Chapter - 1

INTRODUCTION

1.1 INTRODUCTION

The proposed Vishnupuri UG to OC mine is conversion of existing Vishnupuri-I UG and Vishnupuri-II UG Mine into opencast mine. The area under consideration of the present project report is constituted of two geological blocks viz. Vishnupuri Block and part of Sirgora.Block situated in Pench-Kanhan Coal Field, Chhindwara District, Madhya Pradesh. The proposed area is under jurisdiction of Pench area, WCL. In Vishnupuri block, two underground mines namely Visnupuri-I UG and Vishnupuri-II UG are being worked which are separated by faults F_5 (S) and fault F_{14}. In Sirgora block, a small opencast patch namely Kukurmunda OC was worked till the year 2000.

Brief history of different Project Reports prepared in Vishnupuri geological block are as tabulated below:-

Chronology of Previous Approved Reports

Sl. No.	**Approved Project Report**	Date of Approval	Capital Investment (Rs. Crores)	Target Capacity (Mty)
1	PR of Vishnupuri-I UG mine, March, 1989	May.,1990	12.2610	0.21
2	PR of Vishnupuri-II UG mine, Feb, 1990	Jan.,1991	15.8263	0.26

Vishnupuri – I & II UG mines were approved for target capacity of 0.21 Mty and 0.26 Mty respectively, but these mines never achieved the target capacity due to adverse geo-mining conditions. Total production achieved from Vishnupuri-I & II UG mine till March'17 since inception are 1.821 Mt and 2.491 Mt. respectively. Last year (2016-17), Vishnupuri – I and II UG mines have produces only 0.063 Mt and 0.058 Mt respectively. An opencast mine namely Kukurmunda OC was in operation in the south-west rise portion of Vishnupuri-I UG mine from 1992 - 93 to 1999 - 2000 and the total coal production and OB removal were 0.716 Mt and 3.65 Mm^3 respectively. This opencast mine was closed in 1999-2000.

Subsequently, Pench Area made a proposal for feasibility study for conversion of Vishnupuri UG mine mine into Opencast mine vide File no. WCL/ Pench/ AGM/VP I to OC/10 dated 19/01/2015 and WCL/Pench/AGM/Secy/152 dated 18/04/2015. Accordingly, WCL included the job of preparation of PR of Vishnupuri UG to OC Mine in the Annual Plan of 2017-18 of CMPDI, RI-IV, Nagpur so that a viable project could be formulated with minimum constraints.

The Conceptual note for Vishnupuri UG to OC Mine was prepared in May, 2017 and was presented and discussed with CMPDI (HQ) Ranchi on 07.07.2017 (Minutes of meeting enclosed as Annexure-I) and subsequently at WCL (HQ) on 13.07.2017. Based on the suggestions/ decisions taken in the above meetings, Draft Project Report of Vishnupuri UG to OC mine was prepared in October, 2017 for a target capacity of 1.5 Mty.The draft report was discussed on video conferencing with CMPDI HQ on 16.12.2017 (Minutes of meeting enclosed as Annexure-II) and with WCL (HQ) on 28.12.2017 (Minutes of meeting enclosed as Annexure-III).

Following major decisions were taken in the above meetings:

1. The target capacity of mine to be enhanced from 1.5 Mty to 2.0 Mty.
2. The minimum workable thickness of seam for opencast mining to be considered upto 0.5m. Accordingly, 8 nos. of seam sections will be workable in proposed Vishnupuri UG to OC Mine instead of six seam sections proposed in Draft PR.
3. Coal Handling plant to be considered on hiring/outsourcing in all the options.

1.1.1 Salient Features of Last Approved Report

The proposed Vishnupuri UG to OC Mine is conversion of existing Vishnupuri-I UG and Vishnupuri-II UG Mines in to Opencast Mines. The salient features of Project Reports of Vishnupuri - I UG and Vishnupuri - II UG Mines approved by WCL Board are tabulated below :

Sl. No.	Particulars	Project Report of Vishnupuri-I UG mine (approved on May.,1990)	Project Report of Vishnupuri – II UG Mine (approved on Jan.,1991)
A	**General Parameters**		
1	Extractable Reserves (Mt)	7.77	12.456
2	Av. Grade of Coal	'C' LF	'C' LF
3	Mine Capacity (Mty)	0.21	0.25
4	Manpower Requirement (Nos.)	945	797
5	Overall OMS (t)	0.933	1.275
B	**Financial Parameters**		
6	Total capital (Rs.in Crs.)	12.2610	6.538
7	Cost of Production (Rs./t)		
7.1	@ 100% of target capacity (Rs./t)	342.23	337.50
7.2	@ 85% of target capacity (Rs./t)	395.93	389.69
8	Av. Selling Price (Notified) (Rs./t)	350.20	350.20
9	Profit (Rs./t)		
9.1	@ 100% of target capacity (Rs./t)	(+) 7.97	(+) 12.70
9.2	@ 85% of target capacity (Rs./t)	(-) 45.73	(-) 39.49

1.2 EXPLORATION STATUS

The area under consideration of the present project report is constituted of two geological blocks viz. Vishnupuri block and part of Sirgora block. MECL took up detailed exploration in Sirgora block in 1978. Subsequently, western contiguous area of Sirgora, named as Vishnupuri block, was explored during the period between May, 1982 to June, 1984 by MECL. To assess the potentiality of western part of Shivpuri Opencast and the Kukurmunda Incline which is presently named as Vishnupuri Mine-I, the production support drilling was undertaken in 1986. Subsequently, the southern part of Vishnupuri Block area lying south of the Vishnupuri Mine-I and extending westward upto Pench River was undertaken for Production Support drilling and was named as Vishnupuri Mine-II area. Thus, the area has been explored by the MECL during several phases spanning upto Dec.'98.

1.2.1 The summary of exploration details like Series wise number of boreholes and drilling meterage considered for the present project report are given in Table below:

BH Series	Borehole No	Drilling Meterage
MPV	9	2002.80
MVPS	8	1724.90
PE	4	880.35
PEV	57	7158.15
PKCS	54	6751.90
PKR	6	1236.75
SOC	1	67.85
Total	**139**	**19822.70**

1.2.2 Density of Boreholes

Total 139 boreholes have been drilled in an area of 6.64 sq.km. The borehole density within the project area is around 21 per sq.km.

1.3 MINING ACTIVITIES

The present Project Report has envisaged conversion of existing Vishnupuri-I & II UG mines into an opencast mine. Vishnupuri – I & II UG mines were approved for target capacity of 0.21 Mty and 0.26 Mty respectively, but these mines never achieved the target capacity due to adverse geo-mining conditions. Presently, Vishnupuri –I & II UG are being worked on Bord & Pillar method of working. Four seams namely Seam-VB2, Seam –IV A, Seam –III & Seam-I C have been worked in Vishnupuri-I & II UG mine. Last year (2016-17), Vishnupuri – I and II UG mines have produces only 0.063 Mt and 0.058 Mt respectively. An opencast mine namely Kukurmunda OC was in operation in the south-west rise portion of Vishnupuri-I UG mine from 1992 - 93 to 1999 - 2000 and the total coal production and OB removal were 0.716 Mt and 3.65 Mm^3 respectively. This opencast mine was closed in 1999-2000. The brief details of the mines are as follows:

1.3.1 <u>Production</u>

The actual production from Vishnupuri – I & II UG mines and Kukurmunda OC mine since inception upto 31.03.2017 are as follows:

Year	Coal Production (T)				OB (m^3)
	Vishnupuri-I UG Mine	Vishnupuri-II UG Mine	Kukurmunda OC Mine	Total	Kukurmunda OC Mine
1992-93	0	0	19950	**19950**	165248
1993-94	24350	13620	116000	**153970**	419200
1994-95	55000	69000	112200	**236200**	454000
1995-96	69500	55600	135000	**260100**	497000
1996-97	92885	56712	136050	**285647**	478700
1997-98	82380	81208	120050	**283638**	400300
1998-99	107560	105262	70950	**283772**	387200
1999-00	112651	180409	6100	**299160**	66000
2000-01	112521	200830		**313351**	
2001-02	116180	186695		**302875**	

Year	Coal Production (T)				OB (m^3)
	Vishnupuri-I UG Mine	Vishnupuri-II UG Mine	Kukurmunda OC Mine	Total	Kukurmunda OC Mine
2002-03	131300	143435		**274735**	
2003-04	86360	112655		**199015**	
2004-05	94015	104230		**198245**	
2005-06	75430	116145		**191575**	
2006-07	66120	118535		**184655**	
2007-08	49231	115526		**164757**	
2008-09	46893	73155		**120048**	
2009-10	60880	111587		**172467**	
2010-11	61448	117180		**178628**	
2011-12	75500	129365		**204865**	
2012-13	67740	106985		**174725**	
2013-14	58800	86950		**145750**	
2014-15	49149	82848		**131997**	
2015-16	62150	64851		**127001**	
2016-17	63000	58929		**121929**	
TOTAL	**1821043**	**2491712**	**716300**	**5029055**	**2867648**

1.3.2 Manpower

Existing manpower in Vishnupuri – I & II UG mine as on 31.03.2017 is as follows:

Name of Mine	Manpower as on 31.03.2017
Vishnupuri - I UG mine	347
Vishnupuri - II UG mine	393
Total	**740**

1.3.3 Land

The total leasehold area of existing Vishnupuri-I and Vishnupuri-II UG Mine are 122.54 ha and 321.985 ha respectively. Out of this, total acquired area of existing Vishnupuri – I & II UG mine under All Right/Surface Right is 40.855 ha. For balance land, only Mining Right has been taken. In adjacent Shivpuri OC mine, the total mining leasehold area is 336.293 ha., out of which total acquired area under All Right/Surface Right is 133.098 ha.

1.4 JUSTIFICATION OF PR FOR CONVERSION FROM UG TO OC MINE

Vishnupuri –I UG and Vishnuprui-II UG mines were approved for target capacity of 0.21 Mty and 0.26 Mty capacity respectively. Due to adverse geo-mining condition, these underground mines are operating at production level much below their target production and are incurring heavy loss. In last 5 years, Vishnupuri-I UG has achieved annual production in the range of merely 0.049 Mty to 0.068 Mty and has incurred annual loss in the range of about Rs. 26 crores to Rs. 31 crores. Similarly, Vishnupuri-II UG has achieved annual production in the range of merely 0.059 Mty to 0.107 Mty and has incurred annual loss in the range of about Rs. 29 crores to Rs. 35 crores. Thus, to increase the target capacity and to reduce the heavy loss incurring in these mines, it is very essential to plan some alternative mining options.

There are huge extractable reserves available in these underground mines which need to be extracted in economical way with proper conservation of coal.

In recent years, the cut-off stripping ratio for opencast mines for economical viability has increased to a level of about 1:7 to 1:10 depending on the quality of coal because of hiring of HEMM for OB removal and/or coal extraction. Moreover, the percentage of extraction in opencast mine is much higher than UG mines and higher annual target capacity can be achieved from opencast mine. Considering the heavy loss in Vishnupuri – I & II UG mines due to adverse geo-mining conditions and availability of huge mineable reserves, WCL has decided to explore the possibility for the conversion of Vishnupuri – I & II UG mine into opencast mine and accordingly, the preparation of PR for Vishnupuri UG to OC mine was included in the Annual Plan of 2017-18.

Following benefits are envisaged by the proposed conversion of Vishnupuri – I & II UG mines into opencast mine :

i) The percentage of recovery in UG mines is very less whereas 90 to 95% reserves can be exploited by opencast mining.

ii) The production from Vishnupuri – I & II UG mines was never more than 0.13 and 0.20 Mty respectively in past. The proposed opencast mine after conversion from UG to OC may be planned for higher capacity to the tune of 1.50 Mty.

iii) Both the underground mines have incurred heavy loss in past due to adverse geo-mining condition leading to poor production and productivity. With hiring of HEMM and higher capacity, the proposed OC mine may yield better economics.

iv) WCL is planning to produce 60 Mt coal by 2019-20 to narrow the gap between demand and supply of coal. The proposed Vishnupuri – I& II UG mines will help to achieve and sustain this production target of WCL.

Thus, from conservation, target production and profitability point of view, conversion of Vishnupuri – I & II UG mines into opencast mine is justified.

1.5 SALIENT FEATURES OF PRESENT PR

1.5.1 Different Variants considered for PR Formulation

This Propject Report of Vishnupuri – I & II UG to OC mine has been prepared for the following options:

Departmental Option : Extraction of entire coal and OB by departmental HEMM.

Partial Hiring Option : Coal and Parting by departmental HEMM and Top OB by hiring of HEMM

Total Hiring Option : Entire coal and OB by hiring / out-sourcing of HEMM

1.5.2 Peak Capacity for Environmental Clearance

The target capacity of the proposed mine has been envisaged as 2.00 Mty, but the mine can achieve peak capacity of 2.50 Mty in favourable geo-mining conditions such as availability of larger strike length, flatter seam gradient, less number of rainy days in monsoon, etc. Hence, the peak capacity recommended for Environmental Clearance is 2.50 Mty.

1.5.3 Salient Features of PR

The Salient Features of the proposed Project Report of Vishnupuri UG to OC mine for Departmental option, Partial Hiring option and Total Hiring option (February, 2018) are tabulated below :

Salient Features of Project Report for Vishnupuri UG to OC Mine

Sl No.	Particulars	Depart-mental Option	Partial Hiring Option	Total Hiring Option
01	Mine Capacity (Mty)	2.0	2.0	2.0
02	Grade of Coal GCV (kCal/Kg)	4991 (G-8)	4991 (G-8)	4991 (G-8)
03	Manpower Requirement (Nos.)	882	468	180
04	Overall OMS (t)	8.589	16.188	42.088
05	Additional Capital Required (Rs. Crores)	712.42	465.67	192.63

06	Cost of Production (Rs /t)			
(a)	@ 100% of target capacity (Rs/t)	2187.04	1998.65	1508.54
(b)	@ 85% of target capacity (Rs /t)	2441.27	2164.68	1580.41
07	Av. Notified Selling Price of coal (Rs/t) For Power sectors	1865.42		
08	Profit/Loss (Rs /t) For Power sectors			
(a)	@ 100% of target capacity (Rs /t)	(-) 321.62	(-) 133.23	(-) 356.88
(b)	@ 85% of target capacity (Rs /t)	(-) 575.85	(-) 299.26	(-) 285.01
09	Financial IRR (%) For Power sectors			
(a)	At 100% capacity	(-) 20.97	(-) 13.32	27.93
(b)	At 85% capacity	(-) 27.83	(-) 5.92	21.25
10	Selling price to yield 12% IRR @ 85% capacity	2866.96	2473.60	-

1.5.4 Points to be considered under FLEXIBILITY

The Project Report of Vishnupuri UG to OC mine has been planned with the resources, information and technology available at the time of preparation of PR. However, during the implementation phase or in future, some variations from the Project Report because of availability of more information and / or

better technology, are allowed provided these variations are beneficial for the project from economical point of view and are within the approved capital of the Project.

Following variations from the approved Project Report are allowed during implementation of the project or in future :

a) The measurement of land given in the PR for acquisition purpose is based on the measurement of plots in Revenue Plan by Planimeter/Autocad as mutation land records are not available during PR preparation. However, acquisition of land is done on the basis of govt. land records (mutation records), which may slightly vary from the measurement of land given in the PR. Hence, the above variation in land measurement should be allowed.

b) The actual number of project affected families is not available at the time of PR preparation and therefore the no. of PAFs considered in this report is tentative. The number of project affected families will be firmed up only after the actual survey which may vary from the number considered in the PR. Such variation may be allowed subject to the economical viability of the PR and is within sanctioned capital.

c) The proposed method of mining in the Project Report of Vishnupuri UG to OC mine is incline slicing with shovel dumper combination. The project has a mine of 16 years and in future better technology or equipment may be available with cost and other benefits. Under such circumstances, the technology and or equipment proposed in the PR alongwith other facilities may be changed provided they are beneficial for the mine from economical point of view and are within the sanctioned capital of the project.

