for bolting and grouting machine	2	4 + 2 spare	
6.	FLP drill 1.1 KW, 125 V	3	6 + 2 spare	
7.	Intrinsically safe multi-shot exploder	3	6 + 2 spare	
B.	**Face and gate transport**			
1.	Gathering belt (PVC) conveyor, width 800mm, length 100m, speed 1.5m/sec motor 37 KW, with horizontal loop take up, GEB, 550V FLP electricals	2	4	
2.	Gate belt (PVC) conveyor width 800mm, length 500 to 800m, speed 1.5m/sec, motor 55KW with horizontal loop take up. GEB, 550V FLP electricals	1	2	
C.	**Material supply**			
1.	Endless haulage with 37KW FLP motor & electricals	1	2	
2.	Trollies	6	12 + 6 spare	

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Sl. No.	Particulars of P & M	No. of units		Remarks
		For one district	For two districts	
3	Pulling and lifting machine 2nos / 5 tes.	1	2 + 1 spare	
D.	**Ventilation**			
1.	Auxiliary fan 15KW	1	2 + 1 spare	
2.	Ventilation ducting 700mm dia.	100m	200m	
E.	**Face pump**			
1.	11 LPS, 30m head, bronze impeller	2	4 + 2 spare	

7.1.2 S.D.L. (Side discharge loader).

For gallery height less than 2.1 and upto 1.5m, SDL loading into light duty chain conveyor is preferred. This system will be useful for seams IIB, III and also some places in seam IIA besides drivage of stone drifts where crawler mounted loaders will be suitable. The list of machines for a district is almost the same as in the case of LHD except for the following :

Sl. No.	Particulars of P & M	For one district	For two districts	Remarks
1.	S.D.L. 1.1m³ bucket, crawler mounted, 48 KW drive, trailing cable with handling device, GEB (gate end box) and all electrical suitable for FLP at 550V	2	4 + 2 spare	
2.	Light duty chain conveyor (LDCC) 100 TPH, 2 x 15 KW drive with GEB and FLP electricals at 550V, length 100m each	One in each heading		

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7.2 Coal transport

7.2.1 Gate road

The mining plan provides for simultaneous drivages in seam IC & IIA, IC & II (composite), IC & IIIA, IVA & VA for reasons of safety as prescribed in Coal Mines Regulation (CMR, 1957) because of contiguous nature of the seams. The upper seam of the pair is proposed to be kept in advance by at least two pillars of the lower

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seam. In order to keep the length of the gate belt within a reasonable limit, it is proposed to transfer coal from upper gate to lower gate through a staple pit which can be used as a surge bunker. In this case the gate belt of the lower seam has to be faster to serve as a common outlet for two seams, say 150 TPH capacity.

7.2.2 Trunk road

The trunk transport is proposed to be sectionalized and laid out in bottom seam of each pair of seam to be worked together in this mine. The function of the trunk transport is two fold.

1. To serve as the main carrier of coal from a number of districts upto the shaft bottom coal bunker for u/g. storage and loading mining cars (3te capacity).
2. To feed u/g. coal bunker to be constructed as and when necessary for transfer of coal from the upthrow to downthrow side of fault for centralization of the main coal transport system.

Trunk belt should be of PVC (D-5000) material, 1000mm wide, 150 TPH capacity to deal with an output of 1200 TPD.

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7.2.3 Vertical transport

7.2.3.1 At the shaft bottom of each stage, coal carried by trunk conveyor from the production districts, will be collected into mine cars (3 te capacity) through the main bunker (capacity 100 tes – one hours production). The mine cars (both empty and loaded) can be hauled in or out of the loading station either by endless haulage or by electric locomotive – plying on the shaft bottom mine car circuit.

7.2.3.2 Loaded mine cars, arranged in tandem, in single deck cages are proposed to be hoisted up to the surface through shaft No. 1 by winding engine - located at pit top. The winding speed and capacity of the pit top and pit bottom car circuit should be sufficient to provide at least 25 winds per hour from the deepest landing level of the shaft i.e. 150 TPH which for 10 hours effective winding time /

day works out to 1500 TPD which is 25% more than the planned production capacity of the mine.

7.2.3.3 Generally, it is seen that the delay in completion of the winding cycle is due to the malfunction or slow down of the pit top and pit bottom car circuit. Therefore, the need for an efficient car circuit both at pit top and bit bottom should be an integral part of the overall winding and coal transport system of the mine.

7.3 Material supply and transport

The material supply to the mine is proposed through shaft no. 2 which is planned to be an upcast shaft for return air with an air lock at the pit top. This shaft is also proposed to be used for evacuation of materials produced by drivage of stone drifts.

Endless haulage, direct haulage, tuggers to be installed u/g. for haulage of trollies carrying materials in or out of the mine.

7.4 Man winding

Both shafts 1 & 2 can be used for man winding. **As per Coal Mines Regulation the max. permissible rope speed for man winding in shaft upto a depth of 300m is 4m/sec.**

7.5 Ventilation

7.5.1 Degree of gassiness

Shaft No. 2 is proposed to be fitted with a mechanical ventilator of adequate capacity in a fan drift connected to the shaft for outlet of return air from the mine by exhaust system of ventilation. The shaft needs to be provided an air lock on surface for exhaust system of ventilation. For the purpose of planning, the mine has been considered as category II gassy mine as defined in CMR 1957.

7.5.2 Quality of air

Quantity of air required to ventilate the mine can be calculated on the basis of the following parameters prescribed in CMR 1957.

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A. 6 cum/min of air per person employed in the district during the largest shift.

B. Not less than 2.5 cum/min of air per tonne of daily output which ever is larger.

On the basis of A: For 500 persons employed in 4 production districts plus ancillary jobs in the 1st shift, the quantity of air required to ventilate the mine works out to 500 x 6 x 2 ÷ 60 = 100 cum/sec.

On the basis of B: For 1200 tes as average daily output, the quantity of air required to ventilate the mine works out to 1200 x 2.5 x 2 ÷ 60 = 100 cum/sec.

7.5.3 Velocity of air

7.5.3.1 For shaft dia of 6m. the max. velocity of air current in the shaft works out to 100 x 1.1 ÷ 28.3 = 3.9 say 4m/sec. which is well within the max. permissible limit of 8m/sec. for man-winding shaft.

7.5.3.2 The max. velocity of intake air in the shaft bottom works out to 100 ÷ 20 = 5m/sec. which is well within the max. permissible limit of 6m/sec.

7.5.3.3 The max. velocity of intake air in conveyor roadway works out to 50 ÷ 14.4 = 3.5m/sec. which is less than the max. permissible velocity of 4m/sec.

7.5.3.4 The velocity of intake air at the face (after allowing for leakage) works out to 12.5 cum ÷ 14.4 sqm = 0.87 m/sec. which is above min. limit of 0.5m/sec. allowed for seam of first or second degree gassiness (Reg. 136 A.A. CMR, 1957).

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7.5.4 Pressure required to ventilate the whole mine:

Ventilation pressure required for the mine is based on the following formula :

$P = RQ^2$

Where P is in pascal
R is mine resistance in gaul
Q is air flow in m^3/sec.

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Putting the values of R and Q, P works out to 0.11 x 100 x 100 = 1100 pascals ÷ 9.81 = 112.1 say 110 to 115mm of water gauge at well developed stage of the mine (having at least 1 Km. long airways with rough surface).

7.5.5 Capacity of main fan motor

For supplying air quantity of 100m³/sec. at 115mm of water gauge the fan motor capacity works out to 100 x 115 ÷ (75 x 0.8) = 11500 ÷ 60 = 191.6 say 200 HP i.e. 150 KW. For operating 4 Nos. of LHD districts in parallel–two in upper and two in lower seams maintaining verticality of pillars and galleries about 1 km away from the shafts – 150 KW motor is recommended for the main fan.

7.6 Pumping

Make of water in an u/g. mine is mostly due to strata seepage which varies with the thickness and characteristics of the confined acquifers. Since the coal column in Barakars is overlain by a thick formation of Motur which is rich in clay and serves as an acquiclude, not much problem due to water is anticipated during the development phase of the mine but during the depillaring operation with caving, cracks, fissure, may develop in the Motur which, if not filled up by clay, may cause heavy make of water.

In the absence of hydro-geological data, it is difficult to quatify the yield. However, the mining plan provides for the construction of main sump at pit bottom where pumped out water from the districts can be stored and main pumps can be installed for draining out the excess water from the mine to surface where it can be disposed off into the natural drainage system.

Since, the coal seams in the area, south of dyke, are affected by downthrow faults at short intervals, it is suggested that large dia (250mm) boreholes are drilled from surface upto the dip side workings of some of these sectors for fitting delivery pipes through which pumped out water can be discharged on surface. This arrangement will help in saving of power and length of pipes.

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CHAPTER VIII

MANPOWER AND MINE INFRASTRUCTURE

8.1 Manpower

Manpower for 4 production districts for average daily production of 1200 tonnes is estimated as follows

I. Underground

			For 4 districts	
A.	Face operation	@ 90/ district for 3 shift	360	including overman, mining sirdar & shotfirer.
B.	Maintenance		52	
C	Trunk transport		25	
D.	Material transport		24	
E.	Mining supervision		12	
F.	Surveying		7	
	Sub-total-I		**480**	

II. Surface

A.	Production services	35
B.	Material management including explosives	10
C.	Coal handling and dispatch	18
D.	Quality control lab	4
E.	E & M including CHP & workshop – maintenance	11
F.	Training centre	5
G.	Water supply & pumping	3
H.	Driver (LMV / HMV)	5
I.	Administration	16
K.	Others (security, welfare, medical, sanitation etc.)	13
	Sub-total-II	**120**
	Total U/g + surface	**600**

Note : The above manpower list does not include u/g. manpower for stone drift drivage, construction of stoppings, installation of ventilation devices and surface manpower for township management and care, rest house, dispensary etc. which can be outsourced.

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8.2 Output per manshift (OMS)

8.2.1 U/g. OMS = $\frac{360000}{480 \times 261} = \frac{360000}{125280} = 2.87$

8.2.2 Overall OMS = $\frac{360000}{480 \times 261 + 120 \times 264} = \frac{360000}{125280 + 31680} = \frac{360000}{156960} = 2.29$ say 2.3

8.3 Surface Coal Handing Plant (CHP):

A simple coal handling arrangement is proposed on surface at the pit top which will consist of a tippler for mine cars feeding an elevating conveyor belt discharging into 2 nos. of twin pocket hoppers each of 2 x 100 tes. capacity through a reversible conveyor. This reversible conveyor can run on either side and discharge coal from either end. The O/H hopper will provide storage of 400 tes of ROM (one shift's production) and four trucks can be loaded at a time with this system. All despatches will be weighed in an electronic road weigh bridge (50te capacity). The weigh bridge will have facility for making bills and also for keeping records.

In extreme cases, when the hoppers are full but there is no off take due to any reason, coal from the hoppers can be carried by trucks to a ground stock at a safe distance from the mine – to be reclaimed later by pay loaders for despatch.

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8.4 Power supply and distribution

Power at 33KV will be brought to the site by OHT line from Amarwara sub-station of MPEB. The power demand of the project is under assessment. From the list of equipment and machinery required for the proposed u/g. mine, it is estimated to be between 3000 KVA to 4000 KVA excluding the load for township which may be located some distance away from the mine. Transformer capacity 2 x 3 KVA at PF 0.96 for annual production of 0.36 Mt of coal. The utilization voltage of various equipment / installation proposed for the project will be as follows :

- incoming supply from MPEB - 33KV

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- main fan on surface – 3.3KV
- Winding engine on surface – 3.3KV
- Power distribution to u/g. – 3.3KV
- Main pump at the u/g. sump 3.3 KV
- u/g. utilization voltage – 550V
- u/g. illumination 110V.
- Workshop and CHP on surface – 550 V
- Surface illumination – 230V.

For the purpose of planning the mine has been considered of degree II gassiness. Therefore, all electrical equipment and installations u/g. will be of FLP design to prevent to risk of open sparking.

8.5 Service building:

The following service buildings should be located close to shafts 1 & 2.

1. Main sub-station
2. Administrative building
3. Workshop & store,
4. Cap. lamp cabin / attendance cabin.
5. First aid centre
6. Canteen and rest shelter
7. Service magazine.

Main magazine should be located away from the mine premises at a safe distance and place (as per the provision of CMR'57 and Explosive Act) and will serve the needs for coal production as well as shaft sinking and stone drifting.

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8.6 Residential buildings

Accommodation in the form of hostels for executives / staff and hutments for workers will be constructed in the first phase during the construction period of the mine. In the next phase, township for workers, staff and officers will be constructed within a radius of 3 Kms. of the mine.

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8.7 Water supply

Following is a rough estimate of the water demand of the project (excluding township)

1.	Clean water supply to u/g. for dust suppression	0.20 MLD
2.	For industrial use in workshop, CHP, dust suppression and plantation	0.15 MLD
3.	Potable water	0.10 MLD
	Total	0.45 Say 0.5 MLD

During construction period of the mine, the water requirement of the mine can be met through borewells. During the development stage of the mine – mine water pumped out from the mine can be treated and recycled for industrial use.

8.8 Requirement of land:

Land requirement for the mine will be restricted to the minimum area required for shafts and pit top facilities which generally do not exceed 5 Ha. Land will also be required for main magazine. The existing cart track, (approx. 1.2km) from the road leading to Shivpuri Incline can be widened and strengthened to serve as all weather approach road to the project site.

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CHAPTER IX

SAFETY, CONSERVATION AND PROTECTION OF ENVIRONMENT

9.1 Safety

9.1.1 Use of safe and proved technology for mining

The mining plan for proposed u/g. project in Brahmapuri block has provided for bord and pillar method of mining with LHD – belt conveyor system which is a proved technology and commonly practiced in many of the WCL mines. This system is not only efficient in giving high production with improved productivity but also safe and flexible in nature to adjust with varying geo-mining conditions.