1.6 DIFFICULTIES AND CONSTRAINTS IN MINING WITH ASSOCIATED RISK

Following surface constraints are envisaged in the proposed Vishnupuri UG to OC mine:

1) Land Acquisition

Total land involved in proposed Vishnupuri UG to OC mine is 590.46 ha, out of which 560.76 ha is within the proposed mine boundary and rest 29.70 ha acquired land is outside mine boundary. Total 173.953 ha land (40.855 ha in Vishnupuri-I & II UG Mine and 133.098 ha in Shivpuri OC Mine) has already been acquired by WCL, out of which 144.253 ha falls within proposed mine boundary of Vishnupuri UG to OC Mine and balance 29.70 ha land is outside the proposed mine boundary. Balance 416.507 ha (560.76 ha – 144.253 ha) is proposed to be acquired which involves 189.893 ha tenancy land, 103.942 ha govt. land and remaining 122.672 ha forest land. Forest clearance for the proposed mine is time consuming activity. Acquisition of land is also one of the major surface constraints without which no development work can be started.

2) Village Shifting & Rehabilitation

Kukurmunda village is located in the proposed quarry area which have to be shifted and rehabilitated for quarry operation. The total number of houses in this village is about 131. Shifting and rehabilitation of these houses is critical activity for mine development.

3) Thick Basalt Trap

The proposed Vishnupuri UG to OC mine is overlain by thick cover of Basalt Trap which is very hard and requires more blasting resulting into low powder factor. About 70 % of the total OB in proposed Vishnupuri UG to OC mine is basalt trap. The cost of OB removal becomes high due this basalt trap which is one of the major constraint for the development of proposed opencast mine.

4) Nala Diversion

Few seasonal nallas flow across proposed quarry area which are required to be diverted. The route of diversion will be decided after survey of existing nallas. Adequate capital provisioning for above diversion has been provided in the Project Report.

5) Diversion of Road

A WCL road from Parasia to Shivpuri is passing over the proposed quarry area and needs to be diverted for the proposed project. About 2.5 km Diversion of

this road is proposed and tentative location is shown in Quarry & Surface Layout Plan.

6) Water Supply

Presently, water is supplied to Shivpuri Colony from water reservoir in the void of Kukurmunda OC. It is proposed in this report to include Kukurmunda OC mine area in the quarry of Vishnupuri UG to OC mine. Therefore, another source of water for Shivpuri colony such as reservoir of Haranbhata OC will have to be utilized. This will require about 10 km pipe line from Haranbhata OC reservoir to Shivpuri colony which is a critical activity.

7) 3.3 kV HT Line Diversion

One 3.3 kV HT Line is passing through the proposed quarry area which will have to diverted. Adequate capital has been provided in the report for this diversion.

8) Extraction of Developed Pillars (Vishnupuri I and II UG Mine)

Major portion of Vishnupuri – I & II UG mine area falling within the proposed Vishnupuri UG to OC mine has been developed by underground method of mining. It is proposed in this report to extract developed pillars (underground workings) by opencast mining. To eliminate the danger due to falling of equipment into developed galleries, a method of controlled blasting to fill-up the galleries will have to be adopted. Exposed underground galleries have to be blanketed by OB material to avoid occurrence of fire.

9) Deployment of underground manpower

The existing manpower as on 31.03.2017 in Vishnupuri-I & II UG mine are 347 and 393 respectively. Considering retirement of existing manpower @ 4% per annum, the total existing manpower in Vishnupuri-I & II UG mine as on 31.03.2021 will be 295 and 334 respectively. In this PR, the manpower proposed for departmental option, Partial hiring and total hiring is 882, 468 and 180 respectively.

Manpower generated in lieu of land compensation will also add up the surplus manpower. Deployment of these surplus manpower in others mines of Pench Area or others areas of WCL is a critical activity.

10) Slope Stability of Internal and External Dumps

Maximum height of external OB dump has been proposed as 90 m which requires proper layout of slopes and benches. The overall slope angle of external dump works out to 27 degree. Stability of internal and External Dump is very important and needs proper care.

Adequate provision has been made while preparing PR to overcome these constraints. Moreover, provision for scientific studies on slope stability of External and Internal Dump etc. has been made in this report.

1.7 PROJECT OBJECTIVES AND TARGET BENEFICIARIES

1.7.1 Objective of the Project

The main objectives of the proposed Vishnupuri – I & II UG to OC mine are as follows:

a) To enhance the production to 2.00 Mty by conversion of existing of Vishnupuri –I & II UG mine to an opencast mine and to bridge the gap between demand and supply of coal.

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

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

d) Socio-economic development of the area.

1.7.2 Target Beneficiaries

The target beneficiaries of the proposed Vishnupuri UG to OC project are the following stakeholders.

a) Company

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

b) The Community

The community is one of the major stakeholders and it includes landholders, local business and service providers, neighbors and nearby residents, local government and NGOS and community groups. The land holders are given suitable compensation for their lands in addition to the land cost. Various welfare activities for the uplift of land losers and other community are taken up under the project.

The proposed project will bring development in the area and its neighborhood and nearby residents will be benefited by the job opportunities created by the project. The local business and service providers will also be benefited due to several ancilliary activities generated due to this project.

c) The State

The State Government, the Central Government and various concerned Government agencies are also the target beneficiaries of the proposed project.

The State Government will get royalty for the coal produced. The creation of various job opportunities and various development activities carried out under the project will ultimately benefit the State Government.

The Central Govt. being the owner of CIL & WCL, the profit earned by the project will ultimately be the profit of Central Government. Moreover, the tax paid on the income will add the revenue income of the Central Government.

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Chapter - 2

MARKETABILITY & JUSTIFICATION

2.1 INTRODUCTION

The mines of WCL are under constant pressure to meet the increasing demand of non-coking coal for power houses and other bulk consumers from Western as well as Southern part of country. The proposed project is located in Vishnupuri and part of adjacent Sirgora Geological Block of Pench Area in Chhindwara district of Madhya Pradesh. The justification of this mine has been studied in the light of estimated demand for non-coking coal from power sector and production forecast from existing, completed, ongoing and future projects of WCL.

2.2 DEMAND OF COAL

The year wise FSA/LOA commitment of WCL upto 2020-21 is detailed below :-

SL. NO.	PARTICULARS	FSA / LOA COMMITMENT AS ON 01.08.2017 (Mt)								
		Applic-able Trigger Level	2017-18		2018-19		2019-20		2020-21	
			FSA Qty.	Qty. at Trigger Level	FSA Qty.	Qty. at Trigger Level	FSA Qty.	Qty. at Trigger Level	FSA Qty.	Qty. at Trigger Level
A)	**EXISTING COMMITMENTS THROUGH FSAs & MOUs**									
1	Old Power Producers existing as on 31.03.2009 with whom FSAs have been signed	90 %	30.628	27.566	30.628	27.566	30.628	27.566	30.628	27.566
2	Past Commitment of Non Power Sector except Cokeries with whom FSAs are signed prior to 31.12.2011 & Commitment of Bhilai Steel Plant from Nandan washery	60 %	4.998	2.999	4.998	2.999	4.998	2.999	4.998	2.999
3	Past Commitment of Cokeries with whom FSAs are signed prior to 31.12.2011	30 %	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	New Non-power FSA executed	50 %	0.702	0.351	0.702	0.351	0.702	0.351	0.702	0.351
5	Cost Plus FSAs with Wardha Power Co. Ltd.	90 %	1.625	1.463	1.625	1.463	1.625	1.463	1.625	1.463
6	New Power FSA executed with MPPGCL on 02.01.2013, with NTPC on 04.09.2013, with VIPL on 10.03.2014 and Mahagenco (as per IMTF's recommendations) on 27.04.2015	75% for 16-17 onwards	9.271	6.953	9.271	6.953	9.271	6.953	9.271	6.953

SL. NO.	PARTICULARS		FSA / LOA COMMITMENT AS ON 01.08.2017 (Mt)							
			2017-18		2018-19		2019-20		2020-21	
			FSA Qty.	Qty. at Trigger Level	FSA Qty.	Qty. at Trigger Level	FSA Qty.	Qty. at Trigger Level	FSA Qty.	Qty. at Trigger Level
7	Bridge Linkage with Mahagenco		8.678	8.678	3.623	3.623	0.000	0.000	0.000	0.000
8	GSECL MOU		4.200	4.200	0.000	0.000	0.000	0.000	0.000	0.000
9	NTPC one time supply of 2.0 Lakh tonnes for commissioning & trial run of Unit IV, Stage-II		0.200	0.200	0.000	0.000	0.000	0.000	0.000	0.000
10	TANGEDCO Commitment	90%	0.500	0.450	0.500	0.450	0.500	0.450	0.500	0.450
11	Linkage Auction Commitments Tranche-I	75 %	1.643	1.232	1.643	1.232	1.643	1.232	1.643	1.232
12	Linkage Auction Commitments Tranche-II	75 %	1.312	0.984	1.312	0.984	1.312	0.984	1.312	0.984
	TOTAL (A) EXISTING COMMITMENTS THROUGH FSAs AND MOUs		**63.757**	**55.075**	**54.302**	**45.620**	**50.679**	**41.997**	**50.679**	**41.997**
B)	**LOA COMMITMENT**									
1	Commitment of Power Plants achieved milestones and appearing in list circulated by MOC vide letter dated 17.07.2013	75% for 16-17 onwards	1.373	1.030	1.373	1.030	1.373	1.030	1.373	1.030
2	NTPC Telangana Cost Plus Tapering LOA for First year (2019-20) – 75%, Second year (2020-21) – 50%, Third year (2021-22) – 25%	90 %	0.000	0.000	5.688	5.119	5.688	5.119	4.266	3.839
3	Wardha Power Cost Plus	90 %	0.635	0.572	0.635	0.572	0.635	0.572	0.635	0.572
	TOTAL (B) FSA TO BE EXECUTED		**2.008**	**1.601**	**7.696**	**6.720**	**7.696**	**6.720**	**6.274**	**5.441**
C)	**OTHER LOA HOLDERS**									
1	Power Utility not achieved milestones and not appearing in MoC letter dated 17.7.2013 or achieved milestones but not appearing in Moc letter dated 17.7.2013	75% for 16-17 onwards	9.469	7.102	9.469	7.102	9.469	7.102	9.469	7.102
2	CPP LOA Holders	50 %	0.621	0.311	0.621	0.311	0.621	0.311	0.621	0.311
3	Sponge LOA Holders achieved minlestones	50 %	0.144	0.072	0.144	0.072	0.144	0.072	0.144	0.072
4	Cement LOA Holders not achieved milestones but BIFR Court directed not to take coercive action	50 %	0.042	0.021	0.042	0.021	0.042	0.021	0.042	0.021
	TOTAL (C) OTHER LOA HOLDERS		**10.276**	**7.505**	**10.276**	**7.505**	**10.276**	**7.505**	**10.276**	**7.505**
	TOTAL FSA/LOA COMMITMENT (A+B+C)		**76.041**	**64.181**	**72.274**	**59.845**	**68.651**	**56.222**	**67.229**	**54.943**
D)	**SPOT E-AUCTION**		**5.000**	**5.000**	**5.500**	**5.500**	**6.000**	**6.000**	**6.000**	**6.000**
E)	**OTHER AUCTIONS (Exclusive/Special Forward/ Special Spot etc.**		**4.845**	**4.845**	**5.000**	**5.000**	**5.500**	**5.500**	**5.500**	**5.500**
	GRAND TOTAL (A+B+C+D+E)		**85.886**	**74.026**	**82.774**	**70.346**	**80.151**	**67.723**	**78.729**	**66.443**

The above table indicates that WCL has a FSA/LOA commitment of 76.041 Mt, 72.274 Mt, 68.651 Mt and 67.229 Mt at 100% supply for the year 2017-18, 2018-19, 2019-20 & 2020-21 respectively. The FSA/LOA commitment at trigger level are 64.181 Mt, 59.845 Mt, 56.222 Mt and 54.943 Mt for the year 2017-18, 2018-19, 2019-20 and 2020-21 respectively. In addition to this, the coal supply through Spot Auction and Other Auctions (Exclusive/ Special Forward / special Spot etc.) is envisaged as 9.845 Mt, 10.50 Mt, 11.50 Mt and 11.50 Mt in 2017-18, 2018-19, 2019-20 and 2020-21 respectively.

2.3 Availability of Coal

CIL is planning for 1 Billion Tonnes Coal production by 2019-20 and the share of WCL is 60 Mt in this 1 BT planned production. The following table shows the availability of coal from the existing, completed, on-going and future mines of WCL:

Sl. No.	Sector	Projections of Availability of Coal (Mt)		
		2017-18	2018-19	2019-20
1	Existing mines	0.290	0.00	0.00
2	Completed projects	10.955	9.85	7.93
3	On-going projects	37.255	45.15	52.07
4	Future projects	0.00	0.00	0.00
	Total	**48.50**	**55.00**	**60.00**

2.4 Deficit in Availability of Coal from WCL

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

Sl. No.	Sector	Projections of Surplus / Deficit of Coal (Mt)		
		2017-18	2018-19	2019-20
1	Total FSA/LOA Commitment + proposed E-Auction	85.886	82.774	80.151
2	Availability of coal	48.50	55.00	60.00
3	Surplus / Deficit (+/-)	(-) 37.386	(-) 27.774	(-) 20.151

From the above table, it is clear that the deficit in supply of coal from WCL is 37.386 Mt in 2017-18 which will be narrowed down to 20.151 Mt in 2019-20 if WCL achieves the target capacity of 60Mt in 2019-20.

2.5 UTILITY OR MARKET FOR THE COAL FROM MINE / PROJECT

The mines of WCL are under constant pressure to meet the increasing demand of non-coking coal for power houses and other bulk consumers from Western as well as Southern part of country. The justification of this mine has been studied in the light of estimated demand for non-coking coal from power sector and production forecast from existing, completed, ongoing and future projects of WCL.

The marketing of non-coking coal produced from proposed Vishnupuri UG to OC mine will not be a problem as there is a readily available market. There is huge demand of coal from power sector and the coal may be supplied to the power houses of MPPGCL / MSEDCL / NTPC or captive power houses. Also there are many miscellaneous industries which can utilize the coal produced from Vishnupuri UG to OC mine.

2.6 AVAILABLE LINKAGE OR FIRM FUEL SUPPLY AGREEMENT (FSA)

There is no firm linkage available for proposed Vishnupuri UG to OC mine to either power house or any miscellaneous industries.

2.7 JUSTIFICATION AND MARKETABILITY

From the tables given in para no. 2.2 to 2.4, it is clear that the deficit in supply of coal from WCL is 37.386 Mt in 2017-18 which will be narrowed down to 20.151 Mt in 2019-20 if WCL achieves the target capacity of 60 Mt in 2019-20. To further reduce the gap between demand and supply of coal, it is very essential to either open new mines or increase the production from existing mines of WCL. Thus proposed Vishnupuri UG to OC mine having target capacity of 2.00 Mty will help to reduce the gap between demand and supply of coal from WCL mines.