9.1.2 Layout of panels maintaining verticality of pillars and galleries.

The mining plan has provided for formation of panels in each workable seam / section leaving barrier of coal against adjacent panels, M.L. boundary and faults with width / depth ratio of panel generally less than 1 and maintaining verticality of pillars and galleries because of contiguous nature of occurrence of the coal seams in this block. Simultaneous extraction pillars in contiguous seams by a number of slices maintaining a diagonal line will help in better control of strata. The mining plan has provided for leaving coal standing on pillars for protection of shafts 1 & 2 and Bichua village considering angle of draw as 40° in Moturs.

9.1.3 Need for detailed investigation of rock characteristics:

The whole block is capped by a thick (60 to 120m) layer of Deccan Trap which is massive and hardest of all rocks because of its igneous origin followed by an equally thick layer (generally more than 100m) of Moturs, which is of sedimentary origin and rich in clay. It is expected that cracks and fissures developing in Motur during depillaring with caving will be filled up by clay, preventing water from acquifers reaching the workings in large quantity. The Deccan trap is expected to behave like an unbreakable shield preventing subsidence on surface. The above expectations should be confirmed by detailed

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investigations of rock samples in an authorized laboratory so that proper precautions can be taken before hand to prevent any massive collapse or failure of workings or any heavy inrush of water. Hydrogeoogical study should also form a part of the investigation.

9.1.4 Precaution against spontaneous heating in goaf:

Crossing point and ignition point of coal seams need to be determined by the prescribed method to know the incubation period based on which the size of panels has to be planned. Needless to mention the panel needs to be sealed off by isolation stoppings within the incubation period so that there is no spontaneous heating of coal inside the goaf.

9.1.5 Precaution against inundation:

The surface of the block is a hilly terrain with ridges and streams originating from them flow in all directions. These seams become very active during heavy rain. If cracks or fissures develop on the surface due to main fall in the goaves, surface water may find its way into the mine during heavy rains. Therefore, it is necessary to monitor the surface during and after depillaring operation and if some cracks are detected, they should immediately be filled up to stop breathing of air through goaf and also to prevent inundation during heavy rains.

9.1.6 Other precautions:

Besides the above major precautions against roof fall, fire and inundation, certain other precautions need to be taken during actual mining operations some of which are mentioned below:

- The thickness of parting between working seam / sections should not be less than 3m which should be confirmed by **additional drilling** from the junction of the upper seam / section.
- Roof support will be by **roof bolting as per Systematic Support Rules** under the supervision of skilled and trained personnel.
- Regular **ventilation survey** of the mine has to be done to check the presence of inflammable and noxious gases within the workings and sealed off area.

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- As many **persons** as possible to be **trained** by the management to improve the skill and quality of work besides all aspects of safety in the mine.
- Adequate number of **employees** to be **trained in rescue work** and first aid and distributed in required numbers in each shift.

9.2 Conservation

Extractable potential of the coal reserves (+1.5m thick) in the block as estimated in the mining plan is summarized below

Reserves (Mt)	North of dyke	South of dyke	Total
A. Geological	10.606	27.370	37.976
B. Within panel	5.590	16.040	21.629
C. Extractable	2.698	9.645	12.343
Extraction % C/B	61.84	60.13	60.58
Extraction % C/A	25.44	35.24	32.50

The extractable potential of the block is poor because of the following reasons:

1. Reserves within panel are only 60% of the geological reserves because of inaccessibility of some of the sectors due to faults,
2. Loss of coal in barriers against faults and adjacent panels.
3. Inherent loss of coal in ribs left against goaf during depillaring.

Considering the occurrence of < 1.5m seam thickness in isolated patches, multiplicity of seams affected by faults at close intervals and the standard of safety to be maintained during the actual working of the mine, the overall extraction percentage projected in the mining plan is quite reasonable.

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9.3 Protection of environment

The mining plan envisages extraction of coal from this block with minimum damage to environment. The following points are worth noting.

1. Acquisition of land for u/g. project has been limited to the barest minimum.
2. There is no proposal to shift any village.

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3. Mining activities will be conducted at a min. depth of 160m. from the surface which may extend to a maximum depth of 300m. No disturbance on surface due to u/g. mining is apprehended in area. Additional safety precaution as laid down by the regulatory authorities will be taken to protect not only Bichua village but also forest land.
4. The new u/g. coal project will open up new employment opportunities for the local people who will be provided training and financial aid to find better job as and when created within the project and also outside the project.
5. To sum up, the opening of the project at Brahmapuri will have a healthy effect on the environment besides contributing to the industrial development of the area and improving the quality of life of the local people.

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CHAPTER X

PROGRESSIV MINE CLOSURE PLAN

10.1 Stage I : Year 01 to 08

Paramcters arc as follows

Seams to be worked :		Thickness (m)
	IC	3.5 to 3.8 (thickness revised by combining with IB)
	IIA	2.1 to 2.2
Parting between seam:		2.9 to 3m (interrelation of shale & sandstone)
Place :	North of dyke	
Sectors :	21 and 25	
Depth from surface :	Starting 175m (Sector 21)	
	Max. 290m (sector 25)	
Landing :	Floor of seam IIA at a depth of 175m.	
Gradient of seam floor:	1 in 8 (7°)	
Sequence of development :	Simultaneous development of seam IIA & IC maintaining verticality of pillars and galleries and min. thickness of 3m. for parting.	
Coal winning :	Solid blasting	

Coal transport :

	Seam IIA	Seam IC
Face :	Low ht LHD loading into gathering belt	Std. ht. LHD loading directly into gathering belt
Gate:	Belt conveyor	Belt conveyor
Trunk :	Belt conveyor in Seam IIA carrying coal from Seam IC - through strata bunkers constructed in staple pits.	

No. of districts :	2 No. in Seam IIA
	2 Nos. in Seam IC
Daily output :	6 heading panel in Seam IIA : 250 to 300 TPD
By development :	6 heading panel in Seam IC : 350 to 400 TPD
and by depillaring	Total for 4 districts : Av. 1200 TPD

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Reserves to be liquidated:	See Table 5.9
By development	**0.630 Mt**
By depillaring	**0.872 Mt.**
Total	**1.502 Mt.**
Max. annual output:	**0.36 Mt.**
Working life of stage-I:	About 8 years including shaft sinking period of 3 years.

Yearwise schedule of production

Yr.	Coal production (Mt)		Yr.	Coal Production (Mt)	
	Yrly.	Cum.		Yrly.	Cum.
01		-	06	0.36	0.91
02	-	-	07	0.36	1.27
03	0.03	0.03	08	0.36	1.63
04	0.18	0.21			Stage I completed Stage II started
05	0.34	0.55			

10.2 Stage II (Year 08 to year 13)

A. Area of activity

- North of dyke : Seams IV, VA in sector 21 and 25.
  Seams IIC & IIA in sectors 23 & 24.
- South of dyke : Seam IC and IIA in sectors 18 and 17.

B. Details of seamwise reserves (Extracted from Table 5.4 Ch. V.).

Figs. in mil. tes.

Seams	North of dyke			South of dyke			Total
	Geol	Panel	Extractable	Geol.	Panel	Extractable	Extractable
IC	0.832	0.342	0.246	1.634	0.942	0.577	0.823
IIA	0.493	0.203	0.123	0.592	0.355	0.213	0.336
IIB							
III							
IVA	1.130	0.679	0.304	-	-	-	0.304
VA	2.108	1.326	0.473	-	-	-	0.473
VB	0.510	0.192	0.050	-	-	-	0.500
	5.143	**2.746**	**1.196**	**2.226**	**1.297**	**0.790**	**1.986**

C.	Shaft landing	:	on the floor of seam VB – North of dyke at a depth of 225 from surface.
D.	Entry ; North of dyke	.	Seam IVA through drift from shafts bottom.
	South of dyke	:	Seam IC & IIA by drift through shaft bottom (120m long) cutting across dyke

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E. Mining technology :

Seam IC	:	Std. ht. LHD & belt conveyor (seam thickness > 2.8m)
Seam IIA (North of dyke), IVA, VA:		Low ht. LHD & belt conveyor (2.1 to 2.8).
Seam VB and IIA (south of dyke) :		Low ht. SDL/ chain conveyor.

F. Production schedule

Year	Coal (Mt)		Remarks
	Yrly.	Cum.	
08	0.13	0.13	excess from stage I
09	0.36	0.49	
10	0.36	0.85	
11	0.36	1.21	
12	0.36	1.57	
13	0.36	1.93	
14	0.056*	1.986	* balance from stage III

10.3 Stage III (Year 13 to year 30)

This stage involves drivage of a pair of stone drifts each about 120m long from shafts 1 and 2 to intersect seam VA south of dyke and develop both upper and lower group of seams on the downthrow side of fault F22. Needless to point out, the area south of dyke in this stage of mine is having the highest mining potential – seamwise reserves of which are given in table 5.4 (Chapter V). The mining plan envisages the following extractable reserves from seam IC, IIA, IIB, III, IVA, VA and VB (Details in table 5.11 – Chapter V).

Available Geol Reserves	:	24.078 Mtes.
Reserves within panel	:	14.742 Mtes.

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Extractable reserves:

By development	: 2.903	8.855
By depillaring	: 5.952	

The mining plan proposes extraction of approx. 6.00 Mil. tes. from this stage over a period of 17 years (end of ML period of 30 years) @ 0.36 Mt/annum and the balance reserves beyond the end of ML period after renewal of mining lease. The extent of the area measures 2.2Km. along strike and 1.2 Kms. along the dip rise direction. The liquidation of the reserves distributed in upper and lower group of seams (divided into a no. of sectors by faults) through shafts 1 and 2 located to the north of dyke may pose problems of logistics as well as ventilation for which another shaft may need to be sunk at a later date. The actual location of this shaft No. 3 depends upon a number of factors which are not possible to visualize at present. As and when the decision is taken for sinking another shaft the Mining Plan will be revised and submitted for fresh approval.

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APPENDIX I

COAL BLOCK : BRAHMAPURI

PENCH VALLEY COALFIELD

CO ORDINATES,REDUCED LEVELS& TOTAL DEPTHS OF BOREHOLES, DRILLED BY MI

BOREHOLES RISE SIDE OF DYKE

Sr No.	SECTOR	BH.NO.	REDUCED LEVEL(m)	CO-ORDINATES		TOTAL DEPTH(m)
				Latitudes (m)	Departure (m)	
1	B-5	PE-40	759.19	20377.27	23586.20	294.60
2		PE-60	753.23	20425.27	24246.12	305 10
3		PKCS-33	771.11	19962.13	23299.24	282 60
4	B-6	PKCS-9	738.78	20101.67	24118.86	290 25
5	B-9	PE-77	783.99	19972.83	22960.58	266.50
6	B-10	PE-6	788.43	20165.58	22772.66	301 25
7		PE-78	757.05	19973.90	22368.16	259.30
8	B-11	PE-37	765.67	20331.12	23486.42	281.50
9		PE-41	775.49	20269.28	23104.30	300 00
10	B-12	PE-2	800.59	20191.02	22296.67	303.10
11		PE-66	767.69	20448.28	22922.78	326.85
12	B-13	PE-67	778.83	20645.08	23683.84	289.85
13		PE-70	782.67	20499.41	23246.72	304.80
14	B-15	PE-5	798.39	20549 44	22253.95	317.65
15		PE-7	798.70	20566.72	22676.80	315.10
16		PE-35	796.89	20729.94	23439.26	327.25
17		PE-36	795.05	20679.21	23039.11	326.80
18	B-16	PE-34	785.40	20776.62	23826.66	296.60
19		PE-69	760.11	20824.80	24249.18	248.45
20		PE-65	813.06	20808.72	22425.67	342.50
21	B-17	PE-64	800.42	20984.49	22807.29	322.00
22		PE-71	759.60	21031.38	24048.42	257 90
23		PE-72	759.38	21007.16	24309.69	258 25
24	B-18	PE-45	759.93	21012.73	23595.40	263 40
25		PE-63	774.17	21031.37	23203 30	286.65
26		PE-73	778.26	21114.89	23426 54	254.30
27		PE-74	799.95	21031.13	22957 31	307.30
		BOREHOLES NORTH OF DYKE				
28	B-19	PE-58	762.51	21,177.27	24,187.11	112.00
29		PE-33	756.17	21,186.04	23,797.26	113.85
30	B-20	NIL				
31	B-21	PE-28	769.1	21,560.71	23,742.39	309.20
32		PE-39	772.05	21,341.69	23,324.88	272.60
33	B-22	NIL				
34	B-23	PE-61	776.16	21,621.64	24,147.69	286.10
35		PE-68	782.22	21,789.56	23,915.81	341.80
36		PMD-48				
37	B-24	NIL				
38	B-25	PE-32	780.29	21,950.60	23,693.91	266.90
39		PE-62	793.02	22,006.69	24,103.15	348.50

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APPENDIX - J

DETAILS OF INTERSECTION DEPTH & THICKNESS OF DIFFERENT FORMATIONS AS ENCOUNTERED IN BRAHMAPURI BLOCK

BOREHOLES RISE SIDE OF DYKE

SECTOR	B.H. NO.	REDUCED LEVEL(m)	SOIL	W.ZONE	DECCAN TRAP Floor Depth	DECCAN TRAP Thick.(m)	JABALPURS Floor Depth	JABALPURS Thick.(m)	MOTURS Floor Depth	MOTURS Thick.(m)	BARAKARS Floor Depth	BARAKARS Thick.(m)	TALCHIRS Floor Depth	TALCHIRS Thick.(m)	TOTAL DEPTH
B-5	PE-40	759.19	0.00	3.00	113.88	113.88	0.00	0.00	214.50	214.50 (corr. 100.00)	294.60	80.10	0.00	0.00	294.60
	PE-60	765.23	2.00	3.00	126.00	124.00	133.77	7.77	234.50	100.73	305.10	70.60	0.00	0.00	305.10
	PKCS-33	771.77	1.00	3.00	112.84	111.84	121.00	8.16	216.80	95.80	282.80	66.00	0.00	0.00	282.80
B-6	PKCS-8V	736.76	2.00	3.00	115.32	119.32	120.25	4.93	211.84	91.59	290.25	78.41	0.00	0.00	290.25
B-7	NIL														
B-8	NIL														
B-9	PE-77	763.99	0.00	2.05	114.07	112.07	130.30	16.23	211.00	80.70	286.50	75.50	0.00	0.00	286.50
B-10	PE-6	768.43	1.00	1.50	120.45	118.45	128.65	8.20	223.90	106.26	301.28	71.38	0.00	0.00	301.25
	PE-70	767.05	2.00	3.00	78.15	75.15	79.00	0.85	180.00	101.00	259.30	79.30	0.00	0.00	259.30
B-11	PE-37	765.67	0.00	0.50	107.20	107.20	119.25	12.05	203.75	84.50	281.60	77.75	0.00	0.00	281.50
	PE-4	775.48	0.00	7.50	109.00	109.00	0.00	0.00	233.00	124.00	300.00	67.00	0.00	0.00	300.00
B-12	PE-2	800.59	0.50	7.35	121.00	120.50	128.73	7.73	239.23	110.60	302.10	63.87	0.00	0.00	305.10
	PE-56	767.89	0.00	4.50	109.15	109.15	0.00	0.00	249.80	140.65	325.55	77.05	0.00	0.00	325.55
B-13	PE-67	778.83	2.25	4.26	111.62	109.33	0.00	0.00	215.00	103.38	289.85	74.85	0.00	0.00	289.85
	PE-70	767.57	7.50	6.30	111.51	109.01	0.00	0.00	237.08	125.56	304.80	67.74	0.00	0.00	304.80
B-14	NIL														
B-15	PE-5	768.39	0.81	0.00	97.55	86.74	102.05	5.30	240.37	137.52	317.65	77.28	0.00	0.00	317.55
	PE-7	790.70	1.00	0.00	110.50	108.50	117.25	6.75	246.02	128.77	315.10	66.00	0.00	0.00	315.10
	PE-35	796.89	0.00	2.30	112.80	112.60	0.00	0.00	244.00	131.40	327.25	83.25	0.00	0.00	327.25
	PE-36	796.05	0.00	5.50	102.75	102.75	118.45	14.19	245.20	128.75	326.80	81.60	0.00	0.00	326.80
B-16	PE-34	785.40	0.00	3.00	105.35	105.35	0.00	0.00	216.14	113.79	296.80	80.66	0.00	0.00	296.80
	PE-59	790.11	5.00	6.00	71.50	66.50	0.00	0.00	175.60	104.30	248.45	72.85	0.00	0.00	248.45
	PE-65	813.06	1.00	3.50	114.49	113.49	120.60	6.11	266.92	146.32	342.50	75.58	0.00	0.00	342.50
B-17	PE-64	800.42	0.00	7.60	98.80	98.80	99.81	1.01	249.00	149.19	322.00	73.00	0.00	0.00	322.00
	PE-71	758.63	1.00	4.00	47.07	46.07	0.00	0.00	179.98	132.91	257.90	77.92	0.00	0.00	257.90
	PE-72	756.30	0.60	0.00	45.40	44.90	45.80	1.40	183.06	138.79	256.25	73.16	0.00	0.00	256.25
B-19	PE-45	756.33	0.00	4.98	64.39	54.39	0.00	0.00	197.20	142.01	263.40	66.20	0.00	0.00	263.40
	PE-63	774.17	1.00	4.20	69.50	68.50	72.58	218.583	140.82	68.24	288.65	72.15	0.00	0.00	286.95
	PE-73	778.28	4.00	7.00	70.50	68.50	83.30	12.80	224.80	141.90	254.30	25.40	0.00	0.00	254.30
	PE-74	759.65	5.50	14.00	104.34	98.84	114.32	12.97	245.50	131.10	307.30	61.80	0.00	0.00	307.30

BORE HOLES NORTH OF DYKE

SECTOR	B.H. NO.	REDUCED LEVEL(m)	SOIL	W.ZONE	DECCAN TRAP Floor Depth	DECCAN TRAP Thick.(m)	JABALPURS Floor Depth	JABALPURS Thick.(m)	MOTURS Floor Depth	MOTURS Thick.(m)	BARAKARS Floor Depth	BARAKARS Thick.(m)	TALCHIRS Floor Depth	TALCHIRS Thick.(m)	TOTAL DEPTH
B-18	PE-58	762.51	4.00	10.30	56.14	52.14	64.00	7.86	102.00	38.00	Dyke at 12.00 M, Till 10.00 M				112.00
	PE-33	756.17	0.25	3.70	48.39	48.19	63.40	7.01	106.20	52.80	Dyke upto(113.85 m) Dyke thickness 7.65 m				113.85
B-20	NIL														
B-21	PE-28	769.10	0.00	8.00	86.93	86.93	88.96	1.03	188.05	99.09	305.45	119.40	308.20	3.76	309.20
	PE-39	772.36	0.00	4.50	55.50	51.00	0.00	0.00	198.00	147.00	272.80	74.80	0.00	0.00	277.00
B-22	NIL														
B-23	PE-51	774.17	1.00	5.00	122.84	121.84	128.50	2.89	245.70	120.20	286.10	40.40	0.00	0.00	286.10
	PE-58	752.22	1.00	9.89	135.87	134.87	138.50	2.93	273.90	136.30	341.80	58.00	0.00	0.00	341.80
	PMD-49	763.39	
B-24	NIL														
B-25	PE-32	780.29	0.00	4.50	126.10	126.10	124.20	4.10	230.50	106.30	266.90	36.40	0.00	0.00	266.90
	PE-62	793.82	0.00	213.50	142.52	137.52	00.00	00.00	267.24	124.72	348.50	81.26	00.00	00.00	348.50

Notes beside PE-63 and PE-58: Refer

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APPENDIX III

CORRELATION OF COAL SEAMS/ SEAM SECTION IN BRAHMAPURI BLOCK(E.K.VALLEY C.F.) M.P.

SECTOR	BH.NO	SECTOR	BH.NO.	SEAM-IA FROM	SEAM-IA TO	SEAM-IA THICK	SEAM-IA Parting	SEAM-II FROM	SEAM-II TO	SEAM-II THICK	SEAM-II Parting	SEAM-III FROM	SEAM-III TO	SEAM-III THICK	SEAM-III Parting
B-4	PE-40	B-5	PE-40	225.68	230.37	0.69	3.15	231.56	233.31	1.45	0.67	233.98	236.65	3.07	2.48
	PE-60	"	PE-60		Faulted				Faulted				Faulted		
	PKCS-23	"	PKCS-33	221.80	222.54	0.74	0.97	223.51	226.03	1.52	0.32	226.35	226.74	3.39	2.76
B-6	PKCS-6	B-8	PKCS-8	230.33	231.30	0.67	1.32	232.62	233.9	1.58	0.20	234.20	237.01	3.4	2.38
B-9	PE-77	B-9	PE-77	227.61	228.58	0.98	1.1	229.08	231.48	1.79	0.37	231.75	235.17	3.42	2.85
B-10	PE-6	B-10	PE-6	239.01	241.22	1.31	1.4	242.62	244.47	1.65	0.23	244.70	247.76	3.06	2.47
	PE-78	"	PE-78		NOT DEVELOPED			196.65	198.86	0.21	0.37	197.23	201.66	3.53	3.04
B-11	PE-87	B-11	PE-87	215.26	216.50	1.24	0.54	217.04	219.2	2.16	0.16	219.36	222.85	3.49	4.06
	PE-41		PE-41	238.46	239.25	0.77	1.59	240.84	241.59	0.71	0.56	242.21	243.70	1.49	3.37
B-12	PE-2	B-12	PE-2		Faulted				Faulted			246.28	246.80	0.52	3.85
	PE-58		PE-58	263.47	264.43	0.53	1	265.43	266.64	1.24	0.51	267.15	270.28	3.13	3.09
B-13	PE-87	B-13	PE-87	227.07	227.83	0.53	0.35	227.98	229.52	1.56	0.31	229.83	233.23	3.40	-2.60
	PF-70		PF-70	245.07	246.21	1.14	1.16	247.36	249.02	1.66	0.32	249.34	252.74	3.40	3.41
B-15	PE-5	B-15	PE-5	248.83	250.5	0.57	1.55	252.05	253.9	1.85	0.41	254.31	257.01	2.70	3.04
	PE-7		PE-7	253.07	253.67	0.6	1.4	255.27	257.33	2.06	0.35	257.68	260.68	2.35	4.35
	PE-35		PE-35	258.63	259.55	0.72	0.84	260.49	261.88	1.39	0.80	262.78	265.64	2.86	3.20
	PE-36		PE-36	264.64	265.0	0.56	1.49	266.56	268.8	1.81	0.21	269.01	272.56	3.64	3.23
B-16	PE-34	B-16	PE-34	239.05	239.3	0.15	0.95	239.25	240.8	1.55	0.47	241.27	244.73	3.46	2.55
	PE-59		PF-59	190.6	191.32	0.32	3.09	192.05	193.45	1.4	0.82	194.27	197.05	2.75	2.60
	PE-65		PE-65		NOT DEVELOPED			278.17	279.8	1.63	0.55	280.35	283.10	2.75	3.74
B-17	PE-64	B-17	PE-64	255.5	256.09	0.59	1.24	257.33	259.1	1.77	0.65	259.75	261.52	1.74	4.23
	PF-71		PF-71	193.05	193.57	0.52	1.32	195.05	195.01	0.66	0.99	197.00	200.34	3.34	1.33
	PE-72		PE-72		NOT DEVELOPED			195.51	196.25	0.74	0.82	196.87	199.49	2.62	2.44
B-18	PE-45	B-18	PE-45		Faulted				Faulted			196.05	200.77	4.71	2.68
	PE-63		PE-63	220.07	220.8	0.831	1.27	221.87	222.86	0.99	0.52	223.38	226.28	2.89	3.81
	PE-73		PE-73		Faulted				Faulted				Faulted		
	PE-74		PE-74	250.86	251.32	0.44	1.17	252.49	254.29	1.8	0.51	254.80	257.29	2.49	4.74
												BOREHOLES NORTH OF DYKE			
B-19	PE-55	B-19	PE-55	DYKE											
	PE-33		PE-33	DYKE											
B-20	NIL	B-20	NIL												
B-21	PE-28	B-21	PE-28	204.23	204.68	0.85	1.141	206.02	206.03	2.01	0.59	206.62	212.83	3.26	2.89
	PE-39		PE-39	213.26	213.47	0.19	0.4	213.87	216.33	1.46	0.65	215.98	217.62	1.64	2.70
B-22	NIL	B-22	NIL												
B-23	PE-61	B-23	PF-61		Faulted				Faulted				Faulted		
	PE-60		PE-60	284.98	285	0.05	0.57	285.57	287.85	2.28	0.28	288.14	290.64	2.50	3.48
	PWD-49		PWD-49		Faulted										
B-24	NIL	B-24	NIL												
B-25	PE-32	B-25	PE-32		Faulted				Faulted				Faulted		
	PE-62		PE-62		Faulted			281.7	282.19	0.48	0.73	282.92	285.49	2.57	3.04

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App. II contd

BRAHMAPURI COAL BLOCK

SECTOR	BH NO.	SEAM-IIA FROM	TO	THICK	Parting	SEAM-IIB FROM	TO	THICK	Parting	SEAM-II FROM	TO	THICK	Parting
B-5 N.C.	PE-40	238.11	239.38	0.27	0.44	238.82	241.61	1.78	2.21	243.92	245.74	1.52	20.75
	PE-00	237.6	236	1.40	2.20	0.06	0.60	0		241.20	241.75	0.56	15.77
	PKCS-33	231.49	232.54	0.66	0.53	232.67	233.72	1.05	2.07	236.1	237.08	0.98	21.17
B-6	PKCS-E	240	240.51	0.51	0.52	241.06	242.78	1.76	2.43	245.22	246.1	0.80	19.1
B-9	PE-77	236.02	239.04	1.02	0.34	239.38	240.64	1.46	2.39	243.23	244.57	1.74	16.42
B-10	PE-6	250.25	250.97	0.77	0.45	251.42	252.86	1.44	2.66	255.02	257.35	(1.33)	17.02
	PE-76	203.9	205.40	1.50	0.86	206.36	206.84	0.48	2.47	209.31	211.31	1.2	19.11
B-11	PE-31	226.54	228.40	1.86	2.34	0	0	0	3	231.24	232.25	1.01	16.38
	PE-41	247.07	247.17	0.10	0.75	247.82	248.85	0.53	3.51	252.38	253.71	1.95	20.68
B-12	PE-2	250.75	251.61	0.86	1.24	252.85	253.7	0.85	2.6	256.3	258.06	1.78	19.81
	PE-6r	274.17	274.25	0.10	0.97	275.32	278.0	1.20	2.01	278.41	281.13	1.72	
B-13	PE-67	235.63	235.74	0.31	3.50	236.64	238	1.36	2.48	240.46	241.56	1.07	19.43
	PE-70	256.15	257.65	1.50	2.83	0	0	0		260.98	261.61	1.63	18.64
B-15	PE-5	260.04	260.63	0.55	1.10	257.7	262.82	1.12	3.04	265.99	267.87	1.5	20.57
	PE-7	264.38	264.53	0.14	0.97	265.5	266.92	1.42	2	266.82	270.74	1.92	18.53
	PE-36	268.24	270.67	2.03	2.43	0	0	0		273.3	274.65	1.35	11.12
	PE-35	275.78	275.20	0.42	0.55	276.75	278.17	1.41	2.58	280.75	281.88	1.11	17.17
B-16	PE-34	247.46	247.60	0.54	0.49	246.09	249.77	1.68	1.90	251.76	252.29	0.53	16.31
	PE-59	169.85	169.98	0.23	0.50	190.58	191.54	1.16	2.16	193.7	194.85	1.16	22.35
	PE-65	266.84	267.30	0.46	1.37	288.67	293.18	1.51	5.1	293.29	294.88	1.7	15.84
B-17	PE-44	266.81	267.12	1.37	2.12	0	0	0		269.43	270.52	1.09	18.51
	PE-71	201.67	204.17	(2.50)	2.33	0	0	0		206.5	207.56	1.06	18.17
	PE-72	190.93	191.04	0.11	0.63	191.57	193.08	1.51	2.14	195.22	196.7	0.98	21.79
B-18	PE-45	203.43	205.10	1.67	4.65	0.00	0.00	0		209.75	208.90	0.76	26.09
	PE-63	200.37	201.87	1.80		0	0	0		233.75	234.45	0.7	16.11
	PE-73	Faulted				Faulted				Faulted			
	PE-74	262.02	253.26	1.24	1.35	0	0	0		264.61	265.3	0.88	20.67
B-19	PE-58	NORTH OF DYKE								NORTH OF DYKE			
	PE-33												
B-20	NIL												
B-21	PE-28	214.77	217.22	2.45	2.07	0	0	0		219.29	220.58	1.29	21.64
	PE-36	220.32	222.15	1.02	0.86	0	0	0		223.04	223.46	0.42	20.6
B-22	NIL												
B-23	PE-61	Faulted				Faulted				Faulted			
	PE-86	293.82	295.38	2.17		0	0	0		298.31	262.68	0.37	
[illegible]	PMO-49												
[illegible]	NIL												
B-25	PE-32	Faulted				Faulted				Faulted			
[illegible]	PE-62	288.53	290.73	2.20	2.42					293.15	293.6	0.55	15.13

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App III Contd.