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Chapter - 3

PROJECT SITE INFORMATION

3.1 LOCATION

The proposed project is conversion of Vishnupuri - I & II UG mines into opencast mine. The access to the mine has been envisaged from adjacent Shivpuri OC mine which is proposed to be amalgamated in Vishnupuri UG to OC mine. The area under consideration of the present project report is constituted of two geological blocks viz. Vishnupuri Block and part of Sirgora Block situated in Pench-Kanhan Coal Field, Chhindwara District, Madhya Pradesh. The proposed area is under jurisdiction of Pench area, WCL and falls in survey of India Topo Sheet No. 55-J/16 and is defined by the latitudes and longitudes as given below.

Latitudes : N 21º 19' 31", N 21º 21' 16"

Longitudes : E 78º 55' 47", E 78º 58' 40"

3.1.1 Area of the Project

The mining block covers an area of 6.64 sq.km.

3.2 ACCESSIBILITY AND COMMUNICATION

Vishnupuri mine can be approached by a metalled road connecting Parasia to Shivpuri mines. The block is located 15 Kms east of Parasia town which lies on the Madhya Pradesh state Highway No. 19. The district headquarter Chindwara is 27 Km away in the south and Nagpur is about 150 Km from Parasia.

Parasia is also linked with Chindwara through a narrow gauge railway line of south-eastern railway and with Amla by a broad gauage line of Central Railway.

3.3 TOPOGRAPHY & DRAINAGE

Vishnupuri block has a rugged topography having flat topped Pratapgrah hills in its south east part and undulating plains in the region of Pench river in the western part. The general elevation of the ground is 705 m above MSL in the plains and 760 m in hilly region. The highest point, however has an elevation of 766.71 m which is located on the Pratapgarh hills.

The drainage of the area is controlled by Pench river, which forms the Western boundary of the proposed mine. The river takes an easterly turn flowing more or less parallel to the Southern boundary of the block. Many small rain-fed gullies and nallas flow westerly and join Pench river.

3.4 CLIMATE AND RAINFALL DATA

The region experiences pleasant climate on account of its elevation. Summer is moderate but winter is cold. The average annual rainfall is around 1150 mm. The precipitation is concentrated during the period from 15th June to 15th September. The average relative humidity varies from 22.5% to 76%.

3.5 IMPORTANT SURFACE FEATURES

The area falling under report is mostly occupied by tenancy land and forest land with hilly terrain. A road from Parasia to Shivpuri passing over the proposed quarry needs to be diverted. Pench river forms the Western boundary of the proposed mine. The river takes an easterly turn flowing more or less parallel to the Southern boundary of the block. Many small rain-fed gullies and nallas flow westerly and join Pench river.

One Kukurmunda village is located in the proposed quarry area which have to be shifted and rehabilitated for quarry operation. The population and number of projected affected families in this village as per population census, 2011/ data supplied by mine area are as follows:

Sl. No.	Villages	Population	No. of project affected families
1	Kukurmunda	550	131

3.6 PRESENT LAND USE PATTERN

The block is mostly covered by privately owned cultivated land and forest land. The crops are generally seasonal such as wheat, maize, jawar and groundnut. Major flora in this area are Teak, sal, mahua and Tendu together with thorny bushes.

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Chapter - 4

MINE BOUNDARY, RESERVES AND MINE LIFE

4.1 INTRODUCTION

This Project Report envisages conversion of existing Vishnupuri-I & II Underground mine into opencast mine. In existing Vishnupuri-I UG mine, Bord and Pillar mining has been done in Seam-IC, III, IVA and VB2 .In Vishnupuri-II UG mine working is being done in Seam-IC, III, IV A & Seam-VB2. The annual coal production from existing Vishnupuri – I & II UG mine was about 0.122 Mt in the year 2016-17.

4.2 PIT FORMULATION STRATEGY

Shivpuri OC mine is being worked adjacent to proposed Vishnupuri UG to OC mine in north eastern side. Presently, Seam I, III, IVA, VA and VB2 are being worked in Shivpuri OC through a Scheme. It is proposed in this report to approach the proposed quarry of Vishnupuri UG to OC mine through Shivpuri OC mine along the bottommost workable seam i.e. VB2 after it is decoaled as per the approved Scheme. This will reduce the gestation period in mine development and coal production can be started early. Moreover, no separate access trench will be required no coal will be blocked between Shivpuri OC and the proposed OC Mine.

The eastern quarry surface of proposed Vishnupuri UG to OC mine has been proposed leaving 100 m safe distance from Sirgora village and 30 m from existing OB dump on south –eastern side.

In the northern side, a major fault F_9 – F_9 having throw in the range of 70m to 100m due north separates this block from Brahmpuri Block. The eastern part of Brahmpuri Geological block is captive block. The northern quarry surface boundary of proposed Vishnupuri UG to OC mine has been planned leaving a barrier against Brahmpuri captive block and Fault F_9-F_9 to accommodate the diversion of existing Parasia road which is passing over the quarry area.

In the southern side, incrop of seam as well as major fault F-18 (s) having a thrown in the range of 60m to 150m due north form the southern geological block boundary. The southern quarry floor boundary of proposed Vishnupuri UG to OC mine has been planned along the incrop of seam as well as along the Fault F-18(s).

In the western side, Vishnupuri block continues upto Pench river. However, the proposed dip side western limit of Vishnupuri UG to OC mine has been planned upto 150m depth at the floor of bottom most seam where stripping ratio is about 7.26 m^3/t. The dip side reserves beyond 150m depth have been excluded due to higher stripping ratio and constraints of OB dumping place. It is proposed in this report to accommodate external OB dump in dip side coal bearing area leaving 100m safe distance from the western quarry surface limit of proposed Vishnupuri UG to OC mine.

4.3 MINE BOUNDARIES

4.3.1 Selection of Seams

The detailed exploration in Vishnupuri & Sirgora block has proved the existence of five groups of seams viz. Seam-I, II, III, IV and V, which are in conformity with the other adjoining blocks explored in Pench Valley. All these seams are present in the form of sections/sub-sections that include I/IA, IB/ IB+IC/IC, II/IIA, IIB, III, IV/IVA, IVB, VA /VA1, VB/VB_2, VC & VD. Out of these seam sections, eight nos. of seam sections are workable by opencast method of working with Shovel dumper combination viz. IA, I (B+C), II / IIA , III, IV /IVA, IVB, VA/VA1, VB/VB2. Resources have been estimated for seams IA, IB+IC, II/IIA, III, IV/IVA,IVB, VA/VA_1, VB/VB_2 within the reporting area. **Coal reserves have been considered where minimum seam thickness is 0.5 m and above.**

4.3.2 Selection of sectors

The proposed Vishnupuri and Part of Sirgora block has been divided into 39 sectors (Sector S-1 to S-39) by various faults. The proposed Vishnupuri UG to

OC mine has been planned in Sector S-12 & S-14 and part of Sectors S-6, S-16, S-19, S-20, S-21, S-22, S-23, S-29, S-30, S-32, S-33 and S-34.

Sector-2, 3 and 6 are in the northern side adjacent to Brahmpuri Captive block and major fault F9 – F9 where diversion of Parasia road has been envisaged and therefore these sectors are not considered in the proposed mine. Rest sectors are in the western dip side beyond 150 m depth which have not been considered in the proposed mine due to high stripping ratio and constraints of OB dumping.

4.3.3 Mine boundaries

Based on the Pit formulation strategy detailed above, the quarry boundary of the proposed Vishnupuri UG to OC mine are demarcated as follows:-

North - 100 m safety distance from proposed diverted road to Parasia

South - Incrop of Seam and Fault F-18(s) forming the southern Block boundary of Vishnupuri Block

East (Rise side) - Safe distance of 100 m from hutments of Sirgora village and 30 m from 30 m high dump on south-eastern side.

West (Dip side) - 150 m depth at the floor of bottom seam- VB_2

4.4 MINEABLE RESERVES

The total net in-situ geological reserves in proposed block (Vishnupuri and part of Sirgora geological block) is 86.30 Mt in all the 39 sectors including split sections. Out of the total 39 Sectors, the proposed Vishnupuri UG to OC mine has been planned in Sector S-12 & S-14 and part of Sectors S-16, S-19, S-20, S-23, S-29, S-30, S-32, S-33 and S-34. The total geological reserves in these sectors within the proposed quarry area is 30.74 Mt. **Upto 0.5 m coal thickness has been considered in the PR for reserve calculation.**

The seam-wise break-up of net geological reserves in entire block as well as in proposed mine area is tabulated below:

Seam/Section	Geological Reserves in Entire Block (Mt)	Geological Reserves in Proposed Vishnupuri UG to OC mine (Mt)
IA	4.56	1.33
IB+IC	25.88	10.12
II/IIA	10.40	2.84
III	6.32	1.65
IV/IVA	12.03	4.11
IVB	2.76	0.84
VA/VA_1	8.17	3.37
VB/VB_2	16.18	6.48
Total	**86.30**	**30.74**

Considering 10 % geological loss (only in Seam IA, II/IIA, IVB and VA/VA_1 which are virgin seams) and 5% mining losses, the net mineable reserves in proposed quarry area works out to **28.42 Mt**. Total 5.029 Mt coal reserves have been extracted from Vishnupuri – I & II UG mines and Kukurmunda OC mine upto 31.03.2017. Out of this, about 4.00 Mt coal reserves have been extracted from the proposed quarry area. Thus net mineable reserves available in the proposed Vishnupuri UG to OC mine works out to 28.42 Mt – 4.00 Mt = **24.42 Mt.**

The seam-wise net mineable reserves in proposed Vishnupuri UG to OC mine is tabulated below:

Seam/Section	Net Mineable Reserves (Mt)
IA	0.51
IB+IC	8.68
II/IIA	2.43
III	1.13
IV/IVA	3.05
IVB	0.72
VA/VA_1	2.88
VB/VB_2	5.02
Total	**24.42**

4.5 TARGET AND LIFE OF THE MINE

Based on the Geo-mining parameters such as strike length, gradient, thickness of seam and average rate of deepening of opencast quarries in WCL, the target production in the proposed Vishnupuri UG to OC mine has been envisaged as **2.00 Mty**. In favourable conditions such as availability of greater strike length, flatter gradient, less number of rainy days in monsoon etc., the mine can achieve a Peak production up to 2.50 Mty and therefore peak capacity of 2.50 Mty is recommended for EMP purpose.

Zero Date

Zero date is defined as the date of completion of activities like PR and EMP approval and processes of land acquisition (notification under various sections) so that physical possession of land can be completed in 1st year of mine life. In proposed Vishnupuri UG to OC mine, it is envisaged that activities of PR and EMP approval and processes of land notification etc. will be completed upto 31.03.2020 and thus, zero date of this project is 01.04.2020. The physical possession of land is proposed to be completed in 1st year (2020-21) and excavation work will start in 2nd year. The mine will achieve target capacity in 6th year

Mine Life

The total mineable reserves in proposed Vishnupuri UG to OC mine is 24.42 Mt. Considering the proposed rated output of mine as **2.00 Mty** of ROM Coal, the total life of the mine is estimated as **16 years** including one year gestation period for land acquisition purpose.

The break-up of mine life is as under:

Construction Period	**:**	1 year
Production Build-Up Period	:	4 years
Target Production Period	:	10 years
Tapering Production Period	:	1 year
Total Mine Life	**:**	**16 years**

4.6 FUTURE EXPANSION POTENTIAL, IF ANY

The mine has future expansion potential as the geological reserves is available in dip side upto Pench river within proved Geological block. However, the proposed PR for Vishnupuri UG to OC has been envisaged upto 150 m depth.

4.7 ANY FURTHER EXPLORATION REQUIRED

To confirm the subcrop & geological structure, additional drilling will be required, for which capital provision has been made in this PR.

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Chapter - 5

METHOD OF MINING

5.1 GENERAL

The proposed Vishnupuri UG to OC mine is conversion of existing Vishnupuri-I & II UG mines into an opencast mine. This will not only ensure better coal conservation but will also increase the target production from existing 0.46 Mty capacity to 2.00 Mty. Opencast mining with shovel dumper combination is the most common method and is being practiced successfully in existing opencast mines of WCL. Hence the same mining method has also been envisaged in the proposed mine.

5.2 GEO-MINING CHARACTERISTICS

5.2.1 Seam Gradient

Strike is NNW-SSE in the south-eastern part to N-S throughout the rest of the block. However, the strike has changed slightly to NNE-SSW in the northern part of the project area.

The general dip of the coal beds is towards SW in the southern part and towards NW in the northern part, throughout the rest of the block it is westwards. The gradient ranges from 1 in 7 in NW part to 1 in 11.7 in the central part, while it is 1 in 12.5 in south-western part. In the north-eastern and south-eastern, the gradient remains more or less uniform at about 1 in 7. Thus it remains more or less uniform throughout the northern and eastern part of the block and shows a gradual flattening towards the south-western part.

5.2.2 Geological Disturbances

Total 31 faults have been deciphered in Vishnupuri & Sirgora geological block with throw varying from 5m to 160m. The two major faults F(9) and F18(s) form respectively the northern and southern boundary of the block.

In addition to above two Major faults F9 and F18 (s), 23 nos of minor faults, with magnitude of throw not more than 30m, have been reported. The rest 6 faults have been reported with magnitude of more than 30 m throw.