BRAHMAPURI COAL BLOCK

SECTOR	BH.NO	SEAM IV-A-1 FROM	SEAM IV-A-1 TO	SEAM IV-A-1 THICK.	Parting	SEAM IV-A-2 FROM	SEAM IV-A-2 TO	SEAM IV-A-2 THICK.	Parting	SEAM V-A-1 FROM	SEAM V-A-1 TO	SEAM V-A-1 THICK.	Parting
B-5	PE-40	265.95	267.05	1.1	3.39	0	0	0		270.44	272.16	1.72	0.74
	PE-60	265.52	266.69	1.17	2.41	0	0	0		259.1	261.1	2	0.6
	PKCS-33	258.25	260.8	2.54	4.13	0	0	0		264.73	266.01	1.28	4.33
B-C	PKCS-9	265.2	266.69	1.49	3.49	0	0	0		270.18	272.03	1.85	1.43
B-6	PC-77	261.39	263.9	2.51	7.2			0		27[illegible] 1	277.7	1.6	
B-10	PE-6	274.37	276.16	1.79	1.01	277.17	277.44	0.27	4.36	281.8	283.33	1.53	2.94
	PE-78	230.43	233.25	2.82	5.34	0	0	0		239.58	241.37	1.79	
B-11	PE-97	250.62	252.95	2.32	2.91	0	0	0		255.85	257.45	1.62	1.23
	PE-41	274.6	277.06	2.46	5.06	0	0	0		202.12	202.68	0.56	1.52
B-12	PE-2	277.88	278.4	0.51	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0
	PE-66	Faulted				Faulted				297.35	287.59	0.24	2.05
B-13	PE-57	260.96	261.78	0.8	5.04	0	0	0		286.82	288.27	1.45	0.31
	PE-70	280.25	282.02	1.77	4.29	0	0	0		286.3	288.15	1.85	[illegible]
B-15	PE-5	287.74	290.11	2.37	4.11	0	0	0		294.22	296.25	2.03	2.36
	PE-7	290.27	292.15	1.89	4.63	0	0	0		295.85	290.2	1.47	1.85
	PE-85	Faulted				Faulted				285.77	288.5	2.73	1.72
	PE-36	299.03	301.13	2.1	4.03	0	0	0		305.16	307.48	2.02	2.65
B-16	PE-34	268.6	270.12	1.52	4.31	0	0	0		274.43	275.75	1.32	1.12
	PE-59	217.2	217.64	0.44	1.65	219.29	221.68	2.39	4.8	226.48	227.47	0.99	1.6
	PE-65	310.67	312.41	1.76	5.06	0	0	0		317.5	319.04	1.54	2.69
B-17	PE-64	289.03	291.15	2.12	1.1	0	0	0		292.25	293.69	1.38	4.53
	PE-71	225.68	227.27	1.66	3.04	minor fault				251.11	252.34	1.23	0.64
	PE-72	217.90	218.94	0.85	2.50					221.43	223.38	1.95	1.57
B-18	PE-45	235.98	237.69	1.7	3.08	0	0	0	0	240.71	243.5	2.79	0
	PE-63	253.56	256.05	2.49	2.06	0	0	0		258.11	261.05	2.94	3.73
	PE-73	Faulted				Faulted				Faulted			
	PC-74	285.37	286.88	1.28	1.9			0		286.55	290.6	7.05	2.14
		NORTH OF DYKE				NORTH OF DYKE							
B-19	PE-58												
	PE-33												
B-20	NIL												
B-21	PE-28	242.22	244.2	1.98	1.65	245.99	246.03	0.04	0.0	246.53	249.4	2.87	0.17
	PE-38	244.26	246.7	2.44	1.54	0	0	0		248.24	250.72	2.48	0.80
B-22	NIL												
B-23	PE-61	Faulted				Faulted				Faulted			
	PE-48	Faulted				Faulted				316.14	317.65	1.51	
	PMD-49												
	NIL												
B-26	PE-32	Faulted				Faulted				Faulted			
	PE-62	308.53	309.75	0.22	2.65	310	311	1	0.89	311.99	312.86	0.87	[illegible]

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Appx II contd

BRAHMPURI COAL BLOCK

SECTOR	BH.NO.	SEAM-V A2 FROM	TO	THICK.	Parting	SEAM-V B FROM	TO	THICK.	Parting	SEAM-V B2 FROM	TO	THICK.	Parting
B-5	PE-40	272.9	273.35	0.45	12	0	0	0		285.35	286.91	1.56	3.09
	PE-60	261.7	262.05	0.35	13.47	0	0	0		275.52	277.92	2.4	1.82
	PKCS-33	270.34	270.58	0.24	8.22			0		275.8	277.95	2.15	1.09
B-6	PKCS-9	273.46	273.73	0.27	11.29	0	0	0		284.96	286.05	1.09	2.46
B-9	PE-77												
B-10	PE-5	280.27	280.62	0.35	7.11	278.52	278.08	0.56		Faulted			
	PE-78	0	0	0		0	0	0		292.76	295.29	2.53	0.32
B-11	PE-37	259.71	259.92	0.21	1.42	247.9	248.08	0.19	5.89	249.67	252.95	2.68	1.37
	PE-41	264.6	264.82	0.22		Faulted				260.44	260.85	0.41	4.25
B-12	PE-2					Faulted				Faulted			
	PE-65	289.64	296.85	0.21	4.61	0	0	0				0	0
B-13	PE-67	288.53	288.83	0.3	12.56	0	0	0		304.66	306.09	1.44	2.16
	PE-70	0	0	0		0	0	0		291.46	293.59	1.93	1.09
B-15	PE-6	288.61	289.12	0.51	8.67	0	0	0		300.23	300.86	0.52	0.54
	PE-7	300.25	300.36	0.11	8.99	0	0	0		307.79	309.88	2.09	2.58
	PE-35	290.22	290.4	0.18	8.14	298.54	298.9	0.36	0.24	304.35	304.81	0.46	1.84
	PE-36	309.71	310.12	0.41	11.84	0	0	0		289.14	289.35	0.21	1.09
B-16	PE-34	276.87	277.67	0.8	6.02	0	0	0		321.96	322.56	0.6	1.99
	PE-58	229.07	229.32	0.25		Faulted				285.69	288.74	1.05	2.39
	PE-55	321.87	322.12	0.25	5.18	0	0	0		Faulted			
B-17	PE-64	295.18	295.21	0.15	10.67	0	0	0		330.3	332.19	1.89	2.35
	PE-73	282.06	283.55	0.59	9.66	0	0	0		309.38	309.93	0.85	4.49
	PE-72	224.95	225.31	0.36	6.23	0	0	0		242.42	244.49	2.07	1.83
B-18	PE-45	0	0	0	0	0	0	0		236.54	237.42	0.88	0.82
	PE-83	261.78	262.06	0.28	11.63	0	0	0		259.89	261.3	1.41	3.07
	PE-73	Faulted								273.69	275.47	1.78	2.36
	PE-74	292.74	292.89	0.15	9.45	Faulted				296.5	297.49	0.99	2.78
B-19	PE-58									301.32	302.85	1.53	3.02
	PE-39												
B-20	NIL												
B-21	PE-28	249.57	250.65	1.08	6.26	0	0	0					
	PE-38	251.6	251.9	0.3	10.53	0	0	0		250.92	252.33	1.41	1.54
B-22	[illegible]									262.63	264.93	2.3	0.97
B-23	[illegible]												
	[illegible]	319.28	319.43	0.15	5.11	Faulted 324.54	324.78	0.24	0.42	246.7	246.2	1.49	3.1
B-24	[illegible]									325.2	325.62	0.42	5.02
B-25	[illegible]												
	[illegible]	Faulted											
	[illegible]	316.6	320	3.2	4.62	Faulted 324.62	324.79	0.17	5.5	326.1	326.4	1.3	0.69
										324.29	326.9	0.61	5.97

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App III

BRAHMAPURI COAL BLOCK

SECTOR	BH NO.	SEAM-VC FROM	TO	THICK	Total Depth
B-5	PE-40	267.86	268.26	0.27	294.8
	PE-60	278.55	279.7	0.15	305.1
	PKCS-33	278.09	279.61	0.56	282.8
B-6	PKCS-B	238.51	238.6	0.09	290.25
B-6	PE-77	Faulted			283.5
B-10	PE-6	299.22	296.34	0.12	301.26
	PE-78	254.32	284.47	0.1	299.3
B-11	PE-57	265.11	265.3	0.19	281.5
	PE-41	Failed			300
B-12	PE-2			0	
	PE-66	303.56	308.48	0.13	328.85
B-13	PE-67	264.47	264.7	0.23	298.85
	PE-70	301.38	301.59	0.2	304.8
B-15	PE-5	312.47	312.73	0.25	317.65
	PE-7	306.45	305.82	0.37	315.1
	PE-35	300.44	300.8	0.16	327.25
	PE-38	324.40	324.65	0.18	328.9
B-16	PE-34	299.13	299.27	0.14	286.8
	PE-56	Faulted			249.45
	PE-65	334.54	334.84	0.3	342.5
B-17	PE-64	314.42	314.62	0.2	322
	PE-71	246.12	246.28	0.16	267
	PE-72	233.3	233.85	0.55	258.25
B-18	PE-45	258.37	258.95	0.46	209.4
	PE-63	277.85	278.14	0.31	295.05
	PE-73	240.2	241	0.8	254.3
	PE-74	305.97	306.16	0.19	307.3
		North of Dyke			
B-19	PE-60				112
	PE-33				113.85
B-20	NIL				
B-21	PE-20	259.87	260.25	0.39	309.2
	PE-39	265.9	265.58	0.18	272.6
B-22	NIL				
B-23	PE-61	251.3	251.58	0.28	286.1
	PE-68	331.44	331.47	0.03	341.8
	FMD-45				
B-24	NIL				
B-26	PE-52	237.09	237.61	0.52	286.9
	PE-62	335.87	336	0.13	348.5

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N. Pkcs
(3 Pcs)

MINING PLAN for BRAHMAPURI W/A — Sept '08 — Appendix IV

SECTOR	BH.NO.	THICK(m)	M%	ASH%	V.M%	F.C%	G.V. kcal/kg	U.H.V kcal/kg	GRADE	REMARKS
	SEAM-V		BRAHMAPURI BLOCK							
B-5	PE-40	3.07	6.05	21.34				6120	C	
	PE-60	Faulted								
	PKCS-53	3.39	5.11	20.71						
B-8	PKCB-9	3.41	4.18	20.73				6199	C	
B-9	PE-77	3.42	6.09	20.78				5046	C	
B-10	PE-6	2.68	6.59	23.91				4778	D	
	PE-78	3.85	6.46	21.28				4829	C	0.10m band
B-11	PE-37	3.49	5.86	19.91				5072	C	
	PE-41	2.88	3.83	40.47				5344	C	
B-12	PE-2	0.82(P)						2787	E	
	PE-68	3.13	4.25	21.68						
B-13	PE-67	3.40	7.20	25.20	27.00	40.00	5085	5339	C	
	PE-70	3.40	4.26	22.64				4429	D	
B-15	PE-5	3.41	2.44	34.39				5169	C	
	PE-7	3.05	6.16	29.26	29.10	45.40		3617	E	
	PE-36	2.66	3.16	34.87				4000	E	
	PE-38	3.54	3.16	24.2?				5105	C	
B-16	PE-34	3.46	3.66	22.62				5128	C	
	PE-59	2.76	6.60	27.10	25.60	41.40	4945	5280	C	
	PE-65	2.75	4.67	27.40				4348	D	
B-17	PE-64	3.19	1.41	47.25				4458	D	0.06 Band
	PE-71	3.34	6.68	32.23				2185	G	
	PE-72	2.98	1.88	40.85				4924	D	
B-18	PE-45	2.71	1.80	26.80	20.70	51.90		3031	F	
	PE-63	2.89	2.40	22.10	22.90	52.60		5119	C	
	PE-73	Faulted						6619	C	
	PE-74	3.59	2.62	38.86				3804	E	
	BOREHOLES NORTH OF DYKE									
B-19	PE-56	DYKE								
	PE-33	DYKE								
B-20	NIL									
B-21	PE-28	3.26	3.78	21.58						
	PE-39	3.76	4.40	34.43				5403	C	
B-22	NIL							3541	E	
B-23	PE-51	Faulted								
	PE-58	3.70	1.91	39.18						
	PMD-48	Faulted						3230	F	0.21 Band
B-24	NIL									
B-25	PE-32	[illegible]								
	PE-62	[illegible]	5.37	35.21	28.00	40.60	5290	3162	E	

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Appendix IV Contd.