5.2.3 Sequence of coal seams and parting

In Pench-Kanhan Valley Coalfield, multiple coal seams occur almost in middle part of Barakar formation. In Vishnupuri, occurrence of five seams has been observed that have mostly been splitted into different sections separated by partings. . The uppermost workable seam is seam- IA and lowermost workable seam is seam-VB/VB2. The seams include I/IA, IB/IB+IC/IC, II/IIA, IIB, III, IV/IVA, IVB, VA /VA1, VB/VB_2, VC & VD, details of which have been provided below :

Coal seam & Intervening Parting Thickness

Coal Seam/ Section	Roof depth (m)		Thickness range (m)		Prevalent thickness range (m)	Workable /Not workable
	Min.	Max.	Min.	Max.		
I/IA	12.71 (PEV-47)	235.17 (MPV-09)	0.13 (PKCS-78)	2.21 (PEV-07)	0.50 – 1.00	**Workable**
Parting	-	-	0.06 (PE-15)	3.48 (PEV-79)	0.75 - 1.25	
IB	14.73 (PEV-47)	237.13 (MPV-9)	0.35 (PKCS-38)	2.29 (PEV-72)	1.00-2.00	
IB+IC	14.73 (MWPG-4)	227.14 (PEV-2)	2.98 (MPV-5)	7.12 (PEV-51)	3.50 – 6.00	**Workable**
IC	28.18 (PKCS-53)	239.93 (MPV-9)	0.53 (PEV-77)	3.88 (PEV-79)	2.00-3.50	
Parting			1.11 (PE-24)	8.23 (PEV-74)	2.00-3.50	
II/IIA	20.03 (PKCS-40)	245.78 (MPV-9)	0.22 (PKCS-37)	4.03 (PEV-79)	1.50-3.00	**Workable**
Parting			0.43 (PEV-18)	1.42 (PE-15)	0.50-1.00	
IIB	21.02 (PKCS-40)	248.83 (MPV-9)	0.06 (PE-13)	1.38 (PKCS-29)	0.50-0.90	

Coal Seam/ Section	Roof depth (m)		Thickness range (m)		Prevalent thickness range (m)	Workable /Not workable
	Min.	Max.	Min.	Max.		
Parting			2.09 (PKCS-45)	6.18 (PEV-18)	2.00-3.00	
III	21.03 (PKCS-17)	251.97 (MPV-9)	0.12 (PEV-80)	2.72 (PEV-2)	1.00-1.50	**Workable**
Parting			4.03 (MVPS-3)	25.00 (PKCS-19)	12.00-20.00	
IV/IVA	42.49 (PKCS-17)	269.60 (MPV-9)	0.10 (PKCS-32)	5.38 (PEV-9)	1.80-2.50	**Workable**
Parting			1.09 (PKCS-80)	9.14 (PKCS-41)	1.00-3.00	
IVB	16.85 (PKCS-16)	272.64 (MPV-9)	0.03 (PKCS-76)	1.82 (PEV-1)	0.50-0.80	**Workable**
Parting			0.35 (PKCS-19)	10.59 (MVPS-6)	4.00-7.00	
VA/VA_1	18.54 (PKCS-16)	280.07 (MPV-9)	0.08 (PKCS-83)	4.57 (PKCS-41)	1.30-1.70	**Workable**
Parting			0.86 (PEV-2)	1.55 (PE-24)	1.00-1.10	
VA_2	175.42 (PKCS-79)	266.20 (PEV-2)	0.17 (PEV-2)	0.94 (PE-24)	0.50-0.70	
Parting			1.06 (PE-15)	3.95 (PE-21)	1.00-1.50	
VB/VB_1/ VB_2	19.60 (PKCS-36)	287.73 (MPV-9)	0.12 (PKCS-20)	5.11 (PKCS-46)	2.00-3.00	**Workable**
Parting			0.21 (PKCS-16)	9.98 (PKCS-72)	1.00-2.00	
VC	22.36 (PKCS-36)	290.65 (PKCS-81)	0.04 (PKCS-17)	1.20 (PE-15)	0.20-0.50	
Parting			0.09 (PKCS-45)	7.00 (PEV-6)	0.50-1.50	
VD	25.50 (PKCS-36)	292.05 (PKCS-81)	0.05 (PKCS-32)	1.08 (PKCS-79)	0.20-0.30	

5.3 MINE PARAMETERS

The geo-mining parameters of the proposed quarry are tabulated below:

Sl. No.	Particulars		Quantity	
1.	Area of the Quarry			
a)	On floor (ha)		198.10	
b)	On surface (ha)		284.58	
2.	Depth (m) [upto floor of bottom seam VB_2]			
a)	Initial		50	
b)	Final		150	
3.	Gradient of Seam		1 in 7 NW part , 1 in 11.7 in central to 1 in 12.5 SW part	
4.	Average thickness of seams / Partings(m)		Min (m)	Max (m)
	Seam I/IA	**Workable**	0.13	2.21
	Parting		0.06	3.48
	Seam IB	Not workable	0.35	2.29
	Seam (IB+IC)	**Workable**	2.98	7.12
	Seam IC	Not workable	0.53	3.88
	Parting		1.11	8.23
	Seam II / IIA	**Workable**	0.22	4.03
	Parting		0.43	1.42
	Seam IIB	Not Workable	0.06	1.38
	Parting		2.09	6.18
	Seam III	**Workable**	0.12	2.72
	Parting		4.03	25.0
	Seam IV/ IV A	**Workable**	0.10	5.38
	Parting		1.09	9.14
	Seam IV B	**Workable**	0.03	1.82
	Parting		0.35	10.59
	Seam VA / VA1	**Workable**	0.08	4.57
	Parting		0.86	1.55
	Seam VA2	Not Workable	0.17	0.94
	Parting		1.06	3.95
	Seam VB/B1/VB2	**Workable**	0.12	5.11
	Parting		0.21	9.98
	Seam VC	Not Workable	0.04	1.20
	Parting		0.09	7.0
	Seam VD	Not Workable	0.05	1.08

Sl. No.	Particulars	Quantity
5.	Average Strike length (m) (at floor)	1000
6.	Average Width (m) [dip rise] at floor	2208
7.	Weighted average GCV of Coal (kCal/kg)	4991 (G-8)
8.	Mineable Reserves (Mt)	24.42
9.	Total OB including access trench	177.32
10.	Average stripping ratio (m^3/t)	7.26

5.4 CHOICE OF TECHNOLOGY

The proposed Vishnupuri UG to OC mine is having total 31 faults with throw varying from 5m to 160m, hence, deployment of Dragline and Surface miner is not suitable in this property. The possibility of deployment of Surface Miner is also ruled out because 3 to 4 seams in both Vishnupuri - I and Vishnupuri - II UG mine are developed and standing on pillars/ depiilared.

Opencast mining with shovel dumper combination is the most common method of opencast mining in WCL and the same system is recommended in the proposed Vishnupuri UG to OC mine. Considering moderate gradient of 1 in 7 to 1 in 12.5, Inclined Slicing Method is proposed.

5.4.1 Different Options of Mining

This Project Report has been prepared for the following three options :-

1. Departmental Option

In this Option, entire coal extraction and OB removal have been proposed by departmental HEMM.

2. Partial Hiring Option

In this Option, Coal extraction and Parting OB removal have been proposed by departmental HEMM and entire Top OB will be removed by Hiring of HEMM.

3. Total Hiring Option

In this Option, entire coal extraction and OB removal will be done by hiring of HEMM.

5.5 EQUIPMENT SELECTION

In the proposed OC Project, the annual target of coal production is 2.00 Mty and peak OB removal is 17.0 Mm^3/annum In Departmental Option, considering the annual overburden removal, 4 nos. of 11.0 m^3 Diesel Hydraulic Shovels have been provided alongwith matching numbers (35 Nos.) of 100 T Rear Discharge Dumpers. For extraction of coal and parting OB, 9 nos. of 4.0-5.0 m^3 Diesel Hydraulic Backhoe with Matching nos.(57 Nos.) of 60 T Rear Discharge Dumpers have been provided for coal transport upto coal stock yard and OB dump.

In Partial hiring option, Coal extraction and parting removal have been proposed by departmental HEMM whereas Top OB has been proposed by hiring HEMM. For Coal extraction and parting OB removal, 9 no. of 4.0-5.0 m^3 Diesel Hydraulic backhoe with matching nos. (57 Nos.) of 60 T Rear Discharge Dumpers have been provided.

In Total hiring option, OB removal & coal extraction are proposed by hiring of HEMM.

Major HEMM Provision is as given below:-

Sl. No.	HEMM	Dept. Option	Partial Hiring option	Total Hiring Option
A	**TOP OB (Av. 3.0 km lead)**			
1	11.0 m^3 Diesel hydraulic shovel	4	By Hiring	By Hiring
2	100T RD Dumpers	35	By Hiring	By Hiring
3	410 HP Dozers	4	By Hiring	By Hiring
4	250 mm Electric Drill	4	By Hiring	By Hiring
B	**COAL & PARTING (Av. 3.0-3.5 km lead)**			
1	4.0-5.0 m^3 diesel hyd. backhoe	9	9	By Hiring
2	60T RD Dumper	57	57	By Hiring
3	410 HP Dozer	9	9	By Hiring
4	160 mm RBH Drill	9	9	By Hiring

Sl. No.	HEMM	Dept. Option	Partial Hiring option	Total Hiring Option
C	**COMMON**			
1	70/90t Crane	1		
2	Mobile Crane 30/40t	1	1	0
3	Mobile Crane 8t	1	1	1
4	2.8 m^3 Diesel Hyd. backhoe	1	1	1
5	28 kl Water Sprinkler	4	2	1
6	5.0-6.0 m^3 Front End Loader	1	1	0
7	280 HP Motor Grader	1	1	0
8	320 HP Dozer (for coal stock & misc.)	1	1	1
9	Mobile Maintenance Van	2	1	1
10	Diesel Bowser, 8-12 kL	2	1	0
11	Tyre handler	1	1	0
12	Fire Fighting Truck	1	1	1
D	**RECLAMATION**			
1	410 HP Dozer	1	1	1
2	28kL Water Sprinkler with mist spray	1	1	1

5.6 MINING SYSTEM & SYSTEM PARAMETERS

5.6.1 Width & height of working and non-working benches

For overburden, keeping the bench height of 10 m, the width of working and non-working benches are kept as 30 m and 20 m respectively in Departmental option. However, in hiring option, the actual bench width and height would depend upon the size of equipment deployed by the hiring / outsourcing agency. Considering gradient of 1 in 7 to 1 in 12.5 Inclined Slicing Method has been proposed.

The height of benches for parting removal has been considered as 10m or as per thickness of parting, if thickness of parting is less than 10m. The height of uppermost two benches in BC Soil strata has been considered as 5m for planning purpose. Haul road would be constructed at a gradient of 1 in 16 with a width sufficient for dumper movement, dozer path, drainage and electrification etc.

5.6.2 Slope of Benches & Quarry

i) During Mining Operation

The slope of individual benches depends on the type of strata. In this report, the slope of individual bench is proposed as 45^o in soil, alluvium and clay whereas, it is 70^o in hard strata. The overall slope of the quarry in dip side during mining operation works out to 18^o to 20^0 from horizontal plane depending on the nature of strata in the entire depth of quarry.

ii) At the End of Quarry

The slope of individual benches in the batter at the end of quarry remains same as that during mining operation i.e. 45^o in soil, alluvium and clay and 70^o in hard strata. Overall angle of batter considered at the end of quarry is about 37^0 for the rise side as well as dip side batter.

It is proposed in this Project Report to carry out scientific study for slope stability in quarry benches and OB dumps by any Scientific Agency. Based on above scientific study, bench and quarry profile may change.

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Chapter - 6

MINING & DUMPING STRATEGY

6.1 INTRODUCTION

The proposed PR of Vishnupuri UG to OC mine has been envisaged in Vishnupuri block and part of Sirgora block. Major portion of the geological block is developed through Vishnupuri-I & II UG mines. The proposed PR is conversion of the existing Vishnupuri – I & II G mines into opencast mine. The PR has beed prepared for a target capacity of 2.00 Mty and peak OB removal of 17.00 Mm^3. It is proposed in this PR to access the proposed quarry through Shivpuri OC mine which is being worked adjacent to the north eastern side of the proposed mine. This will reduce the gestation period of the mine and the coal blocked between Shivpuri OC and proposed quarry will be available for mining. Moreover, no separate access trench will be required to access the quarry. Initially the OB will be dumped in External OB dump in dip side of proposed quarry on coal bearing area as well as in abandoned quarry of Shivpuri OC located 3.5 km from the mine. Subsequently, once the quarry advances, the simultaneous internal dumping will be done in decoaled area. All the three options ie Derartmental option, Partial Hiring option and Total Hiring option have been detailed in this PR.

6.2 CONSTRAINTS ON MINE DEVELOPMENT

Following surface constraints are envisaged in the proposed Vishnupuri UG to OC mine:

1) Land Acquisition

Total land involved in proposed Vishnupuri UG to OC mine is 590.46 ha, out of which 560.76 ha is within the proposed mine boundary and rest 29.70 ha acquired land is outside the mine boundary. Total 173.953 ha land (40.855 ha in Vishnupuri-I & II UG Mine and 133.098 ha in Shivpuri OC Mine) has already been acquired by WCL, out of which 144.253 ha falls within proposed mine boundary of Vishnupuri UG to OC Mine and balance 29.70 ha is outside the proposed mine boundary. Balance 416.507 ha (560.76 ha – 144.253 ha) is

proposed to be acquired which involves 189.893 ha tenancy land, 103.942 ha govt. land and remaining 122.672 ha forest land. Forest clearance for the proposed mine is time consuming activity. Acquisition of tenancy land is also one of the major surface constraints without which no development work can be started.

2) Village Shifting & Rehabilitation

Kukurmunda village is located in the proposed quarry area which have to be shifted and rehabilitated for quarry operation. The total number of houses in this village is about 131. Shifting and rehabilitation of these houses is critical activity for mine development.

3) Thick Basalt Trap

The proposed Vishnupuri UG to OC mine is overlain by thick cover of Basalt Trap which is very hard and requires more blasting resulting into low powder factor. About 70 % of the total OB in proposed Vishnupuri UG to OC mine is basalt trap. The cost of OB removal becomes high due this basalt trap which is one of the major constraint for the development of proposed opencast mine.

4) Nala Diversion

Few seasonal nallas flow across proposed quarry area which are required to be diverted. The route of diversion will be decided after survey of existing nallas. Adequate capital provisioning for above diversion has been provided in the Project Report.

5) Diversion of Road

A WCL road from Parasia to Shivpuri is passing over the proposed quarry area and needs to be diverted for the proposed project. About 2.5 km Diversion of this road is proposed and tentative location is shown in Quarry & Surface Layout Plan.

6) Water Supply

Presently, water is supplied to Shivpuri Colony from water reservoir in the void of Kukurmunda OC. It is proposed in this report to include Kukurmunda OC

mine area in the quarry of Vishnupuri UG to OC mine. Therefore, another source of water for Shivpuri colony such as reservoir of Haranbhata OC will have to be utilized. This will require about 10 km pipe line from Haranbhata OC reservoir to Shivpuri colony which is a critical activity.

7) 3.3 kV HT Line Diversion

One 3.3 kV HT Line is passing through the proposed quarry area which will have to diverted. Adequate capital has been provided in the report for this diversion.

8) Extraction of Developed Pillars (Vishnupuri I and II UG Mine)

Major portion of Vishnupuri – I & II UG mine area falling within the proposed Vishnupuri UG to OC mine has been developed by underground method of mining. It is proposed in this report to extract developed pillars (underground workings) by opencast mining. To eliminate the danger due to falling of equipment into developed galleries, a method of controlled blasting to fill-up the galleries will have to be adopted. Exposed underground galleries have to be blanketed by OB material to avoid occurrence of fire.

9) Deployment of underground manpower

The existing manpower as on 31.03.2017 in Vishnupuri-I & II UG mine are 347 and 393 respectively. Considering retirement of existing manpower @ 4% per annum, the total existing manpower in Vishnupuri-I & II UG mine as on 31.03.2021 will be 295 and 334 respectively. In this PR, the manpower proposed for departmental option, Partial hiring and total hiring is 882, 468 and 180 respectively. Moreover, manpower generated in lieu of land compensation will also add up the surplus manpower. Deployment of these surplus manpower in others mines of Pench Area or others areas of WCL is a critical activity.

10) Slope Stability of Internal and External Dumps

Maximum height of external OB dump has been proposed as 90 m which requires proper layout of slopes and benches. The overall slope angle of

external dump works out to 27 degree. Stability of internal and External Dump is very important and needs proper care. Adequate provision has been made while preparing PR to overcome these constraints. Moreover, provision for scientific studies on slope stability of External and Internal Dump etc. has been made in this report.

6.3 MINING STRATEGY

6.3.1 This PR has envisaged conversion of two underground mines namely Vishnupuri I UG mine and Vishnupuri II UG mine into opencast mine. One single quarry has been proposed in Vishnupuri – I & II UG mine area upto a depth of 150 m at the bottom most workable seam – VB_2. It is proposed to access the bottom most coal seam VB2 through the Access Trench of Shivpuri OC after its exhaustion. Balance coal and OB of Shivpuri OC as on 1.04.2017 is 0.586 Mt and 1.983 Mcum respectively. After its exhaustion, Vishnupuri UG to OC will be worked by extending the dip side benches of decoaled Shivpuri OC mine in proposed mine area. Initially the OB will be dumped in External OB dump in dip side of proposed quarry on coal bearing area as well as in abandoned quarry of Shivpuri OC (Phase-II) located 3.5 km from the mine. Once the quarry advances, the simultaneous internal dumping will be done in decoaled area.

6.3.2 Volume Regime (Cut-wise Coal, OB & Stripping ratio)

One single quarry has been proposed in Vishnupuri – I & II UG mine area upto a depth of 150 m at the bottom most workable seam – VB_2. For assessment of year-wise workload of OB removal for the targeted output of coal, the entire quarry has been divided into various Cuts. Total four no. of cuts have been envisaged in the entire quarry namely Cut-I, Cut-II, Cut-III & Cut-IV. The details of these Cuts and the cut-wise coal, OB and stripping ratio in the proposed OC mine is given in following table:

Cut-Wise Coal, OB and Stripping Ratio

CUT	Description of cut	Mineable Reserve (Mt)	Top OB (Mm^3)	Parting OB (Mm^3)	Total OB (Mm^3)	Stripping ratio (m^3/t)
Cut-I	Upto 650 FRL of Seam-VB2	2.39	18.96	21.27	40.23	16.83
Cut-II	650 FRL to 630 FRL of Seam-VB2	8.66	36.67	23.66	60.33	6.97
Cut-III	630 FRL to 610 FRL of Seam-VB2	6.58	27.70	15.04	42.74	6.50
Balance Cut	610 FRL to dip side floor boundary in Seam-VB2	6.78	22.00	12.02	34.02	5.02
Sub -Total		**24.42**	**105.33**	**71.99**	**177.32**	**7.26**

The break-up of Cut-wise Coal and parting OB is tabulated below:

Cut	Cut-wise & Seam-wise coal Quantity (Mt)								
	IA	IB+IC	II/IIA	III	IV/IVA	IVB	VA/VA1	VB/VB2	Total
Cut-I	0.02	0.48	0.14	0.11	0.33	0.01	0.37	0.94	2.39
Cut-II	0.10	3.55	0.80	0.24	0.57	0.15	1.10	2.15	8.66
Cut-III	0.07	2.33	0.77	0.19	0.98	0.21	0.67	1.36	6.58
Balance Cut	0.31	2.32	0.72	0.59	1.17	0.35	0.74	0.57	6.78
Total	**0.51**	**8.68**	**2.43**	**1.13**	**3.05**	**0.72**	**2.88**	**5.02**	**24.42**

Cut	Cut-wise & Between Seam-wise Parting OB (Mm^3)							
	Between IA & (IB+IC)	Between I(B+C) & II/IIA	Between II/IIA & III	Between III & IV/IVA	Between IV/IVA & IVB	Between IVB & VA/VA1	Between VA/VA1 & VB/VB2	Total
Cut-I	2.24	1.24	1.33	7.46	1.58	2.52	4.90	21.27
Cut-II	0.01	0.99	1.10	9.66	2.93	5.16	3.81	23.66
Cut-III	1.65	0.66	1.16	7.73	1.21	1.50	1.15	15.04
Balance Cut	0.12	0.47	0.93	6.08	0.90	2.08	1.41	12.02
Total	**4.02**	**3.37**	**4.51**	**30.92**	**6.63**	**11.26**	**11.27**	**71.99**

In addition to above, about 2.70 Mm^3 Black Cotton Soil will be removed from 120 m wide trench cutting along the periphery of the external dump site for stability of dump. Thus, the total OB including the BC soil from trench cutting works out to 180.02 Mm^3 (177.32 Mm^3 from Quarry + 2.70 Mm^3 from Trench). About 1.00 Mm^3 OB will have to be rehandled from internal dump of Shivpuri OC mine which has been included in the total OB and is part of 177.32 Mcum.

6.3.3 Schedule of quantities

The zero date of the proposed Vishnupuri UG to OC mine has been envisaged as 01.04.2020 and activities like PR approval, Environmental Clearance and notification for land acquisition will be completed by 31.03.2020. The physical possession of land will be completed in 1st year (2020-21). The proposed mine will start mining operation in 2nd year and target capacity will be achieved in 6th year.

The schedule of quantities upto target achievement proposed in all the three options is as under:

Year	I	II	III	IV	V	VI
Coal Prod. Production (Mt)	Physical Possession of Land	0.50	1.00	1.25	1.50	2.00
OB Removal (Mm^3)		9.00	17.00	17.00	14.00	14.00

6.4 DUMPING STRATEGY

The total volume of OB proposed to be excavated from the quarry of Vishnupuri UG to OC mine is 177.32 Mm^3 including rehandling of 1.00 Mm^3 OB from Shivpuri OC internal dump. In addition to this, about 2.70 Mm^3 Black Cotton Soil will be removed from 120 m wide trench cutting along the periphery of the external dump site for stability of dump. Thus, the total OB including the BC soil from trench cutting works out to 180.02 Mm^3 (177.32 Mm^3 from Quarry + 2.70 Mm^3 from Trench).

Due to non availability of no coal bearing area adjacent to the proposed mine, an External Dump of height 90 m and capacity 40.00 Mm^3 has been proposed on coal bearing area beyond the western dip side quarry surface boundary leaving 100m safe distance from quarry edge. This OB dump will be rehandled when the mine is extended beyond 150 m in Phase-II of mine expansion.

There is a decoaled quarry of Shivpuri OC Phase-II located about 3.5 km from the proposed Vishnupuri UG to OC mine. It is proposed in this PR to accommodate about 25 Mm^3 OB in the internal backfilling in the void of Shivpuri OC Phase-II.

About 5 m top OB is black cotton soil in the proposed quarry area. It is proposed to dump BC soil separately in Temporary Top Soil in dip side coal bearing area. The BC soil removed from Trench cutting along the periphery of the External dump site will be also dumped in the Temporary Top Soil Dump. The BC soil of this temporary Top soil dump will be rehandled at a later stage over the top of internal dump.

Thus, out of total 180.02 Mm^3 OB, 40.00 Mm^3 OB will be dumped in External OB dump and 25 Mm^3 in internal void of Shivpuri OC Phase-II. Balance 115.02 Mm3 will be accommodated in the internal void of quarry by simultaneous internal backfilling including the proposed re-handling of BC soil from temporary BC soil dump.

90m high External OB dump will be made in three tiers each of 30 m height. Berm of 6 m will be maintained at 15 m, 45m and 75m height whereas berm of 30 m will be maintained at 30 m and 60m height. With this bench pattern, the final angle of slope will be about 24^o for OB dump.

The different External and Internal OB Dumps proposed for Vishnupuri UG to OC mine with their location and height along with dump capacity are tabulated below:

DUMP CAPACITY

Sl. No.	OB Dump	Location	Dump Height (m)	Capacity (Mm3) (Solid)
1.	**EXTERNAL OB DUMP**			
1.1	External Dump	Beyond western Dip side Quarry boundary on Coal Bearing Area	90m	40.00
2.	**TEMPORARY TOP SOIL DUMP (To be Rehandled)**			
2.1	Temporary Top Soil Dump	Beyond western Dip side Quarry boundary on Coal Bearing Area	30m	12.35
	Total External Dump (Excluding Temp. BC Soil Dump)			**40.00**
3.	**INTERNAL DUMP**			
3.1	In the void of abandoned Shivpuri-II OC (Phase –II)	Decoaled Void of OC Mine		25.00
3.2	In the void of Vishnupuri UG to OC mine	Simultaneous Backfilling	Below Ground	115.02
	Total Internal Dump			140.02
	TOTAL DUMP CAPACITY (INTERNAL + EXTERNAL) (Excluding Temporary Top Soil Dump)			**180.02**

From above table, it is clear that only 40 Mm^3 OB will be dumped externally and rest entire 140.02 Mm^3 OB will be backfilled in the internal void of Vishnupuri UG to OC mine (115.02 Mm3) and abandoned void of Shivpuri OC Phase-II (25 Mm3). The internal OB dumping contributes 77.78% of total OB dumping.

6.5 SEQUENCE OF DUMPING OPERATIONS AND STAGE-WISE DETAILS

The sequence of dumping operations and stage wise quantity of external dump and internal dump are as follows:

Sl. No.	Stage Plan	Quantity
A)	**Stage Plan at the End of 5th year**	
1.	Coal mined (Mt)	4.25
2.	OBR (Mm^3) a) from Quarry b) from Trench Cutting c) Total OB	 57.00 2.70 59.70
3.	Stripping ratio (m^3/t)	13.41
4.	Excavated quarry area (Ha)	126.07
5.	Internal dump (Mm^3) (incl. abandoned quarry)	38.52
6.	External dump (Mm^3) Temp. Top Soil Dump External OB Dump	 6.05 15.13
B)	**Stage Plan at the End of 10th year**	
1.	Coal mined (Mt)	14.25
2.	OBR (Mm^3) a) from Quarry b) from Trench Cutting c) Total OB	 123.00 2.70 125.70
3.	Stripping ratio (m^3/t)	8.63
4.	Excavated quarry area (Ha)	253.40
5.	Internal dump (Mm^3) (incl. abandoned quarry)	76.05
6.	External dump (Mm^3) Temp. Top Soil Dump External Hard OB Dump	 9.65 40.00
C)	**Stage Plan at the End of Mine (16th year)**	
1.	Coal mined (Mt)	24.42
2.	OBR (Mm^3) a) from Quarry b) from Trench Cutting c) Total OB	 177.32 2.70 180.02
3.	Stripping ratio (m^3/t)	7.26
4.	Excavated quarry area (Ha)	284.58
5.	Internal dump (Mm^3) (incl. abandoned quarry)	140.02
6.	External dump (Mm^3) Temp. Top Soil Dump External Hard OB Dump	 0.00 40.00

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Chapter - 7

MINING SCHEDULE & EQUIPMENT PHASING

7.1 DESIGN CRITERIA

- **Working Regime**

  Project Report for Vishnupuri UG to OC mine envisages following working regime :-

- **Number of Days of Working in a Year**

  330 days of working has been assumed in a year based on 7 days schedule of mine working.

- **Number of Shifts**

  As per the prevalent practice in WCL, there will be 3 working shifts in a day in proposed Project Report for Vishnupuri UG to OC mine.

- **Number of Hours/Shift**

  It has been envisaged in the Project Report for Vishnupuri UG to OC mine that every shift will be of 8 hours duration.

- **Excavation Category Assumed.**

  The excavation category of OB material has been assumed as 50% Category III + 50% Category IV, whereas, for Coal it is assumed as Category IV.

- **Insitu Volume Weight (t/m^3)**

  The insitu volume weight of OB material has been assumed as 2.1 t/m^3 whereas for coal it is assumed as 1.55 t/m^3.

- **Strength Parameters of Coal and Rock if any –**

  The strength parameters of coal and rock are not available.

7.2 ANNUAL PRODUCTIVITY OF HEMM PROPOSED

The Project report for Vishnupuri UG to OC mine has been proposed in three options i.e. Departmental Option, Partial hiring option and Total hiring option. The annual productivity of HEMM proposed to be deployed in Departmental HEMM are as follows:

Annual Productivity of HEMM Proposed

(A) For Overburden :

Sl.No	Particulars	Productivity /Yr
1.	11.0 m^3 Diesel hydraulic shovel with 100 T Rear Discharge dumpers	**2.816 Mm^3**
2	100 T Rear Discharge Dumpers for 3.0 km lead with 11.0 m^3 Hyd. Shovel	**0.288 Mm^3**

(B) For Parting

Sl. No	Particulars	Productivity /Yr
1.	4.0-5.0 m^3 Diesel Hydraulic Shovel with 60 T Rear Discharge dumpers	**1.133 Mm^3**
2.	60 T Rear Discharge Dumpers for 3.0 km lead with 4.0-5.0 m^3 Hyd. Shovel	**0.1556 Mm 3**

7.3 CALENDAR PROGRAMME OF EXCAVATION

The calendar programme of excavation is same for all three options. The Calendar programme of excavation showing year-wise and cut-wise coal extraction and OB removal (Natural and programmed) is tabulated below.

CALENDAR PROGRAMME OF EXCAVATION (ALL OPTION)

YR	CUT	Coal (Mt)		Natural O.B (Mm^3)					Programmed O.B (Mm^3)				
		Yearly	Cum.	BC Soil	Top OB (Excl. Top Soil)	Parting OB	Total OB	Cum. OB	Top Soil	Top OB Excl. Top Soil)	Parting OB	Total OB	Cum. OB
2	Cut-I	0.50	0.50	0.68	3.29	4.45	8.42	8.42	0.70	3.85	4.45	9.00	9.00
3	Cut-I	1.00	1.50	1.08	6.85	8.90	16.83	25.25	1.10	7.00	8.90	17.00	26.00
4	Cut I	0.89	2.39	0.54	6.52	7.92	14.98	40.23	0.50	5.81	7.92	14.23	40.23
	Cut-II	0.36	2.75	0.30	1.22	0.98	2.50	42.73	0.30	1.49	0.98	2.77	43.00
	Sub Total	1.25		0.84	7.74	8.90	17.48		0.80	7.30	8.90	17.00	
5	Cut-II	1.50	4.25	0.62	5.73	4.10	10.45	53.18	0.75	9.15	4.10	14.00	57.00
6	Cut-II	2.00	6.25	0.74	7.73	5.46	13.93	67.11	0.75	7.79	5.46	14.00	71.00
7	Cut-II	2.00	8.25	0.74	7.73	5.46	13.93	81.04	0.75	7.79	5.46	14.00	85.00
8	Cut-II	2.00	10.25	0.74	7.73	5.46	13.93	94.97	0.59	7.31	5.46	13.36	98.36
	Cut-III	0.00	10.25	0.00	0.00	0.00	0.00	94.97	0.16	0.48	0.00	0.64	99.00
	Sub Total	2.00		0.74	7.73	5.46	13.93		0.75	7.79	5.46	14.00	
9	Cut-II	0.80	11.05	0.00	3.39	2.20	5.59	100.56	0.00	0.00	2.20	2.20	101.20
	Cut-III	1.20	12.25	0.71	4.34	2.74	7.79	108.35	0.75	6.31	2.74	9.80	111.00
	Sub Total	2.00	23.30	0.71	7.73	4.94	13.38		0.75	6.31	4.94	12.00	
10	Cut-III	2.00	14.25	0.61	7.81	4.57	12.99	121.3	0.60	6.83	4.57	12.00	123.00
11	Cut-III	2.00	16.25	0.61	7.81	4.57	12.99	134.3	0.60	6.83	4.57	12.00	135.00
12	Cut-III	1.38	17.63	0.16	5.65	3.16	8.97	143.3	0.14	5.00	3.16	8.30	143.30
	Cut IV	0.62	18.25	0.45	1.56	1.10	3.11	146.4	0.46	2.14	1.10	3.70	147.00
	Sub Total	2.00	35.88	0.61	7.21	4.26	12.08	151.5	0.60	7.14	4.26	12.00	
13	Cut IV	2.00	20.25	1.35	5.13	3.54	10.02	156.40	1.38	5.08	3.54	10.00	157.00
14	Cut IV	2.00	22.25	1.50	4.98	3.54	10.02	166.50	1.50	4.96	3.54	10.00	167.00
15	Cut IV	2.00	24.25	1.45	5.03	3.54	10.02	176.50	1.25	5.21	3.54	10.00	177.00
16	Cut IV	0.17	24.42	0.00	0.55	0.30	0.85	177.3	0.00	0.02	0.30	0.32	177.32
TOTAL		**24.42**		**12.28**	**93.05**	**71.99**	**177.32**		**12.28**	**93.05**	**71.99**	**177.32**	

In addition to the above calendar programme of excavation, the schedule of OB quantities from Trench Cutting along the periphery of the External dump site and re-handling of Temporary Top Soil Dump over the internal dump is tabulated below :

Year	Volume of B.C. Soil from Trench Cutting (Mm^3)	Volume of OB Rehandled from Temporary Top Soil Dump (Mm^3)
2	1.70	
3	1.00	
11		3.00
12		3.00
13		3.00
14		0.65
TOTAL	**2.70**	**9.65**

LEAD

The weighted average lead for OB considered for provisioning of population of dumpers for planning purpose works out to 3.00 km. The lead for coal transport from coal face to coal stock/CHP has been considered as 3.50 km.