SEAM-II	BRAMHAPURI BLOCK									
SECTOR	BH.NO.	THICK.(m)	M%	ASH%	V M%	F.C%	C.V. kcal/kg	U.H.V. kcal/kg	GRADE	REMARKS
				SEAM IIA						
B-10	PE-78	1.50	6.07	37.88				2800	F	(0.38m CSH included.)
B-12	PE-2	0.96	6.40	38.30				2869	F	
				SEAM IIB						
B-5	PE-40	1.79	8.25	31.49				3834	E	(0.16 m band included)
	PKCS-33	1.08	8.45	13.32				6304	B	
B-8	PKCS-6	1.76	7.56	16.38				6734	B	
B-9	PE-77	1.46	8.43	25.14				4267	D	
B-10	PE-9	1.44	8.30	18.30	28.00	44.40		5391	C	
B-11	PE-6	1.78	2.07	39.44				3172	F	(if 0.45 m band is added)
B-12	PE-41	0.93	5.87	22.09				5050	C	
	PE-86	1.26	6.11	15.98				5889	B	
B-13	PE-87	1.36	10.70	14.70	27.20	47.40	5680	5395	C	
B-15	PE-5	1.12	7.20	28.10	22.20	42.50	4680	4029	E	
	PE-7	1.42	4.60	14.30	30.90	50.30		6308	A	
	PE-38	1.41	3.62	18.57				6128	B	
B-18	PE-34	1.68	2.84	17.69				5629	B	
	PE-59	1.16	5.40	20.40	20.00	46.20		5340	C	
	PE-65	1.51	5.10	24.49				4617	D	
B-17	PE-72	1.51	5.38	16.02				5671	B	
				SEAM IIA+IIB						
B-6	PE-80	1.62	7.10	21.50	26.90	45.50		4953	C	(II B – band)
B-11	PE-37	1.90	5.49	21.93				5120	C	
B-13	PE-70	1.50	4.48	18.84				5860	B	
B-15	PE-35	2.03	8.00	17.78				6020	B	
B-17	PE-64	1.31	5.74	16.09				5887	B	
	PE-71	2.60	3.67	20.82				5507	C	
B-16	PE-46	1.67	1.80	14.50	28.10	56.60		6861	A	
	PE-83	1.30	2.70	20.70	24.80	52.00		5671	B	
	PE-74	1.24	5.24	16.15				6872	B	
B-21	PE-28	2.45	3.27	13.55				6679	A	
	PE-39	1.83	5.74	16.07				5890	B	
B-28	PE-88	2.17	2.34	17.86				6140	B	
B-25	PE-82	2.20	5.00	18.40	31.00	47.60	5085	5847	B	

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Appendix IV contd

SEAM-III		BRAMHAPURI BLOCK								
SECTOR	BH NO	THICK.(m)	M%	ASH%	V.M%	F.C%	C.V. kcal/kg	U.H.V. kcal/kg	GRADE	REMARKS
B-10	PE-6	1.63	8.30	16.60	30.60	44.50		5464	C	
	PE-73	2.00	8.37	20.37				4934	D	
B-15	PE-6	1.51	11.00	16.90	26.90	43.20	5165	4774	D	
	PE-7	1.82	3.90	18.80	29.80	47.50		5767	B	

SEAM-V B		BRAMHAPURI BLOCK								
SECTOR	BH.NO.	THICK.(m)	M%	ASH%	V.M%	F.C%	C.V. kcal/kg	U.H.V kcal/kg	GRADE	REMARKS
B-5	PE-40	1.66	6.20	16.48				5770	B	
	PE-60	2.41	5.90	18.30	27.90	47.90		5580	C	
	PKCS-33	2.16	8.11	16.48				5507	C	
B-10	PE-8	1.58	7.10	10.00	27.40	48.50		5712	B	
	PE-76	2.06	6.82	20.45				5123	C	
B-13	PE-87	1.83	8.60	25.60	27.30	27.40	5625	4029	E	
B-21	PE-26	1.41	6.05	13.78				6061	B	

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Appendix IV contd.

SEAM IV — BRAMHAPUR BLOCK

SECTON	BH.NO	THICK.(m)	M%	ASH%	V.M%	F.C%	C.V. kcal/kg	U.H.V. kcal/kg	GRADE	REMARKS
B-5	PE-40	1.10	8.66	14.82				5950	B	
	PE-60	1.17	9.40	13.40	31.20	49.00		6160	B	
	PKCS-33	2.64	7.06	21.69				4936	D	
B-6	PKCS-9	1.49	7.16	16.98				5708	B	
B-9	PE-77	2.61	7.58	20.79				4985	C	C.05 Band
B-10	PE-6	1.78	8.80	14.30	31.50	49.40		5712	B	
	PE-78	2.82	8.73	14.01				5782	B	
B-11	PE-37	2.32	8.99	16.50				5796	B	
	PE-41	2.48	7.36	17.30				5487	C	
B-12	PE-2	1.19	7.70	18.20				5329	C	
	PE-66	Faulted								
B-13	PE-67	0.80	8.70	28.80	28.10	43.40		4907	C	
	PE-70	1.77	6.82	15.09				6014	B	
B-16	PE-5	2.37	5.90	14.00	31.40	46.70	6110	6164	B	
	PE-7	1.89	5.10	17.30	28.60	49.05		5809	C	
	PE-35	Faulted								
	PE-36	2.10	8.74	19.39				5708	B	
B-16	PE-34	1.62	5.10	14.89				6128	C	
	PE-69	2.39	4.70	28.40	24.20	44.70	6165	4808	D	
	PE-65	1.76	8.20	20.10				4896	D	
B-17	PE-64	2.12	2.44	14.64				6516	A	
	PS-71	1.58	2.94	21.37				5545	D	
	PE-72	0.85	3.43	24.10				5046	C	
B-18	PE-46	1.70	1.70	19.70	25.10	53.50		5947	B	
	PE-63	3.49	5.90	19.50	27.20	47.40		5395	C	
	PE-73	Faulted								
	PE-74	1.26	1.54	21.20				5786	B	
				BOREHOLES NORTH OF DYKE						
B-19	PE-58	DYKE								
	PE-33	DYKE								
B-20	NIL									
B-21	PE-29	1.58	3.61	28.64				4450	D	0.14 Band
	PE-38	2.44	4.01	26.65				4960	C	0.07 Band
B-22	NIL									
B-23	PE-61	Faulted								
	PE-59	Faulted								
	PMD-48	0.52								
B-24	NIL							Visual		
B-25	PE-32	Faulted								
	PE-62	1.26	1.10	33.50	27.40	40.00	4730	3711	E	

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Appendix IV contd.

SECTOR	BH.NO.	THICK.(m)	M%	ASH%	V.M%	F.C%	C.V. kcal/kg	U.H.V. kcal/kg	GRADE	REMARKS
BEAM V	BRAMHAPURI BLOCK									
B-5	PE-40	1.72	6.32	17.54				5607	B	
	PE-60	2.00	6.30	18.80	27.60	46.30	5326	5328	C	
	PKCS-33	1.28	6.62	14.07				6045	D	
B-6	PKCS-9	1.85	4.75	19.05				5618	B	0.21 Band
B-9	PE-77	1.60	6.39	13.98				6172	B	
B-10	PE-8	1.53	5.67	14.36				6108	B	
	PE-78	1.78	7.85	13.81				6911	B	
B-11	PE-37	1.82	5.82	17.73				5650	B	
	PE-41	0.56	5.57	15.34				5904	B	
B-12	PE-2	1.73	6.98	15.69				5785	B	
	PE-66	Faulted								
B-13	PE-67	1.45	8.10	22.50	25.00	44.40	5185	4617	D	0.10 Band
	PE-70	1.65	4.85	14.47				6234	A	
B-15	PE-5	2.03	5.80	14.00	31.40	48.70	6110	6154	B	
	PE-7	1.47	4.60	14.10	30.20	51.10		6319	A	
	PE-35	2.73	4.21	21.04				5416	C	
	PE-39	2.02	4.75	12.18				6656	A	
B-16	PE-34	1.22	4.96	25.06				4648	D	0.37 Band
	PE-59	0.99	4.30	39.60	20.40	35.20	4040	2773	F	
	PE-85	1.54	7.60	15.10				5707	B	
B-17	PE-64	1.36	5.20	18.61	28.30	48.00		5526	B	
	PE-71	1.23	4.46	24.54				3547	C	
	PE-72	1.95	6.80	18.93				5349	C	
B-18	PE-45	2.78	3.67	22.87				5210	C	0.10 Band
	PE-63	2.94	8.50	16.20	29.70	47.60		5767	B	
	PE-73	Faulted								
	PE-74	2.05	5.40	17.81				5697	B	
BOREHOLES NORTH OF DYKE										
B-19	PE-68	DYKE								
	PE-33	DYKE								
B-20	NIL									
B-21	PE-28	2.87	4.57	12.00				6613	A	
	PE-36	2.46	4.84	22.76				5093	C	0.05 Band
B-22	NIL									
B-23	PE-61	Faulted								
	PE-86	1.51	3.84	22.16				5298	C	
	PMD-48	3.42						Visual		
B-24	NIL									
B-25	PE-32	Faulted								
	PE-62	3.28	4.30	15.30	24.80	52.80		5761	B	

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APPENDIX – VA

BRAHMAPURI UNDERGROUND BLOCK

Geological Reserves of Seam IC (Revised Thickness)

NGR (Mt) = Area (Ha) x Thickness (m) x Sp. gravity x 0.9 ÷ 100

A. North of Dyke

Sl. No.	Sector	Area (Ha)	Thickness (m)	Sp. Gravity (grade of coal)	Reserves (Mt)	Remarks
1.	19	4.72	3.00	1.55 (D)	0.197	Unapproachable
2.	20	Negligible	- No borehole – downthrown by fault -			
3.	21	43.12	3.50@	1.55 (D)	2.105	
4.	22	1.36	- No borehole small area – 20m down throw			
5	23	10.688	3.70@	1.55 (D)	0.551	
6.	24	5.76	3.50@	1.55 (D)	0.281	
7.	25	12.30	3.79@	1.55 (D)	0.650	
	Sub-Total	**77.948 say 78 Ha**	**3.48**		**3.784**	

Note : @ indicates revised thickness combining seam IC and IB.

B. South of Dyke

Sl. No.	Sector	Area (Ha)	Thickness (m)	Sp. Gravity (grade of coal)	Reserves (Mt)	Remarks
1.	5	46.416	3.23	1.50 (C)	2.024	
2.	6	3.680	3.41	1.50 (C)	0.169	area small and faulted
3.	7	1.184	3.30	1.50 (C)	0.053	area small and faulted
4	8	4.880	3.07	1.50 (C)	0.202	area small and faulted
5.	9	7.632	3.42	1.50 (C)	0.352	
6	10	25.696	3.35	1.50 (C)	1.162	
7.	11	16.640	3.18@	1.55 (D)	0.738	
8.	12	11.856	3.13	1.50 (C)	0.501	
9.	13	17.312	3.40	1.50 (C)	0.795	
10.	14	2.00	3.10	1.50 (C)	0.084	area too small and faulted
11.	15	33.424	3.21@	1.55 (D)	1.497	
12	16	32.032	3.00	1.50 (C)	1.297	
13.	17	25.872	3.17@	1.60 (B)	1.161	
14.	18	10.624	3.06@	1.55 (D)	0.453	
	Sub-total	**239.248**	**3.21**		**10.808**	
	A + B	**317.248**	**3.276**		**14.292**	

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APPENDIX – VC

BRAHMAPURI UNDERGROUND BLOCK

Sectorwise details of geological and panel reserves (+ 1.5m) in seam IIB

Sector	Area (Ha)	Thickness (m)	Sp. gravity (grade of coal)	Net Geological reserves (Mt)	Panel ID No.	Panel area (Ha)	Thickness grade (m)	Panel reserves (Mt)	Extractable reserves			Extraction %	
									Dev. (Mt)	Dep. (Mt)	Total (Mt)	Panel	Geol.
16	7.94	1.68	1.45 (B)	0.174	16/1	3.872	1.68(B)	0.085	0.022	0.044	0.066	60.0	37.9
					MD	1.160		0.025					
						5.032		**0.110**					
13	6.40	1.36	1.50(C)	0.117	13/1	1.16	1.50 (D)	0.024	0.012	0.024	0.036	60.0	30.8
					MD	1.74		0.036					
						2.90		**0.060**					
05	13.34	1.79	1.55(D)	0.333	5/1	2.90	1.79(D)	0.072	0.043	0.084	0.127	60.0	38.1
					5/2	2.90		0.072					
					MD	2.71		0.068					
						8.52		**0.212**					
Total	**27.68**	**1.36 to 1.79**	**B to D**	**0.624**		**16.45**	**B to D**	**0.382**	**0.077**	**0.152**	**0.229**	**60.0**	**36.7**

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APPENDIX – VD

BRAHMAPURI UNDERGROUND BLOCK

Sectorwise details of geological and panel reserves (+ 1.5m) in seam III

Sector	Area (Ha)	Thickness (m)	Sp. gravity grade of coal	Net Geological reserves (Mt)	Panel area (Ha)	Thickness (m)	Sp. gravity (grade)	Panel reserves (Mt)	Extractable reserves			Extraction %	
									Dev. (Mt)	Dep. (Mt)	Total (Mt)	Panel	Geol.
B-16	5.000	1.70	1.55(D)	0.118									
B-15	15.712	1.67	1.50(C)	0.354	17.617	1.67	1.55(D)	0.410	0.083	0.163	0.246	60	69.5
B-14	1.936	1.50	1.55(D)	0.041	area too small – faulted								
B-13	4.512	1.63	1.50(C)	0.099									
B-12	12.240	1.75	1.525(C/D)	0.294									
B-11	6.352	1.50	1.50(C)	0.129									
B-10	17.840	1.75	1.525(C/D)	0.428	18.005	1.75	1.55(D)	0.440	0.089	0.175	0.264	60	61.7
B-9	7.704	1.68	1.55(D)	0.180									
B-5	2.552	1.50	1.50(C)	0.052									
Total	**71.912**	**1.50 to 1.70**	**1.50(C) to 1.55 (D)**	**1.654**	**35.622**	**1.71**	**1.55(D)**	**0.850**	**0.172**	**0.338**	**0.510**	**60**	**30.1**

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APPENDIX – VE

BRAHMAPURI UNDERGROUND

Sectorwise and Seamwise Geol. Reserves.

Seam IVA (+ 1.5m thickness)

A. North of Dyke

Sl. No.	Sector	Area (Ha)	Thickness (m)	Sp Gravity (grade of coal)	Reserves (Mt)	Remarks
1.	B-19	4.08	1.59	1.50(C)	0.109	unapproachable
2.	B-20	-	-	-	-	
3.	B-21	37.89	2.21	1.50(C)	1.130	
4.	B-22	-	-	-	-	
5.	B-23	4.65	1.80(?)	1.50(C)	0.113	Thickness not confirmed
6	B-24	-	-	-	-	
7.	B-25	-	-	-	-	
	Sub-Total	**46.62**	**2.15(?)**		**1.352**	

B. South of Dyke

Sl. No.	Sector	Area (Ha)	Thickness (m)	Sp Gravity	Reserves (Mt)	Remarks
1.	B-5	30.19	1.67	1.50(C)	0.680	
2.	B-6	2.69	1.49	1.50(C)	0.054	area small and faulted
3.	B-7	negligible	-			area small and faulted
4.	B-8		<1.40	1.50(C)		area small and faulted
5.	B-9	7.20	2.80	1.50(C)	0.272	
6.	B-10	27.38	2.40	1.50(C)	0.887	
7	B-11	12.80	2.40	1.50(C)	0.415	
8.	B-12	12.30	1.50	1.50(C)	0.249	
9.	B-13	9.46	1.60	1.50(C)	0.204	
10.	B-14	1.73	2.50	1.50(C)	0.059	area too small and faulted
11.	B-15	32.30	2.10	1.50(C)	0.916	
12.	B-16	27.90	1.65	1.50(C)	0.621	
13.	B-17	19.61	1.60	1.50(C)	0.476	
14.	B-18	11.94	2.10	1.50(C)	0.338	
	Sub-total	**195.52**	**1.96**	1.50(C)	**6.171**	
	A + B	**242.14**	**1.995**	1.50(C)	**6.523**	
			Say 2			

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APPENDIX – VF

BRAHMAPURI UNDERGROUND

Sectorwise and Seamwise Geological Reserves.

Seam VA (+ 1.5m thickness)

A. North of Dyke

Sl No	Sector	Area (Ha)	Thickness (m)	Sp. Gravity (grade of coal)	Reserves (Mt)	Remarks
1.	B-19	-	1.36	1.45 (B)		small area between faulted dyke
2.	B-20	Negligible				
3.	B-21	44.24	2.67	1.45 (B)	1.841	
4.	B-22	0.72	(3.0)?	1.45 (B)	0.028	No borehole
5.	B-23	8.30	(2.8)?	1.45 (B)	0.303	No borehole
6.	B-24	5.90	(3.5)?	1.45 (B)	0.269	No borehole
7.	B-25	13.58	3.20	1.45 (B)	0.567	
	Sub-Total	**72.74**	**2.65**	**1.45 (B)**	**2.708**	

B. South of Dyke

Sl. No.	Sector	Area (Ha)	Thickness (m)	Sp. Gravity	Reserves (Mt)	Remarks
1.	B-5	28.46	1.67	1.45 (B)	0.565	
2.	B-6	2.69	1.85	1.45 (B)	0.065	area small and faulted
3.	B-7	Negligible	-	-		area small and faulted
4.	B-8	1.30	1.13	1.45 (B)	0.019	area small and faulted
5	B-9	7.20	1.50	1.45 (B)	0.141	
6.	B-10	29.46	1.66	1.45 (B)	0.638	
7.	B-11	12.42	1.62	1.45 (B)	0.262	
8.	B-12	12.30	1.60	1.45 (B)	0.257	
9.	B-13	14.88	1.65	1.45 (B)	0.316	
10.	B-14	1.75	2.32	1.45 (B)	0.053	area small & faulted
11.	B-15	32.55	1.80	1.45 (B)	0.765	
12.	B-16	15.42	1.80	1.45 (B)	0.362	
13.	B-17	10.40	1.80	1.45 (B)	0.244	
14.	B-18	11.28	2.60	1.45 (B)	0.383	
	Sub-total	**176.90**	**1.759**	1.45 (B)	**4.060**	
	A + B	**249.64** Say 250	**2.077**	1.45 (B)	**6.768**	

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APPENDIX – VG

BRAHMAPURI UNDERGROUND

Sectorwise and Seamwise geological Reserves

Seam VB (+ 1.5m thickness)

(As per Folio plan of GR Scale 1 : 4000)

A. North of Dyke

Sl. No	Sector	Area (Ha)	Thickness (m)	Sp. Gravity (grade of coal)	Reserves (Mt)	Remarks
1.	B-21	9.936	1.90 (PE-71)	1.50(C)	0.255	
		13.840	1.80 (PE 39)	1.45(B)	0.325	
	Sub-Total	**23.776**	**1.8 to 1.9**		**0.580**	

B. South of Dyke

Sl No.	Sector	Area (Ha)	Thickness (m)	Sp. Gravity (grade of coal)	Reserves (Mt)	Remarks
1.	B-18	1.888	1.78 (PE-63)	1.50(C)	0.045	
		3.872	1.90 (PE-71)	1.50 (C)	0.099	
		5.760			0.144	
2.	B-17	7.216	1.90 (PE-71)	1.50(C)	0.185	
3.	B-16	3.728	1.80 (PE-65)	1.40(A)	0.084	
4.	B-15	6.000	1.90 (PE-05)	1.45(B)	0.141	
5.	B-13	7.568	1.70 (PE-67)	1.60(E)	0.185	
6	B-12	7.820	1.67 (PE 2)	1.45(B)	0.170	
7.	B-11	7.232	1.50	1.50(C)	0.146	
8	B-10	30.496	2.35 (PE-6,7,8)	1.475(B/C)	0.911	
9.	B-9	7.728	2.70 (PE-3)	1.50(C)	0.281	
10.	B-8	2.592	2.0	1.50(C)	0.070	area small and faulted
11.	B-5	43.104	2.20	1.50(C)	1.280	
	Sub-total	**129.248**	**1.50 to 2.70**		**3.597**	
	A + B	**153.024**	**Av. 2.02**		**4.177**	

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APPENDIX – VIA

BRAHMAPURI UNDERGROUND BLOCK

Sectorwise and Seamwise details of Panel and Extractable Reserves

Seam IC

Sector	Panel ID No.	Area (Ha)	Seam thickness (m)	Sp. gravity (grade of coal)	Panel reserves (Mt)	Depth of cover (m)	Pillar size (m x m)	Extractable reserves (Mt) Dev	Dep.	Total	Extraction percentage of Panel reserves	Geol. reserves
A. NORTH OF DYKE												
B-21	21/1	12.312	3.50	1.55(D)	0.601			0.132	0.095	0.227		
	21/2	5.400	3.50	1.55(D)	0.263			0.058	0.069	0.127		
	21/3	4.320	3.50	1.55(D)	0.211	170 to 230	34.5 x 34.5	0.047	0.111	0.158		
	21/4	3.960	3.50	1.55(D)	0.193			0.043	0.101	0.144		
	MD	2.851	3.50	1.55(D)	0.140			0.032	0.037	0.069		
Sub-total of B-21		**28.843**	**3.50**	**1.55(D)**	**1.408**			**0.312**	**0.413**	**0.725**	**51.5**	**34.4**
B-23	23/1	0.968	3.70	1.55(D)	0.050							
	23/2	2.323	3.70	1.55(D)	0.120	250 to 290	45 x 45					
	MD	0.774	3.70	1.55(D)	0.40							
Sub-total of B-23		**4.065**	**3.70**		**0.210**			**0.034**	**0.117**	**0.151**	**71.9**	**27.4**
B 24	24/1	2.710	3.50	1.55(D)	0.132	280 to 300	45 x 45	0.023	0.072	0.095	71.9	33.8
B-25	25/1	4.453	3.79	1.55(D)	0.235							
	25/2	1.742	3.79	1.55(D)	0.082	270 to 300	45 x 45					
	MD	1.549	3.79	1.55(D)	0.089							
Sub-total of B-25		**7.744**	**3.79**		**0.409**			**0.065**	**0.205**	**0.270**	**66.0**	**41.5**
Total of A		**43.362**	**3.57**	**1.55(D)**	**2.159**	**170 to 300**		**0.434**	**0.807**	**1.241**	**57.5**	**32.8**
B. SOUTH OF DYKE												
B-18	18/1	1.162	3.06	1.55(D)		220						
	18/2	5.033	3.06	1.55(D)		260	45 x 45					
	MD	0.774	3.05	1.55(D)		200						
Sub-total of B-18		**6.969**	**3.06**		**0.297**			**0.059**	**0.121**	**0.180**	**60.6**	**39.7**
B 17	17/1	6.970	3.27	1.60(E)								
	17/2	2.904	3.27	1.60(E)		210 to 200	45 x 45					
	17/3	3.485	[illegible]	1.60(E)								
	MD	0.774	[illegible]	1.60(E)								
Sub-total of B-17		**14.133**	[illegible]		**0.645**			**0.123**	**0.274**	**0.397**	61.5	33.6

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Appendix-VIA, Contd.....

Sector	Panel ID No.	Area (Ha)	Seam thickness (m)	Sp. gravity (grade of coal)	Panel reserves (Mt)	Depth of cover (m)	Pillar size (m x m)	Extractable reserves (Mt)			Extraction percentage of	
								Dev.	Dep.	Total	Panel reserves	Geol. reserves
B-16	16/1	9.456	3.0	1.50(C)								
	16/2	10.842	3.0	1.50(C)		250 to 230	45 x 45					
	MD	1.549	3.0	1.50(C)								
Sub-total of B-16		**21.877**	**3.0**	**1.50 (C)**	**0.856**			**0.179**	**0.353**	**0.532**	**60.0**	**41.00**
B-15	15/1	18.480	3.21	1.55(D)								
	15/2	2.517	3.21	1.55(D)		240 to 230	45 x 45					
	MD	0.387	3.21	1.55(D)								
Sub-total of B-15		**21.384**	**3.21**	**1.55(D)**	**0.957**			**0.181**	**0.407**	**0.588**	**61.4**	**39.3**
B-13	13/1	1.742	3.40	1.50(C)								
	13/2	8.518	3.40	1.50(C)		250 to 220	45 x 45					
	MD	1.62	3.40	1.50(C)								
Sub-total of B-13		**11.422**	**3.40**	**1.50 (C)**	**0.524**			**0.093**	**0.237**	**0.330**	**63.0**	**41.5**
B-12	**12/1**	**7.744**	**3.13**	**1.50(C)**	**0.327**	**280 to 260**	**45 x 45**	**0.063**	**0.133**	**0.196**	**60.0**	**39.1**
B-11	11/1	6.970	3.18	1.55(D)		240 to 220	45 x 45					
	MD	0.387	3.18	1.55(D)								
Sub-total of B-11		**7.357**	**3.18**	**1.55 (D)**	**0.326**			**0.062**	**0.135**	**0.197**	**60.4**	**26.7**
B-10	10/1	17.301	3.35	1.50(C)		220 to 250	45 x 45					
	10/2	1.355	3.35	1.50(C)								
Sub-total of B-10		**18.656**	**3.35**	**1.50(C)**	**0.844**			**0.153**	**0.374**	**0.527**	**62.4**	**45.3**
B-9	**9/1**	**5.227**	**3.42**	**1.50(C)**	**0.241**	**200 to 240**	**45 x 45**	**0.043**	**0.109**	**0.152**	**63.1**	**43.2**
B-5	5/1	2.165	3.23	1.50(C)			45 x 45					
	5/2	7.251	3.23	1.50(C)			45 x 45					
	5/3	5.350	3.23	1.50(C)		190 to 260	45 x 45					
	5/4	8.342	3.23	1.50(C)			45 x 45					
	MD	2.710	3.23	1.50(C)			45 x 45					
Sub-total of B-5		**25.818**	**3.23**	**1.50(C)**	**1.126**	**1690 to 260**	**45 x 45**	**0.211**	**0.472**	**0.683**	**60.6**	**33.7**
Total of B		**140.587**	**3 to 3.42**	**1.5 to 1.6**	**6.173**	**200 to 280**	**45 x 45**	**1.167**	**2.615**	**3.782**	**61.3**	**36.0**
Total A + B		**183.949**	**3 to 3.**	**50 to 1.60 (C to D) generally C/D**	**8.332**	**170 to 300**	**34.5 x 34.5 and 45 x 45**	**1.601**	**3.422**	**5.023**	**60.3**	**35.1**

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APPENDIX – VIB

BRAHMAPURI UNDERGROUND BLOCK
Sectorwise and Seamwise details of Panel and Extractable Reserves
Seam IIA