7.4 DUMPING SCHEDULE

Total volume of OB in the proposed Vishnupuri UG to OC mine is assessed as 177.32 Mm^3 out of which BC soil (Black Cotton soil) is 12.28 Mm^3, Top OB excluding B.C. soil is 93.06 Mm^3 and Parting OB is 71.98 Mm^3. In addition to this, 2.70 Mm^3 Top BC soil Soil will be excavated from Trench cutting along the periphery of external dump site for stability of dumps. Thus total OB involved in the proposed mine including OB from Trench cutting works out to 180.02 Mm^3. The Top BC Soil including soil from Trench cutting is 14.98 Mm^3 (12.28 Mm^3 from quarry and 2.70 Mm^3 from Trench cutting). It is proposed in this PR to dump initial Top BC Soil from the quarry (6.95 Mm^3) upto 10^{th} year and Trench cutting (2.70 Mm^3) in a Temporary Top Soil Dump and rest Top Soil (5.33 Mm^3) will be directly carpeted on the top of external dump. The

Top Soil from Temporary dump will also be rehandled (from 11th year to 14th year) on the top of external dump as soon as this dump attains the total height.

The year-wise dumping schedule is tabulated below :

Dumping Schedule

Year	Source of OB	Volume of OB (Mm^3)	External Dump		Internal Dump	
			Temp. Top Soil Dump (Mm^3)	Dip side Ext. OB Dump (Mm^3)	Decoaled Void of abandoned Shivpuri OC (Phase-II) (Mm^3)	Decoaled Void of Vishnupuri UG to OC (Mm^3)
2	Quarry	9.00	0.70		8.30	
	Trench Cutting	1.70	1.70			
3	Quarry	17.00	1.10		15.90	
	Trench Cutting	1.00	1.00			
4	Quarry	17.00	0.80	9.02	0.80	6.38
5	Quarry	14.00	0.75	6.11		7.14
6	Quarry	14.00	0.75	8.25		5.00
7	Quarry	14.00	0.75	6.40		6.85
8	Quarry	14.00	0.75	6.57		6.68
9	Quarry	12.00	0.75	3.40		7.85
10	Quarry	12.00	0.60	0.25		11.15
11	Quarry	12.00				12.00
	Rehandling		-3.00			3.00
12	Quarry	12.00				12.00
	Rehandling		-3.00			3.00
13	Quarry	10.00				10.00
	Rehandling		-3.00			3.00
14	Quarry	10.00				10.00
	Rehandling		-0.65			0.65
15	Quarry	10.00				10.00
16	Quarry	0.32				0.32
TOTAL		**180.02**	**0.00**	**40.00**	**25.00**	**115.02**

7.5 EQUIPMENT SCHEDULE ~ SCHEDULE OF EXPENDITURE ON HIRING/ OUTSOURCING OF EQUIPMENT

7.5.1 EQUIPMENT SCHEDULE

The Schedule of major equipment along with its phasing for different options are shown as below:

Phasing of Major HEMM (Departmental option)

Sl. No.	HEMM	Nos.	Phasing of HEMM (Years)				
			II	III	IV	V	VI
I.	**For Top OB**						
1.	11.0 m3 Diesel Hydrualic Shovels	4	2	1		1	
2.	100T RD Dumpers	35	8	10	7	10	
3.	250 mm dia. Electric Drills	4	2	1		1	
4.	410 HP Dozers	4	2	1		1	
II.	**For Coal and Parting**						
1.	4.0-5.0 m^3 Diesel Hyd. Shovel/B/H	9	4	5			
2.	60 T RD Dumpers	57	18	24	15		
3.	160 mm Drill (D)	9	4	5			
4.	410 HP Dozer (inc. ripper)	9	4	5			
III	**For Common**						
1.	70/90 t Crane	1					1
2.	30-40 t Mobile Crane	1	1				
3.	8-12 t Mobile crane	1	1				
4.	2.8 m^3 Diesel Hyd. Backhoe	1	1				
5.	28 kl Water Sprinkler	4	1	1	1	1	
6.	5.0-6.0 m^3 Front End Loader	1		1			
7.	280 HP Motor Grader	1		1			
8.	320 HP Dozer (for Coal Stock & Misc)						1
9.	Mobile Maintenance Van	2		1	1		
10.	Diesel Bowser 8/12 kl	2	1		1		
11.	Tyre Handler (100 kW Engine)	1		1			
12.	Fire Fighting Truck	1	1				
D)	**For Reclamation**						
1.	410 HP Dozer	1					1
2.	Water Tanker 28 kl with mist spray	1					1

Phasing of Major HEMM (Partial Hiring Option)

Sl. No.	HEMM	Nos.	Phasing of HEMM (Years)				
			II	III	IV	V	VI
I.	***For Top OB***						
	By HOE						
II.	***For Coal & Parting***						
1.	4.0/5.0 cum Diesel Hyd. shovel	9	4	5			
2.	60 T RD Dumpers	57	18	24			
3	160 mm diesel drill	9	4	5			
4	410 HP Dozer	9	4	5			
III.	**For Common**						
1.	40 t Mobile Crane	1	1				
2.	8-12 t Mobile crane	1	1				
3.	28 kl Water Sprinkler (on 60T dumper chasis)	2		1	1		
4.	280 HP Motor Grader	1		1			
5.	320 HP Dozer (for coal stock and misc.)	1					1
6.	Mobile Maintenance Van	1		1			
7.	Diesel Bowser 8/12 kl	1	1				
8.	Fire Fighting Truck	1	1				
9.	Tyre Handler (100 kW Engine)	1		1			
10.	5.0-6.0 m^3 Front End Loader	1		1			
11	2.8 m^3 Diesel hyd.Backhoe	1	1				
IV.	**For Reclamation**						
1.	410 HP Dozer	1					1
2.	Water Tanker 28 kl with mist spray	1					1

Note: In Partial hiring option, Top OB removal by HoE HEMM and coal & parting by Departmental equipment.

Phasing of Major HEMM (Total Hiring Option)

Sl. No.	HEMM	Nos.	Phasing of HEMM (Years)				
			II	III	IV	V	VI
III.	**For Common**						
1.	8-12 t Mobile crane	1		1			
2.	28 kl Water Sprinkler	1			1		
3.	Fire Fighting Truck	1		1			
4.	320 HP Dozer (coal stock)	1		1			
5.	2.8 m^3 Diesel hyd.Backhoe	1		1			
6.	Mobile maintenance van	1		1			
IV.	**For Reclamation**						
1.	410 HP Dozer	1					1
2.	Water Tanker 28 kl with mist spray	1					1

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Chapter - 8

COAL HANDLING & DESPATCH ARRANGEMENTS

8.1 INTRODUCTION

A coal handling plant **ON HIRING BASIS** is proposed near access trench of the quarry to handle entire production from mine. The CHP will have facilities like crushing, storage truck loading facility and weighment. Mode of despatch of coal from CHP to customer will be by road. Details are given in subsequent paragraphs.

8.2 DESIGN PARAMETERS

8.2.1 Basic Data

a)	Target production from mine	- 2.00 Mty.
b)	Mine Operation	- 3 Shifts/Day
c)	CHP Operation	- 3 Shifts/Day
d)	Production Life of the mine	- 15 Years
e)	Size of coal (ROM)	- (-) 100 mm
f)	Mode of Despatch	- By road
g)	Customer	- M.P.S.E.B. and other misc. consumer

8.2.2 CHP Working Schedule

CHP will work for 330 days in a year. There will be 3 shifts in a day. It will work 3 hours per shift.

8.2.3 System Capacity of CHP

System capacity of CHP is around 800 t/Hour.

8.2.4 Salient Features of CHP

a) Two number of Feeder breakers for crushing of coal to (-) 200 mm product size.

b) Two number of secondary crusher for crushing of coal to (-) 100 mm product size.

c) Two numbers of 1200 mm wide belt conveyors for collecting coal from both feeder breakers.

d) One number of 1400 mm wide belt conveyor for collecting coal from both the secondary crushers and discharging in to 2 X 100 t overhead hopper.

e) 2 X 100 t capacity overhead hoppers.

f) Two numbers of hydraulic sector gates for truck loading from overhead bunker.

g) Despatch of coal on road by trucks.

h) Dust suppression and fire extinguisher system.

i) Power supply, illumination and control systems.

j) Civil and structural cost.

k) Weighment of coal with the help of road weighbridges.

8.2.5 System Description

Rear discharge dumpers of 60t capacity or equivalent type tipping trucks will carry coal from mine and discharge onto a fixed inclined plate installed before the hoppers of the two feeder breakers. The feeder breakers will crush coal to (-) 200 mm size which is conveyable. Two belt conveyors C1 and C2 of 1200mm wide will be installed below each feeder breaker to collect crushed coal up to (-)200mm size, dust, muck etc. and will be discharged into two numbers of double roll secondary crushers separately which will crush coal to (-) 100 mm size. One number of belt conveyor, C3 of 1400mm wide will be installed below both secondary crushers to collect crushed coal from both the crushers and will be discharged into overhead hoppers of 2 x 100 t capacity. Trucks will be loaded from below these

overhead hoppers with the help of hydraulic sector gates provided at the bottom openings of the hoppers.

Two numbers of electronic road weighbridge (one working and one stand by) of 100t capacity will be used for weighing of empty and loaded trucks and for preparation of bills records.

In case there is no off-take and the hoppers are full, coal from processed ROM hoppers will be dumped by trucks at a suitable location on ground. These heaps will be liquidated at a later date, as and when possible, by using front-end loaders / pay loaders, available in the project.

Chapter - 9

WORKSHOP, STORES & MAGAZINE

9.1 DEPARTMENTAL OPTION

9.1.1 INTRODUCTION

To provide maintenance and repair of various HEMM, CHP, equipment, pumps, LMVs, electrical etc of the mine, independent full fledge unit workshop has been envisaged for the project. Proposed workshop will consist of two types of maintenance and repair shops. These maintenance and repair shops will be as follows:

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

ii) **E & M workshop: -** Separate E&M workshop facilities have also been provided to carry out maintenance & repair of the CHP, equipment, pumps, LMVs, electrical etc.

These workshops are essentially a unit workshop and will depend on central/regional workshop for major repair and part manufacture. Shovel and drill maintenance & minor repairs will be carried out at site and components/assemblies requiring running repair will be dismantled from the machine and transported to the workshop for necessary repairs. Provision of dumper repair and maintenance facilities has been made taking into account that 100T & 60t dumpers will be deployed in the project.

Maintenance Facilities:

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

Scope of Work

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

Unit Excavation workshop:

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

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

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

iv) Tyre replacement and tyre inflation.

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

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

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

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

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

x) Miscellaneous structural works.

xi) Scheduling for repair needs at central workshop.

Main Workshop

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

Unit E&M Workshop

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

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

ii) Manufacture of spares to a limited extent

iii) Transformer oil filtration

9.1.2 PROPOSED FACILITIES

In order to carry out the above activities, following facilities are proposed in the workshop:

i) Maintenance and repair sheds for all functional shops.
ii) Stores sheds
iii) POL store
iv) Washing stations
v) Pavement for parking of mining equipment/HEMM
vi) Material handling facilities
vii) Substation
viii) Supporting facilities like pump house, security post, fire fighting etc.
ix) Material handling facilities for workshop and stores.
x) Store yard
xi) Mobile servicing van and mobile refueling facilities
xii) E&M workshop shed consisting of machine shop, Mechanical repair, Electrical repair, welding and structural sections.
xiii) LMVs repair shed
xiv) Washing platform
xv) Workshop office

Necessary provision for plant and equipments, tools, testing equipment etc has been provided in the respective shops for efficient repair and maintenance of the HEMM and other equipment of the project.

In addition to the above, mobile crane, tyre handler etc. have been proposed in this report for field servicing/ maintenance of HEMM.

9.1.3 WORKSHOP AND STORES LAYOUT

For efficient operation and effective supervision, the layout of facilities in the workshop have been prepared taking into consideration the sequence of operation for maintenance & repair, minimum inter-shop movement of men & material etc. The area of each shop/ shed has been worked out after studying

the space requirement and layout design of machines and also providing reasonable working and movement space. The general layout plan of excavation workshop and E& M workshop is provided in this report.

9.1.4 WORKSHOP AND STORE PLANT & MACHINERY

The plant and machinery provided in this workshop is sufficient to meet the requirement of the scope of the workshop. Adequate P& M for main functional shops including stores have been provided. Besides that adequate provision for washing equipment, material handling equipment, floor cleaning equipment, ventilation equipment, general purpose tools, special purpose tools, installation & commissioning, electrical for workshop P & M and initial spares have been provided.

9.1.5 PROJECT STORE

One small and independent unit stores at convenient location has been provided to cater the routine needs of consumables, spares, POLs etc. This will depend on Regional/Central stores for major spares.

9.1.6 CAPITAL INVESTMENT

Total capital investment requirement has been given in appendix A.3.3.

9.1.7 LIST OF WORKSHOP P & M

Details of shop wise P & M requirement for excavation workshop, their cost and phasing have been given in appendix A.3.3.1 and for E & M workshop in Appendix A.3.3.2.

9.1.8 DRAWINGS

Location of the workshop and stores will be decided at the time of start of the mine at convenient location for maintenance & repair. Overall area, Covered area, paved area, roads, gates, provision of repair bays, details of workshop complex, functional shops, bracket height, height of different shops, location of washing and fuel delivery station etc are given in appendix A.2.1 & drawing

of workshop given in this project. Separate complex of unit store with separate entry have been provided at convenient place. Drawing of unit store has not been provided in this report.

One dozer repair shop with two bays has been provided at pit top for maintenance and repair of dozers of the project with facilities of dozer repair shed, washing system with sump and pump house. Drawing of dozer shop is not given in this report.

9.2 PARTIAL HIRING OPTION

9.2.1 Introduction

To provide maintenance and repair of various HEMM, CHP, equipment, pumps, LMVs, electrical etc of the mine, independent full fledge unit workshop has been envisaged for the project. Proposed workshop will consist of two types of maintenance and repair shops. These maintenance and repair shops will be as follows:

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

ii) **E & M workshop: -** Separate E & M workshop facilities have also been provided to carry out maintenance & repair of the CHP, equipment, pumps, LMVs, electrical etc.

These workshops are essentially a unit workshop and will depend on central/regional workshop for major repair and part manufacture. Shovel and drill maintenance & minor repairs will be carried out at site and components/assemblies requiring running repair will be dismantled from the machine and transported to the workshop for necessary repairs. Provision of dumper repair and maintenance facilities has been made taking into account that 60t dumpers will be deployed in the project.

Maintenance Facilities

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

Scope of Work

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

Unit Excavation workshop:

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

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

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

iv) Tyre replacement and tyre inflation.

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

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

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

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

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

x) Miscellaneous structural works.

xi) Scheduling for repair needs at central workshop.