Sector	Panel ID No.	Area (Ha)	Seam thickness (m)	Sp. gravity (grade of coal)	Panel reserves (Mt)	Depth of cover (m)	Pillar size (m x m)	Extractable reserves (Mt) Dev.	Dep.	Total	Extraction % Panel reserves	Geol. reserves
A. NORTH OF DYKE												
B-21	21/1	12.312	2.14	1.45(B)	0.341	173 to 230	34.5 x 34.5	0.090	0.038	0.128		
	21/2	5.400	2.14	1.45(B)	0.151			0.039	0.028	0.067		
	21/3	4.320	2.14	1.45(B)	0.120			0.031	0.044	0.075		
	21/4	3.960	2.14	1.45(B)	0.110			0.028	0.041	0.069		
	MD	2.851	2.14	1.45(B)	0.080			0.020	0.015	0.035		
Sub-total of B-21		**28.843**	**2.14**	**1.45(B)**	**0.805**			**0.208**	**0.166**	**0.374**	**46.5**	**31.1**
B-23	23/1	0.965	2.17	1.45(B)	0.027	250 to 290	45 x 45					
	23/2	2.323	2.17	1.45(B)	0.066							
	MD	0.774	2.17	1.45(B)	0.022							
Sub-total of B-23		**4.065**	**2.17**		**0.115**			0.023	**0.046**	**0.069**	**60.0**	**22.8**
B-24	**24/1**	**2.710**	**2.54**	**1.45(B)**	**0.090**	**280 to 300**	**45 x 45**	**0.018**	**0.036**	**0.054**	**60.0**	**28.3**
B-25	25/1	4.453	2.20	1.45(B)	0.128	270 to 300	45 x 45					
	25/2	1.742	2.20	1.45(B)	0.050							
	MD	1.549	2.20	1.45(B)	0.044							
Sub-total of B-25		**7.744**	**2.20**		**0.222**			**0.045**	0.088	**0.133**	**60.1**	**37.7**
Total of A		43.362	**2.1 to 2.5**	**1.45(B)**	**1.232**	**173 to 303**	**34.5 x 34.5 & 45 x 45**	**0.294**	0.336	**0.630**	51.1	**28.9**
B. SOUTH OF DYKE												
B-18	18/1	1.162	1.67	1.45(B)		223 to 260	45 x 45					
	18/2	5.038	1.67	1.45(B)								
	MD	0.774	1.67	1.45(B)								
Sub-total of B-18		**6.969**	**1.67**		**0.152**			0.031	**0.060**	**0.091**	**60.2**	**39.4**
B-17	17/1	1.453	1.85	1.50(C)		213 to 203	45 x 45					
	17/2	2.904	1.85	1.50(C)								
	MD	0.774	1.85	1.50(C)								
Sub-total of B-17		**8.131**	**1.85**		**0.203**			0.041	**0.081**	0.122	60.1	33.8

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Appendix-VIB, Contd.....

Sector	Panel ID No.	Area (Ha)	Seam thickness (m)	Sp. gravity /grade of coal)	Panel reserves (Mt)	Depth of cover (m)	Pillar size (m x m)	Extractable reserves (Mt)			Extraction %	
								Dev.	Dep.	Total	Panel reserves	Geol. reserves
B-16	16/2	8.710	1.75	1.45(B)	0.199	260	45 x 45	0.040	0.080	0.120	60.3	37.6
B-15	15/1	3.872	2.03	1.45(B)	0.102	270	45 x 45	0.021	0.035	0.056	54.9	43.1
B-13	13/1, 13/2 & MD	8.712	1.50	1.525(C/D)	0.179	250	45 x 45	0.036	0.071	0.107	59.8	41.1
B-11	11/1	2.710	1.96	1.50(C)	0.072	230 to 250	45 x 45	0.014	0.023	0.037	51.7	30.3
B-5	5/1, 5/2 & MD	8.518	1.79	1.55	0.213	190 to 260	45 x 45	0.043	0.080	0.123	57.7	36.9
Total of B		47.622	1.5 to 2	B to C	1.120	203 to 270	45 x 45	0.226	0.430	0.656	58.6	37.4
Total A + B		90.984	1.5 to 2.5	B to C	2.352	173 to 303	34.5 x 34.5 and 45 x 45	0.520	0.766	1.286	54.7	32.6

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Appendix-VIC

BRAHMAPURI UNDERGROUND BLOCK

Sectorwise and seamwise details of extractable reserves – Seam IIB

Sector	Geol. Reserves (Mt)	Panel ID No.	Area (Ha)	Seam thickness (m)	Sp. gravity (grade of coal)	Panel reserves (Mt)	Depth of cover (m)	Pillar size (m x m)	Extractable reserves			Extraction %	
									Dev. (Mt)	Dep. (Mt)	Total (Mt)	Panel Reserve	Geol. Reserves
16	0.174	16/1 & MD	5.03	1.68	1.45 (B)	0.110	220 to 240	45 x 45	0.022	0.044	0.066	60	37.9
13	0.117	13/1 + MD	2.90	1.50	1.55 (D)	0.060	220 to 240	45 x 45	0.012	0.024	0.036	60	30.8
05	0.333	5/1 + 5/2 + MD	8.52	1.79	1.55 (D)	0.212	210 to 240	45 x 45	0.043	0.084	0.127	60	38.1
Total	**0.624**		**16.45**			**0.382**			**0.077**	**0.152**	**0.229**	**60**	**36.7**

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Appendix-VID

BRAHMAPURI UNDERGROUND BLOCK

Sectorwise and seamwise details of extractable reserves – Seam III

Sector	Geol. Reserves (Mt)	Panel ID No.	Area (Ha)	Seam thickness (m)	Sp. gravity (grade of coal)	Panel reserves (Mt)	Depth of cover (m)	Pillar size (m x m)	Extractable reserves			Extraction %	
									Dev.	Dep.	Total	Panel Reserve	Geol. Reserves
B-15	0.354	15/1	17.62	1.67	1.55(D)	0.410	270 to 300	45 x 45	0.083	0.163	0.246	60	69.5
B-10	0.428	10/1	18.01	1.75	1.55(D)	0.440	220 to 260	45 x 45	0.089	0.175	0.264	60	61.7
Total	**1.654***		**35.63**	**1.71**	**1.55(D)**	**0.850**	**220 to 300**	**45 x 45**	**0.172**	**0.338**	**0.510**	**60**	**30.8**

*** includes sector 5,9, 11, 12, 13 and 16 which are not workable (small area and difficult access).**

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APPENDIX – VIE

BRAHMAPURI UNDERGROUND BLOCK
Sectorwise and Seamwise details of Panel and Extractable Reserves
Seam IVA

Sector	Panel ID No.	Area (Ha)	Seam thickness (m)	Sp. gravity (grade of coal)	Panel reserves (Mt)	Depth of cover (m)	Pillar size (m x m)	Extractable reserves (Mt) Dev.	Dep.	Total	Extraction % Panel reserves	Geol. reserves
A. NORTH OF DYKE												
B-21	21/1	7.056	2.21	1.50(C)	0.210			0.054	-	0.054		
	21/2	5.400	2.21	1.50(C)	0.161			0.042	0.030	0.072		
	21/3	3.485	2.21	1.50(C)	0.104	200 to 260	34.5 x 34.5	0.027	0.038	0.065		
	21/4	3.960	2.21	1.50(C)	0.118			0.031	0.044	0.075		
	MD	2.851	2.21	1.50(C)	0.085			0.022	0.016	0.038		
Sub-total of A		**22.752**	**2.21**	**1.50(C)**	**0.679**			**0.176**	**0.128**	**0.304**	**44.8**	**26.90**
B. SOUTH OF DYKE												
B-18*	18/1	1.162	1.70	1.50(C)	0.027							
	MD	0.774	1.70	1.50(C)	0.017	240 to 260	45 x 45					
Sub-total of B-18		**1.936**			**0.044**			**0.009**	**0.014**	**0.023**	**52.3**	**6.8**
B-17	17/1	5.227	1.80	1.50(C)	0.127							
	17/2	3.097	1.80	1.50(C)	0.075	245 to 245	45 x 45					
	MD	0.774	1.80	1.50(C)	0.019							
Sub-total of B-17		**9.098**	**1.80**		**0.221**			**0.045**	**0.088**	**0.133**	**60.2**	**27.9**
B-16	16/1	7.00	1.65	1.50(C)	0.156							
	16/2	10.17	1.65	1.50(C)	0.226	280 to 260	45 x 45					
Sub-total of B-16		**17.17**	**1.65**		**0.382**			**0.077**	**0.153**	**0.230**	**60.2**	**37.0**

* Small area adjacent to dyke-parting & thickness of seam require further proving

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Appendix-VIE, Contd.....

Sector	Panel ID No.	Area (Ha)	Seam thickness (m)	Sp. gravity (grade of coal)	Panel reserves (Mt)	Depth of cover (m)	Pillar size (m x m)	Extractable reserves (Mt)			Extraction %	
								Dev.	Dep.	Total	Panel reserves	Geol. Reserves
B-15	15/1	22.457	2.10	1.50(C)	0.636	290 to 310	45 x 45	0.128	0.254	0.382	60.1	41.7
B-13	13/2	6.776	1.60	1.50(C)	0.146	290 to 260	45 x 45	0.029	0.058	0.087	59.6	42.6
B-12	12/1	6.970	1.50	1.50(C)	0.141	320 to 280	45 x 45	0.028	0.056	0.084	59.6	33.7
B-11	11/1	7.160	2.40	1.50(C)	0.232	250 to 300	45 x 45	0.047	0.093	0.140	60.3	50.0
B-10	10/1	22.774	2.40	1.50(C)	0.738	240 to 300	45 x 45	0.149	0.294	0.443	60.0	50.0
B-9	9/1	4.453	2.80	1.50(C)	0.168	220 to 250	45 x 45	0.034	0.067	0.101	60.1	37.1
B-5	5/2	6.773	1.67	1.50(C)	0.153	270 to 210	45 x 45					
	5/4	6.582	1.67	1.50(C)	0.148		45 x 45					
	MD	2.710	1.67	1.50(C)	0.061		45 x 45					
Sub-total of B-5		16.065	1.67	1.50(C)	0.362	210 to 270	45 x 45	0.073	0.145	0.218	60.2	32.1
Total of B		114.859	1.5 to 2.8	1.50(C)	3.070	320	45 x 45	0.619	1.222	1.841	60.0	35.6
Total A + B		137.61	1.5 to 2.8	1.50(C)	3.749	200 to 320	34.5 x 34.5 and 45 x 45	0.795	1.350	2.145	57.2	32.88

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APPENDIX – VIF

BRAHMAPURI UNDERGROUND BLOCK

Sectorwise and Seamwise details of Panel and Extractable Reserves

Seam VA

Sector	Panel ID No.	Area (Ha)	Seam thickness (m)	Sp. gravity (grade of coal)	Panel reserves (Mt)	Depth of cover (m)	Pillar size (m x m)	Extractable reserves (Mt) Dev.	Extractable reserves (Mt) Dep.	Extractable reserves (Mt) Total	Extraction % Panel reserves	Extraction % Geol. reserves
A. NORTH OF DYKE												
B-21*	21/1	12.312	2.67	1.45(B)	0.429			0.052	0.031	0.093		
	21/2	5.400	2.67	1.45(B)	0.188			0.027	0.023	0.050		
	21/3	4.320	2.67	1.45(B)	0.150	200 to 260	34.5 x 34.5	0.032	0.036	0.058		
	21/4	3.960	2.67	1.45(B)	0.138			0.020	0.033	0.053		
	MD	2.851	2.67	1.45(B)	0.100			0.015	0.012	0.027		
Sub-total of B-21		**28.843**	**2.67**	1.45(B)	**1.005**			**0.146**	**0.135**	**0.281**	**27.9**	**18.2**
B-25	25/1	4.453	3.20	1.45(B)	0.186			0.036	0.075	0.111		
	25/2	1.742	3.20	1.45(B)	0.073	280 to 310	45 x 45	0.013	0.030	0.043		
	MD	1.549	3.20	1.45(B)	0.061			0.012	0.026	0.038		
Sub-total of B-25		**7.744**	**3.20**	**1.45(B)**	**0.323**			**0.061**	**0.131**	**0.192**	**59.4**	**33.8**
Total of A		**36.587**	**2.78**	**1.45(B)**	**1.328**	**200 to 310**		**0.207**	**0.266**	**0.473**	**35.6**	**17.5**
B. SOUTH OF DYKE												
B-18	18/1	1.161	2.60	1.45(B)	0.039							
	18/2	5.421	2.60	1.45(B)	0.184	240 to 260	45 x 45					
	MD	0.774	2.60	1.45(B)	0.026							
Sub-total of B-18		**7.356**	**2.60**	**1.45 (B)**	**0.249**	**240 to 260**	**45 x 45**	**0.050**	**0.100**	**0.150**	**60.2**	**39.2**
B-17	17/1	0.774	<1.5									
	17/2	3.097	<1.5									
	17/3	3.291	1.9	1.45(B)	0.081	245	45 x 45					
	MD	0.774	<1.5									
Sub-total of B-17		**3.291**	**1.90**		**0.081**			**0.016**	**0.026**	**0.042**	**51.8**	**17.2**
B-16	16/2	11.33	1.80*	1.45(B)	0.266							
	MD	1.55	[illegible]	1.45(B)	0.036		45 x 45					
Sub-total of B-16		**12.88**	**1.80**	**1.45(B)**	**0.302**	**260 to 280**	**45 x 45**	**0.061**	**0.119**	**0.180**	**59.6**	**49.7**

* Extractable thickness reduced [illegible] because coal has to be left on the roof to increase the thickness of parting to atleast 3m. between Seam IVA and VA

\# subject to confirmation by add[illegible]

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Appendix-VIF, Contd.....