Main Workshop

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

Unit E&M Workshop

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

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

ii) Manufacture of spares to a limited extent

iii) Transformer oil filtration

9.2.2 PROPOSED FACILITIES

In order to carry out the above activities the following facilities are proposed in the workshop:

i) Maintenance and repair sheds for all functional shops
ii) Stores sheds
iii) POL store
iv) Washing stations
v) Pavement for parking of mining equipment/HEMM
vi) Material handling facilities
vii) Switch room
viii) Supporting facilities like pump house, security post, fire fighting etc.
ix) Material handling facilities for workshop and stores.
x) Store yard
xi) Mobile servicing van and mobile refueling facilities
xii) E&M workshop shed consisting of machine shop, Mechanical repair, Electrical repair, welding and structural sections
xiii) LMVs repair shed
xiv) Washing platform
xv) Workshop office
xvi) Necessary provision for plant and equipments, tools, testing equipment etc has been provided in the respective shops for efficient repair and maintenance of the HEMM and other equipment of the project

In addition to the above, mobile crane, tyre handler etc. have been proposed in this report for field servicing/ maintenance of HEMM.

9.2.3 WORKSHOP AND STORES LAYOUT

For efficient operation and effective supervision, the layout of facilities in the workshop have been prepared taking into consideration the sequence of operation for maintenance & repair, minimum inter-shop movement of men & material etc. The area of each shop/ shed has been worked out after studying the space requirement and layout design of machines and also providing reasonable working and movement space. The general layout plan of excavation workshop and E&M workshop is provided in this report..

9.2.4 WORKSHOP AND STORE PLANT & MACHINERY

The plant and machinery provided in this workshop is sufficient to meet the requirement of the scope of the workshop. Adequate P& M for main functional shops including stores have been provided. Besides that adequate provision for washing equipment, material handling equipment, floor cleaning equipment, ventilation equipment, general purpose tools, special purpose tools, installation & commissioning, electrical for workshop P & M and initial spares have been provided.

9.2.5 PROJECT STORE

One small and independent unit stores at convenient location has been provided to cater the routine needs of consumables, spares, POLs etc. This will depend on Regional/Central stores for major spares.

9.2.6 CAPITAL INVESTMENT:

Total capital investment requirement has been given in appendix A.3.3.

9.2.7 LIST OF WORKSHOP P & M :

Details of shop wise P & M requirement for excavation workshop, their cost and phasing have been given in appendix A.3.3.1 and for E & M workshop in Appendix A.3.3.2.

9.2.8 DRAWINGS

Location of the workshop and stores will be decided at the time of start of the mine at convenient location for maintenance & repair. Overall area, Covered

area, paved area, roads, gates, provision of repair bays, details of workshop complex, functional shops, bracket height, height of different shops, location of washing and fuel delivery station etc are given in appendix A.2.1 & drawing of workshop given in this project. Separate complex of unit store with separate entry have been provided at convenient place. Drawing of unit store has not been provided in this report.

One dozer repair shop has been provided at pit top for maintenance and repair of dozers of the project with facilities of dozer repair shed, washing system with sump and pump house. Drawing of dozer shop is not given in this report.

9.3 TOTAL HIRING OPTION

All HEMM deployed in this mine will be hired and their maintenance will be contractor's responsibilities. Hence, there is no provision of any unit excavation workshop in the report. E & M workshop facilities have been provided to carry out the maintenance and repair of the CHP equipment, pumps, electrical etc. of the mine. This E & M workshop will be supported by Regional/Central workshop for major repairs and parts manufacture, because it is essentially a pithead maintenance workshop.

Maintenance and repairs of CHP equipments, pumps, electrical, manufacture of spares to a limited extent, transformer oil filtration, scheduling for repair needs at Regional/Central workshop etc. have been provided in the scope of activities of the workshop. Facilities provided in this workshop are machine shop, mechanical repair shop, electrical repair shop, welding and structural section, etc. Necessary provision for plant and machinery, tools, testing equipment etc. has been provided in respective shops for efficient repair and maintenance of the mine equipments.

The layout of the facilities in the workshop has been provided in this report. The requirement of plinth area for workshop sheds and other engineering details have been given in appendix A.2.1. The summary of estimated capital investment for workshop plant and machinery has been given in appendix

A.3.3. The manpower required for the supervision and operation of the workshop is given in appendix-B

9.3.1 UNIT STORES

One small and independent unit stores has been provided at convenient location to cater the routine needs of consumables, spares, POLs etc. This will depend on Regional/Central stores for major spares. Unit store lay out drawing is not given in this project.

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Chapter - 10

SAFETY AND CONSERVATION

10.1 GENERAL

The project report has been drawn in conformity with the prevailing statutory provisions as per Mines Act 1952 and CMR 2017 applicable for safety in Opencast Mines. However, all statutory rules, regulations, applicable laws etc. and statutory requirement related to Govt. licenses, workers compensation, Insurance, etc. including minimum wage act for workers employed by the agency outsourcing HEMM shall have to be adhered to. All the regulations & schedules of coal mines Regulations 2017 relating to opencast mining have to be adhered to and implemented in order to maintain day to day safety precautions as per statute.

10.2 INUNDATION

Pench river is flowing in the western side of the proposed Vishnupuri UG to OC mine. The HFL of this river is 700 m. An embankment of 30m width and 6 m above HFL has been proposed against the river for the safety of the mine. As per prevailing practice, proposed embankment has to be constructed by spreading the suitable soil i.e fine grained soil for Hearting zone and coarse grained soil for casing zone in continuous layers and compacted by mechanical means i.e. by rollers to standard optimum dry density at optimum moisture content. However before adoption of this section it is suggested that the proposed embankment section may be got approved by competent authority like Maharashtra Irrigation department of Govt. of Maharashtra and DGMS for its structural safety and stability. The alignment of the proposed embankment is shown in Quarry & Surface Layout Plan. It is also suggested to determine withdrawal level/Danger mark, so that as water level crosses the limit, workings shall be stopped.

Suitable float alarms connected to Pench river would be provided at strategic places like Time Keeper Office, Security Office, Safety Office, Manager Residence, Pit Office etc. The floats in the river would activate the alarms as soon as the water level in the river crosses the danger mark. Suitable action can then be taken to investigate the alarm and take other suitable precautions. In addition, river side patrolling would also be carried out during monsoon to caution the project authority in case of any sudden rise of water level in the river. Adequate wireless communication sets have been provided for the above purpose. The rain water falling within the project area would be diverted from the quarry area by providing garland drains and shall be collected towards low lying area.

Few seasonal nallas flows across proposed quarry area which are required to be diverted. The route of diversion will be decided after survey of existing nallas. Adequate capital provisioning for above diversion will be provided in the Project Report.

10.3 DUST SUPPRESSION

For suppression of dust water sprinklers have been provided. Suppression of mine dust may be done by using package bond & dust bond, for methodology of application DGMS Circular No.8 of 1997 may be referred.

10.4 FIRE AND SPONTANEOUS HEATING

The project report proposes extraction of standing pillars from seams- IC, III, IVA & VB2 of UG mine by opencast method. The incubation period of this coalfield is reported to vary between 6 months to 1 year. There may be spontaneous heating of coal in UG galleries near the quarry coal face due to leakage of air and fire may broke-out as soon as these galleries are exposed. It is proposed to lay water pipeline along the strike length on the dip side of quarry so that flexible hoses can be taken out from `T' points of the pipeline for immediate quenching of the fire in coal galleries/pillars. In addition to this, a fire retardant Bitumen based sealant which is in the approved list of DGMS can be used in the coal benches to minimize leakage of air and thereby reduce incidence of occurrences of fire due to spontaneous heating.

While extracting pillars by opencast method, precautions against coal dust explosion as specified in DGMS Circular No.4 of 1983 should be adhered to. Wild or herbaceous plants shall be removed from the mine. No person shall deposit heated material or ashes on any opencast working. No person shall light a fire or permit a fire to be lighted in any OC working except by the permission in writing of the Manager and only for a special purpose specified therein. No coal shall be left exposed in coal benches more than its incubation period to avoid fire in seam due to spontaneous heating. Proper type of the extinguisher should be kept in each HEMM for use in case of emergency. In coal stock, coal shall be dispatched on the basis of first in first out.

10.5 SLOPE STABILITY

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

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

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

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

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

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

vi) No undercutting of slopes to be done.

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

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

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

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

10.5.1 STABILITY OF DUMPS

Coal Mines Regulation'2017 provides for precautions to be taken for Spoil banks and dumps in Regulation no. 108 and Circular No. DGMS (Tech.) (S&T) Circular 2 Dhanbad, dated 20/6/2001. The Regulation is as following:

Spoil banks and dumps (Regulation 108.)

(1) While removing overburden, the top soil shall be stacked at a separate place, so that the same is used to cover the reclaimed area.

(2) Slope of a spoil bank shall be determined by the natural angle of repose of the material being deposited, but shall in no case exceed 37.5 degrees from the horizontal. The spoil bank shall not be retained by artificial means at an angle in excess of natural angle of repose or 37.5 degrees whichever is less.

(3) Loose overburden and other such material from opencast workings or other rejects from washeries or from other source shall be dumped in such a manner that there is no possibility of dumped material sliding.

(4) Any spoil bank exceeding 30m in height shall be benched so that no bench exceeds 30m in height and the overall slope shall not exceed 1 vertical to 1.5 horizontal.

(5) The toe of a spoil-bank shall not be extended to any point within 45 m of a mine opening, railway or other public works, public road or building or other permanent structure not belonging to the owner.

(6) A suitable fence shall be erected between any railway or public works or road or building or structure not belonging to the owner and the toe of an active spoil bank so as to prevent unauthorized persons from approaching the spoil-bank.

(7) No person shall approach or shall be permitted to approach the toe of an active spoil bank where he may be endangered from material sliding or rolling down the face.

(8) Adequate precautions shall be taken to prevent failure of the slopes of the spoil banks or dumps.

Following precautions are required for stability of OB Dumps

1. Dumping Site Selection

Usually, ground close to the mine is selected for dumping in surface mines. However, suitability of site should be evaluated before construction of dump to ensure the stability. If the site is not suitable from the point of view of stability then alternative site may be explored, or else some site preparations should be undertaken for making it suitable for waste dumping.

Following factors should be considered while selecting the dumping site:

a) Size of the area,
b) Presence of infrastructural and other features,
c) Topography and landforms,
d) Soil characteristics,
e) Rain Fall,
f) Hydrology, and
g) Regional seismicity.

2. Stability of OB Dumps

The stability of dumps must be carefully evaluated and monitored during the operating phase of the mining. The OB dump slopes are usually designed with substantial factors of safety and there is usually little risk of failure.

The long term stability of OB dump slopes can decrease as a result of :

(i) increase in the groundwater table due to groundwater accumulation and due to changes in the permeability of the dump materials resulting from weathering and the in washing of fines,

(ii) decrease in the dump material strength due to weathering.

3. Methods of Improving Stability of OB Dumps

Many methods have been used in geotechnical engineering for stabilization of landslides. The legislative and environmental requirements of most countries stress on stability of dumps to protect the environment and for safety of land, building and mankind. But the legislative controls cannot adequately detail the procedures to aid mining personnel or regulatory agencies in identifying potential stability problems. Moreover, stability problems are often site specific and require individual attention. Any legislative control cannot preclude the failure of spoil dumps altogether. The various methods for improving the stability of waste dumps are as follows :

- Modification of spoil pile configuration (berms, slope stepping, slope flattening etc.
- Drainage by horizontal and vertical drains, sand drains, relief wells, diversion ditches etc.
- Improvement of spoil strength by compaction, zonation etc.
- External buttresses, berms, in situ coal wedge etc.
- Vegetation.
- Soil reinforcement techniques-Geotextiles, geogrids.

All the stabilization techniques mentioned above function by either increasing resistance forces or decreasing driving force in a potentially unstable slope.

i) Modification of spoil pile configuration

The flattening of slope or provision of berms is generally attempted to increase the stability of dumps by reducing the driving forces in the slope. Reduction of dump height is the last alternative to enhance stability.

ii) Drainage

The influence of groundwater seepage in the slope or in combination with other actions, is the most common cause of slope failure in temperate and humid regions all over the world. The weakening of moisture – sensitive material at the base of the spoil pile or spoil material often initiates instability in wet, saturated dumps.

Drainage reduces the hydrostatic and seepage forces on the slope as well as the risk of erosion and piping and, therefore, stabilizes slopes. The intent of drainage is to limit the amount of water in the spoil and/or underclay, thereby enhancing stability or expedite the consolidation. Drainage may be accomplished by providing drainage ditches, granular basal drains beneath the spoil pile, horizontal and vertical drains, relief walls beneath saturated spoil pile or rarely by sand drains, sand wicks and electro-osrnosis.

iii) Vegetation

Revegetation is one of the widely used technique for controlling erosion and stabilization of dump slope, and thereby maintaining ecological equilibrium in the area. Role of vegetation growth upon dump slope can be described as hydrogeological and mechanical actions. With respect to the hydrogeological action, roots of vegetation play an important role in enhancing the dump stability by controlling interception of rain water and evapotranspiration and the resulting pore pressure reduction. Whereas mechanical action in turn, reinforced the dump material by roots and enhanced the shear strength of dump material. This action is closely related to root density, depth and strength. The small roots of vegetation mobilize their tensile strength by increasing soil-root friction of the compound matrix (soil-fiber), whereas, the large size roots intersect the shear plane; act as individual anchors and eventually tend to slip through the soil matrix without breaking, mobilizing a small portion of their tensile strength. The role or effect of smaller plants in stability of slopes is different from that of the large plants. The roots of smaller plants (such as grasses and shrubs) do not go very deep, however, it

stabilizes the slope by binding the upper layer of slope. It also prevents the rain water from infiltrating into upper layer of slope thereby preventing material strength loss. The roots of the large plants (such as trees) go deeper into the slope and act as permanent stitching material. It increases the shear strength of dump mass in general and weakness joint planes in particular. However, tree takes longer time to grow and significantly contribute in slope stability.

Vegetation is multifunctional, relatively inexpensive, self repairing, visually attractive, and does not require heavy or elaborate equipment for installation. However, there are certain limitations. Vegetation is susceptible to blight and drought. It is difficult to get established on mine waste dumps and steep slopes. It is unable to resist severe scour and is slow to become established. It provides only surface stability, deeper level stability is difficult. Therefore, this is not practiced in isolation today due to several uncertainties. But the method offers several environmental benefits.

iv) Geosynthetically reinforced slopes

Geosynthetic soil reinforcement is another technique used to stabilize slopes in civil engineering applications, particularly if steeper and higher slope is desired. In addition, it can improve compaction on the edge of the slope.

In the establishment and associated construction work abroad, Geosynthetics have proven to be successful in a wide range of applications. For example, geotextiles are not used to assist in construction of access roads, site preparation, haul roads and in connection with the construction of

embankments for storage ponds and dams as well as for general hydraulic and foundation engineering problems. However in India, they have not been tried in coal mines for dumps stability improvement, though their use is common in civil engineering.

Soil reinforcement using high tensile strength inclusions can increase the shear resistance of a soil mass. This strengthening permits construction of soil structures at slope angles greater than the soil's angle of repose and/or greater than would be possible without the reinforcement.

Geogrid is a variant of geosynthetics. Geogrids are placed in layers during construction to intercept and stabilize potential slip surface. Geogrid soil reinforcement imparts tensile strengths to the soil, thereby increasing the overall factor of safety of slopes against sliding or rotation.

4.0 Monitoring

4.1 Deformation as an Indication of Failure

Deformation occurs in a slope as a result of stresses and shear displacement in the mass of material forming the slope. Some of these deformations, such as consolidation are not indicative of failure while others, such as shear displacement along the failure surface are indicative of failure. To predict failure, it is necessary to distinguish deformations which indicate failure from those which do not. This requires and understanding of the failure mode and the deformations that accompany it.