Sector	Panel ID No.	Area (Ha)	Seam thickness (m)	Sp. gravity (grade of coal)	Panel reserves (Mt)	Depth of cover (m)	Pillar size (m x m)	Extractable reserves (Mt) Dev.	Dep.	Total	Extraction% Panel reserves	Geol. reserves
B-15	**15/1**	**23.232**	**1.80**	**1.45(B)**	**0.546**	**290 to 310**	**45 x 45**	**0.110**	**0.218**	**0.328**	**60.0**	**42.9**
B-13	13/1	1.55	1.65	1.45(B)	0.033	280 to 260						
	13/2	8.52	1.65	1.45(B)	0.184							
	MD	1.16	1.65	1.45(B)	0.025							
Sub-total B-13		**11.23**	**1.65**	**1.45(B)**	**0.242**	**260 to 280**	**45 x 45**	**0.049**	**0.096**	**0.145**	**59.9**	**45.9**
B-12	**12/1**	**6.970**	**1.60**	**1.45(B)**	**0.145**	**280 to 320**	**45 x 45**	**0.029**	**0.058**	**0.087**	**60.0**	**33.8**
B-11	**11/1**	**7.160**	**1.62**	**1.45(B)**	**0.151**	**250 to 300**	**45 x 45**	**0.031**	**0.060**	**0.091**	**60.3**	**34.7**
B-10	**10/1**	**22.77**	**1.66**	**1.45(B)**	**0.493**	**240 to 300**	**45 x 45**	**0.100**	**0.197**	**0.297**	**60.2**	**46.5**
B-9	**9/1**	**4.453**	**1.60**	**1.45(B)**	**0.087**	**220 to 250**	**45 x 45**	**0.017**	**0.035**	**0.052**	**59.8**	**36.9**
B-5	5/1	4.38	1.60	1.45(B)	0.091							
	5/2	3.26	1.60	1.45(B)	0.068							
	5/3	6.97	1.60	1.45(B)	0.145		45 x 45					
	5/4	3.59	1.60	1.45(B)	0.075							
	MD	2.71	1.60	1.45(B)	0.057							
Sub-total of B-5		**20.90**	**1.60**	**1.45(B)**	**0.436**	**210 to 270**	**45 x 45**	0.088	**0.174**	**0.262**	**60.1**	**47.2**
Total of B		120.25	1.5 to 2.6	**1.45(B)**	**2.732**	**210 to 320**	**45 x 45**	0.551	1.083	1.634	59.8	**40.2**
Total A + B		156.84	1.5 to 3.2	**1.45(B)**	**4.060**		**34.5 x 34.5 and 45 x 45**	0.758	1.349	2.107	51.9	31.2

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APPENDIX – VIG

BRAHMAPURI UNDERGROUND

Sectorwise and Seamwise details of Extractable Reserves

Seam VB

Sector	Panel ID No	Area (Ha)	Seam thickness (m)	Sp. gravity (grade of coal)	Panel reserves (Mt)	Depth of cover (m)	Pillar size (m x m)	Extractable reserves (Mt)			Extraction %	
								Dev	Dep.	Total	Panel reserves	Geol. reserves
A. NORTH OF DYKE												
B-21	21/1	8.165	1.8*	1.45(B)	0.192	200 to 230	34.5 x 34.5	0.050		0.050	26.0	8.6
B. SOUTH OF DYKE												
B-13	13/1	1.355	1.80	1.60(D)	0.035							
	13/2	0.968	1.80	1.60(D)	0.025							
	MD	1.161	1.80	1.60(D)	0.030							
Sub-total B-13		**3.484**	**1.80**	**1.60(D)**	**0.090**	**275 to 295**	**45 x 45**	**0.018**	**-**	**0.018**	**0.20**	**9.7**
B-10	**10/1**	**22.77**	**2.25**	**1.475(B/C)**	**0.680**	**250 to 310**	**45 x 45**	**0.137**	**0.272**	**0.409**	**60.1**	**44.9**
B-9	**9/1**	**3.185**	**2.70**	**1.50(C)**	**0.166**	**230 to 260**	**45 x 45**	**0.023**	**0.046**	**0.069**	**59.5**	**24.5**
B-5	5/1	4.38	2.20	1.50(C)	0.130							
	5/2	6.21	2.20	1.50(C)	0.184							
	5/3	6.97	2.20	1.50(C)	0.207							
	5/4	7.55	2.20	1.50(C)	0.224							
	MD	2.71	2.20	1.50(C)	0.08							
Sub-total of B-5		**27.82**	**2.20**	**1.50(C)**	**0.826**	**225 to 285**	**45 x 45**	**0.167**	**0.330**	**0.497**	**60.2**	**38.6**
Total of B		**57.26**	**1.8 to 2.7**	**1.45(B) to 1.6 (D)**	**1.712**	**225 to 310**	**45 x 45**	**0.345**	**0.648**	**0.993**	**58.0**	**27.6**
Total A + B		**65.425**	**1.8 to 2.7**	**1.45(B) to 1.60 (C)**	**1.904**	**200 to 310**	**34.5 x 34.5 and 45 x 45**	**0.395**	**0.648**	**1.043**	**54.8**	**25.0**

* seam thickness and coal quality to be confirmed by additional drilling.

A. K. F. Haque
Retd. C. M. D.
C. M. P. D. I., Nagpur
Mining Consultant, Q.C.
Phone No 0712-2651273

ANNEXURE I

No 38011/11/2006-CA-I
Government of India
Ministry of Coal

.....

New Delhi, the 16th July, 2007.

To

M/s. Pushp Steel & Mining Ltd.,
751, Ground Floor,
Kwandewelan Street,
Ajmeri Gate,
Delhi – 110 006.

Subject : Allocation of Brahampuri coal block in the State of Madhya Pradesh for captive mining of coal by M/s. Pushp Steel & Mining Ltd. for their 0.42 MT sponge iron plant in Dist. Durg, Chhattisgarh.

.....

Sir,

I am directed to refer to your request for allocation of coal block in the State of Madhya Pradesh and to state that the request of the company has been considered by the Central Government and it has been decided to allot Brahampuri coal block in WCL command area to you to meet the coal requirement for your 0.42 MT sponge iron plant in Dist. Durg, Chhattisgarh. This allocation is in pursuance of the provisions contained in Section 3(3)(a)(iii) of the Coal Mines (Nationalization) Act, 1973 and subject to the following conditions :-

i) The allocation of the Brahampuri coal block to you has been made to meet the coal requirement of your sponge iron plant in Dist. Durg, Chhattisgarh.

ii) The block is meant for captive use in their own specified end use project i.e. sponge iron production. The coal produced from the block shall not replace any coal linkages given to you by the Coal India Ltd. / its subsidiary and/or by the Singareni Collieries Company Ltd., without prior permission of this Ministry.

(P.V. S. RANA)
UNDER SECRETARY
MINISTRY OF COAL
GOVT. OF INDIA
NEW DELHI

iii) Middlings generated in the process of washing the coal shall be used for power generation in their own power plant i.e., the useable middlings/rejects generated during beneficiation shall be used captively by the allocatee. The modalities of disposal of surplus coal/middlings/rejects, if any, would be as per the prevailing policy/instruction of the government at the relevant point in time and could also include handing over such surplus coal/middling/rejects to the local CIL subsidiary or to any person designated by it at a transfer price to be determined by the Government.

iv) Coal production from the captive block shall commence within 36 months (42 months in case the area is in forest land) in case of open cast mine and in 48 months (54 months in case the area falls under forest land) in case of

underground mine from the date of this letter. The end-use project schedule and the coal mine development schedule should be modified accordingly and submitted to the Ministry within 3 months from the date of this letter. A copy of the indicative milestone chart is enclosed.

v) The company shall buy geological report from CMPDIL within six weeks from the date of this letter.

vi) The company shall submit a bank guarantee for Rs. 3.28 crores (equal to one year's royalty amount based on mine capacity of 0.36 mtpa assessed by CMPDIL, grades of coal from A to F grade and the weighted average royalty @ Rs. 91 per tonne) within three months from the date of this letter. Subsequently upon approval of mining plan the Bank Guarantee amount will be modified based on the final peak/ rated capacity of the mine.

vii) The company shall submit a mining plan for approval by the competent authority under the Central Government within six months from the date of this letter.

viii) The progress of the mine will be monitored annually with respect to the approved mining plan, which will mention the zero date. In case of any lag in the production of coal, a percentage of the bank guarantee amount will be deducted for the year. This percentage will be equal to the percentage of deficit in production for the year with respect to the rated/peak capacity of the mine, e.g., if rated/peak capacity is 100, production as per the approved mining plan for the relevant year is 50 and actual production is 35, then (50-35)/100x100 = 15% will lead to deduction of 15% of the original bank guarantee amount for that year. Upon exhaustion of the Bank Guarantee amount the block shall be liable for de-allocation/cancellation of mining lease. You shall ensure that the Bank Guarantee remains valid at all times till the mine reaches its rated capacity or till the Bank Guarantee is exhausted.

ix) No coal shall be sold, delivered, transferred or disposed of except for the stated captive mining purposes, and except with the previous approval of the Central Government.

x) Mining of coal from the allocated captive coal block shall be carried out in accordance with the applicable Statutes/Rules/Orders/Directions governing the mining of coal in the country.

xi) Those of the above conditions relevant at the time of grant of mining lease shall be included as additional conditions in the mining lease in addition to any further conditions imposed by or agreed to by the Central Government.

V. S. RAN
UNDER SECRETA
MINISTRY OF CO
GOVT. OF INDI
NEW DELHI

xii) The State Government at the time of seeking previous approval for the grant of mining lease shall submit a draft of the mining lease containing the above relevant conditions for vetting by the Central Government. The final mining lease shall be as vetted/modified by the Central Government. Any deviation from the vetted/modified draft shall render the mining lease deed *ab-initio* null and void and without effect.

2. Allocation / mining lease of the coal block may be cancelled, inter-alia, on the following grounds :-

a. Unsatisfactory progress of implementation of their end use sponge iron plant / power plant.
b. Unsatisfactory progress in the development of coal mining project.
c. For breach of any of the conditions of allocation mentioned above.

The de-allocation/cancellation of mining lease shall be without any liability to the Government or its agencies, whatsoever. Any expenses incurred by the allocatee or any right or liability arising on the allocattee out of the measures taken by him shall solely be to his account and in no way be transferred to or borne by the Government or its agencies.

3. The company may approach CMPDIL for the geological report and contact the State Government authorities concerned for the necessary permissions/clearances etc. for attaining mining rights and related matters. The arrangement of transport of coal will have to be worked out by the company in consultation with the Ministry of Railways / Ministry of Surface Transport depending on the mode of transport.

Yours faithfully,

(K.C. Samria)
Deputy Secretary

Encls. As above.

वी. एस. राणा/V. S. RANA
अवर सचिव/UNDER SECRETARY
कोयला मंत्रालय/MINISTRY OF COAL
भारत सरकार/GOVT. OF INDIA
नई दिल्ली/NEW DELHI

NNEXURE - II

CENTRAL MINE PLANING & DESIGN INSTITUTE Ltd.

(A Subsidiary of Coal India Limited)

GONDWANA PLACE, KANKE ROAD, RANCHI-834 008 (JHARKHAND)

VALID SUBJECT TO ENCASHMENT

RECEIPT NO **A** 13231

ORIGINAL

DATE 14/3/2008

Unit	010
Account	820118

Received with thanks from पुष्प स्टील्स एण्ड माइनिंग प्रा० लिमिटेड दिल्ली - 110006

by Cash/Demand Draft/Cheque No. 498762 delhi

dated 12/3/2008 on ICICI BANK the sum of

Rupees four Crore Eighty one lakh ninety Eight thousand Eight hundred thirty two Only -

against Bill No. —— dated ......

on account of Geological Report के बाबत

Rs. 48198832=00

A.K. Paul

Chief Cashier/Sr. Cashier/Cashier

(Finance Manager)

14/3/08

01638/03-04- 400 Bks. of 50x3 Lvs.

वी. एस. राणा/V. S. RANA
अवर सचिव/UNDER SECRETARY
कोयला मंत्रालय/MINISTRY OF COAL
भारत सरकार/GOVT. OF INDIA
नई दिल्ली/NEW DELHI

By Registered Post.

No.34011/(14)/2004-CLAM
Government of India
Ministry of Coal & Mines
Department of Coal

New Delhi, the 14th September, 2004.

To

Shri Anil Taneja,
Director,
Field Mining and Ispat Limited,
120, Mount Road, Sadar,
Nagpur-440 001.

Subject: Grant of recognition to Shri A. K. F. Haque as competent person to prepare Mining Plan.

Sir,

I am directed to refer to your letter No. FMIL/2004-05/P-50/08 dated 12.6.2004 on the above mentioned subject and to convey approval of the Central Govt. to grant of recognition under Rule 22© of Mineral Concession Rule, 1960 to Shri A K.F Haque as competent person to prepare mining plan for coal and lignite for any coal block up to 10 years from the date of issue of this letter.

Yours faithfully,

(Shyam Sunder)
Under Secretary to the Govt. of India.
Phone No.23389132.

ANNEXURE IV

कार्यालय जिलाध्यक्ष (खनि.शाखा) छिन्दवाड़ा (म.प्र.)

FORM D

RECEIPT OF APPLICATION for Prospecting Licence / Mining Lease or Renewals

(See rules 10 (4) and 23 (4) 29/ML/2007

Government of MADHYA PRADESH Dated 15/10/07

S.No.

Received the application with the following enclosures for a ~~prospecting Licence/~~Mining Lease/ ~~renewal of prospecting Licence/renewal of~~ Mining lease... Mining... lease.....

of Shri/Jag Mohan lal m/s... Pushp Steel & Mining (P.) Ltd

on for about 45 km Hectare of Land located

in village/Govt Forest Taluq.. Pench Kanhan Valley Coal field

District .... Chhindwara..

for ~~prospecting~~ / mining ...... Coal .... mineral/s

Enclosures : (1) I form (2) Challan (3) Authority letter (4) Board Resolution (5) Affidavit (6) MOA&AA (7) Allocation letter (8) Topo sheet of that Area

Place Chhindwara

Date 15/10/07

Signature and designation of Receiving officer

29/10/2007