Failure criteria are usually based on experienced gained as the dump is constructed. The rate of deformation and a change of the rate of deformation are generally good indicators of the behavior of a slope. They may be used to establish criteria indicative of failure.

The slices method of limiting equilibrium analysis may be used to obtain an estimate of the stresses which occur along a failure surface and to determine which portion of the failure surface is in failure. Knowing the stresses and the zones in failure, the nature of the deformations that will result can be inferred.

This inference may be used to design a monitoring system and to interpret the results of deformation monitoring.

4.2 Considerations in Dump Monitoring

1. Failure starts in the zone below the crest. Failure progresses towards the toe which fails just before general slope failure. Deformations at the top of the slope therefore occur during the entire process of failure surface development while those at the toe are most pronounced just before failure occurs. This implies a longer period of warning from monitoring at the crest

than the toe but with more "noise" and a less precise indication of the ultimate failure. The warning signal at the toe is more distinct but may occur too late to be of value.

2. The mobilization of failure conditions on a portion of the potential failure surface does not necessarily imply dump failure. Thus large deformations can occur at the crest with perfectly satisfactory dump performance. The same cannot be said for the toe area.

3. Deformations at the dump crest due to settlement and consolidation can, to some degree, be separated from shear deformations as a result of the greater amount of horizontal movement associated with the latter.

4. Consolidation settlement usually decrease with time. Where vertical deformations continue at the same rate, or accelerate, after dumping is stopped progressive failure is indicated.

5. Stability analyses often indicate a failure surface which intersects the slope at the crest line. Dump failures of this type are frequently observed. Monitoring stations must be located at the crest or sometimes on the front slope. Monitoring stations located back from the crest are of little value if the failure surface is likely to intersect the crest.

6. The amount of movement that is likely to occur before failure determines the sensitivity of the monitoring equipment required. Movement varies with the

   type of dump material, the dump height and the location at which monitoring will be done. Stiff cut rock slopes may fail after a few centimeters of movement and sensitivity to tenths of a centimeter, or less, is required.

10.6 HAUL ROAD MAINTENANCE

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

10.7 BLASTING

i) At the time of operation of mine, drilling parameters have to be optimized on the basis of actual field trial depending upon joint pattern, bedding plane, type of rock and local geology of the blast site.

ii) Suitable precautions would be taken as per statute before and after blasting operations. While working near infrastructure, buildings etc., controlled blasting technique has to be practiced to minimize fly-off rocks and ground vibrations and to keep them within safe limits. Provision for conducting such scientific studies has been made in this report.

10.8 CONSERVATION OF COAL

i) Presently, part of the proposed area is being worked by underground method of mining under Vishnupuri – I & II UG mines. The coal has been left unextracted in underground workings for compliance belowground of safety regulations. In OC workings the losses are quite less. Hence total extractable reserves will increase in opencast mining.

ii) The percentage of extraction in OC mine is very high compared to UG mining and therefore from conservation of coal point of view, the conversion of UG to OC mine is justified.

iii) Although for calculation of mineable coal reserves, 5% mining losses has been taken into account, but in practice all efforts would be made to minimise the losses. Separate excavator would be used for mining coal & parting. OB benches would be kept sufficiently advanced to avoid mixing of coal & OB.

iv) All efforts shall be made to reduce carpet loss on floor of quarry, loss of coal in each contact zones and to reduce pilferage of coal while transporting it from coal face to coal stockyard/CHP.

v) OB benches would be kept sufficiently advanced to avoid mixing of coal & OB. Maximum possible backfilling is proposed in mine.

10.9 SCIENTIFIC STUDIES

Following areas have been identified in the proposed Vishnupuri UG to OC mine for detailed scientific studies:

a) Slope Stability

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

b) Drilling & Blasting

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

c) Hydrogeology

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

In addition to this, various other parameters like, soil testing, etc. need scientific study. Adequate capital provision has been made in this report for these miscellaneous studies also.

10.10 ADDITIONAL PERMISSION / RELAXATIONS REQUIRED FROM DGMS

- **SAFETY ASPECTS FOR OUTSOURCING/HIRING OF HEMM**

Special precaution should be taken while employing contractual labours in the mine. Before employing them to the mine proper vocational training should be imparted and recommendations of Safety Conference should be strictly followed. Terms and conditions shall be fixed by management for deployment of contractual labours as well as machineries. Some of the major aspects are as follows :

A) For persons

i) Records in Form-B & Form-E shall be maintained.

ii) Records of VTC driving licence of operators shall be kept by Operators and readily available for inspection by management

iii) Salaries shall be distributed in front of management representative

iv) No person shall be employed unless person holds VTC certificate and Management is informed.

v) Adequate supervision shall be maintained by competent person.

B) For Machineries

i) All the machineries to be deployed in mines should be passed by the management.

ii) RTO certificate photo copies of all vehicles shall be submitted to management.

iii) Daily welding, monitoring, inspection shall be done by contractor's mechanic as directed by management.

iv) Machine manufacturers should be asked to give risk analysis.

C) General

i) No person/vehicle shall be deployed at any place other than authorised place.

ii) All employees of contractors should obey lawful instruction of mine management.

iii) Risk Management Plan by contractor of tipper/pay loader

iv) Trained Manpower

v) Restricted traffic & traffic control planning.

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Chapter - 11

ENVIRONMENT MANAGEMENT

11.1 INTRODUCTION

The proposed Project Report for Vishnupuri UG to OC Mine has envisaged conversion of existing Vishnupuri-I & II UG mine into an opencast mine. The adjacent Shivpuri OC mine is proposed to be included in the proposed Vishnupuri UG to OC mine after completion of OC Scheme. The status of Environmental Clearance for these existing mines are as follows :

i) Environmental Clearance for Vishnupur-I UG mine has been granted for 0.21 Mty capacity and 122.54 ha mining leasehold area vide letter no. J-11015/228/2005-IA.II(M) dated 27th March, 2006.

ii) Environmental Clearance for Vishnupur-II UG mine has been granted for 0.26 Mty capacity and 321.985 ha mining leasehold area vide letter no. J-11015/229/2005 -IA.II(M) dated 3rd March, 2006.

iii) Environmental Clearance for Shivpuri OC mine has been granted for 1.00 Mty capacity and 336.293 ha mining leasehold area vide letter no. J-11015/385/2008 -IA.II(M) dated 2nd February, 2009.

The proposed target production of Vishnupuri UG to OC mine is 2.00 Mty and the total area involved is 590.46 ha, out of which 560.76 ha is within the project boundary of Vishnupuri UG to OC Mine and rest 29.70 ha is outside the project boundary. Thus, fresh EC will have to obtained for the proposed OC mine prior to conversion of UG mines into OC mine. In the subsequent paragraphs, an attempt has been made to assess the likely environmental impacts due to proposed mining activities.

11.2 EXISTING ENVIRONMENTAL QUALITY

11.2.1 AMBIENT AIR QUALITY IN PROJECT AREA

Regular Environmental monitoring is being carried out by Env Dept. RI-IV CMPDI Nagpur for the existing Shivpuri OC mine at following AAQ Monitoring Locations .

Sl. No.	Location Details	AAQ Station
1	Site Office	PSpOA-1
2	Sub-Station	PSpOA-2
3	Guest House - Shivpuri	PSpOA-3
4	Chhinda village	PSpOA-4

1. Site Office			**: PSPOA-1**				
			(24 hourly values in µg/m^3)				
Month	Dates of Sampling		Parameters				
	From	To	SPM	PM-10	NOx	SOx	PM 2.5
OCT.2016	18.10.16	19.10.16	77	68	6	31	--
NOV.2016	06.11.16	07.11.16	99	78	5	29	--
NOV.2016	20.11.16	21.11.16	87	68	5	22	--
DEC.2016	04.12.16	05.12.16	85	63	5	36	--
DEC.2016	28.12.16	29.12.16	220	167	4	16	--
FEB.2017	13.02.17	14.02.17	156	85	5	24	--
MAR.2017	05.03.17	06.03.17	182	91	6	27	--
MAR.2017	28.03.17	29.03.17	181	101	5	26	--
APRIL.2017	12-04-17	13-04-17	369	258	5.9	29.5	--
APRIL.2017	20-04-17	21-04-17	256	181	5.0	18.7	60
MAY.2017	13-05-17	14-05-17	215	177	5.4	27.5	--
MAY.2017	19-05-17	20-05-17	183	100	5.1	30.0	--
JUNE.2017	19-06-17	20-06-17	316	149	5.6	35.8	--
JULY,2017	19-07-17	20-07-17	28	23	6.0	23.0	13
AUGUST,2017	4-08-2017	5-08-17	223	191	6.0	28.0	41
AUGUST,2017	20-08-2017	21-08-2017	40	28	5.0	32.0	86
SEPTEMBER,2017	19-09-2017	20-09-2017	123	107	5.0	22.0	53
OCTOBER,2017	15-10-2017	16-10-2017	112	58	6.0	25.0	49
OCTOBER,2017	31-10-2017	1-11-2017	101	90	6.0	22.0	77
TLV as per Env.(Protection) Amendment Rule 2000			**600**	**300**	**120**	**120**	**60**

2. Sub Station (Vishnupuri UG)			**: PSPOA-2**				
							(24 hourly values in µg/m
Month	Dates of Sampling		Parameters				
	From	To	TPM	PM-10	NOX	SOx	PM-2.5
OCT.2016	19.10.16	20.10.16	30	21	5	26	--
NOV.2016	06.11.16	07.11.16	87	40	5	31	--
NOV.2016	21.11.16	22.11.16	154	80	5	30	--
DEC.2016	05.11.16	06.12.16	103	100	5	22	--
OCT.2016	19.10.16	20.10.16	220	167	4	16	--
FEB.2017	14.02.17	15.02.17	173	111	5	24	--
MAR.2017	05.03.17	06.03.17	204	73	5	29	--
APRIL.2017	13-04-17	14-04-17	386	231	5.0	23.1	57
APRIL.2017	19-04-17	20-04-17	113	52	4.7	33.7	--
MAY.2017	13-05-17	14-05-17	190	128	5.6	29.5	55
MAY.2017	20-05-17	21-05-17	117	53	5.6	25.0	52
JUNE.2017	19-06-17	20-06-17	198	91	5.5	23.6	--
JULY'2017	20-07-2017	21-07-2017	108	100	6.0	32.0	-
AUGUST'2017	4-08-2017	5-08-2013	37	24	6.0	23.0	-
AUGUST'2017	20-08-2017	21-08-2017	31	19	6.0	26.0	-
SEPTEMBER'2017	19-09-2017	20-09-2017	87	55	5.0	19.0	-
OCTOBER'2017	15-10-2017	16-10-2017	203	99	6.0	15.0	
TLV as per Env.(Protection) Amendment Rule 2000			**600**	**300**	**120**	**120**	**60**

3. Guest house – Shivpuri			**: PSPOA-3**				
							(24 hourly values in µg/m^3
Month	Dates of Sampling		Parameters				
	From	To	TPM	PM-10	NOx	SOx	PM 2.5
OCT.2016	15.10.16	16.10.16	84	25	6	25	--
OCT.2016	18.10.16	19.10.16	45	35	6	31	--
NOV.2016	05.11.16	06.11.16	52	29	6	30	--
NOV.2016	21.11.16	22.11.16	73	55	5	28	--
DEC.2016	05.12.16	06.12.16	99	27	5	26	--
DEC.2016	28.12.16	29.12.16	92	34	7	20	--
JAN.2017	13.01.17	14.01.17	141	90	4	19	--
JAN.2017	18.01.17	19.01.17	131	74	4	21	--
FEB.2017	14.02.17	15.02.17	90	59	4	23	--
FEB.2017	26.02.17	27.02.17	153	67	6	28	--
MAR.2017	05.03.17	06.03.17	172	98	5	28	--
MAR.2017	28.03.17	29.03.17	77	38	5	11	--
APRIL.2017	20-04-17	21-04-17	376	227	4.8	30.0	--
APRIL.2017	13-04-17	14-04-17	194	135	5.0	27.5	--
APRIL.2017	19-04-17	20-04-17	301	227	4.9	22.5	56
MAY.2017	13-05-17	14-05-17	138	84	8.3	30.3	--
MAY.2017	20-05-17	21-05-17	105	39	5.9	19.7	--

			(24 hourly values in µg/m^3				
Month	Dates of Sampling		Parameters				
	From	To	TPM	PM-10	NOx	SOx	PM 2.5
JUNE.2017	19-06-17	20-06-17	116	67	5.8	18.5	--
JULY'2017	19-07-2017	20-07-2017	77	63	6.0	24.0	36
AUGUST'2017	13-08-2017	14-08-2013	61	22	6.0	23.0	55
AUGUST'2017	23-08-2017	24-08-2017	26	17	6.0	29.0	22
SEPTEMBER'2017	14-09-2017	15-09-2017	48	43	5.0	19.0	21
OCTOBER'2017	15-10-2017	16-10-2017	81	70	6.0	30.0	-
OCTOBER'2017	31-10-2017	1-11-2017	82	74	6.0	28.0	-
TLV as per Env.(Protection) Amendment Rule 2000			**200**	**100**	**80**	**80**	**60**

4. Chinda Village			**: PSPOA-4**				
			(24 hourly values in µg/m^3)				
Month	Dates of Sampling		Parameters				
	From	To	TPM	PM-10	NOx	SOx	PM-2.5
OCT.2016	13.10.16	14.10.16	75	67	5	34	11
OCT.2016	20.10.16	2110.16	67	53	6	25	33
NOV.2016	06.11.16	07.11.16	130	76	5	21	32
NOV.2016	21.11.16	22.11.16	71	54	5	22	24
DEC.2016	06.12.16	07.12.16	199	100	5	32	40
DEC.2016	24.12.16	25.12.16	92	54	7	30	26
JAN.2017	13.01.17	14.01.17	121	47	5	19	45
JAN.2017	19.01.17	20.01.17	158	65	5	28	57
FEB.2017	10.02.17	11.02.17	152	55	5	31	11
FEB.2017	27.02.17	28.02.17	80	56	6	23	24
MAR.2017	06.03.17	07.03.17	180	95	5	24	50
MAR.2017	25.03.17	26.03.17	192	91	5	26	55
MAY.2017	13-05-17	14-05-17	201	89	5.9	28.6	--
MAY.2017	20-05-17	21-05-17	219	118	5.6	32.2	--
JUNE.2017	19-06-17	20-06-17	135	40	6.1	29.5	--
JULY'2017	12-07-2017	13-07-2017	119	82	6.0	31.0	47
AUGUST'2017	11-08-2017	12-08-2013	42	26	7.0	30.0	-
AUGUST'2017	19-08-2017	20-08-2017	101	88	6.0	19.0	-
SEPTEMBER'2017	20-09-2017	21-09-2017	45	30	6.0	19.0	5
OCTOBER'2017	29-10-2017	30-10-2017	86	79	6.0	17.0	-
TLV as per Env.(Protection) Amendment Rule 2000			**200**	**100**	**80**	**80**	**60**

Core zone (Mine Leasehold Boundary)

Most of the values are found to be well within the Standards for Coalmines stipulated by Ministry of Environment, Forests & Climate Change (MoEF&CC).

Buffer zone (10 km radius) from ML Boundary

Most of the values of SPM, RPM, and SO_2 and NO_X are well within the CPCB norms.

11.2.2 WATER QUALITY

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

EFFLUENT WATER QUALITY REPORT

NAME OF THE COMPANY : WCL YEAR : 2017
NAME OF THE AREA : PENCH Q.E. : JUNE
NAME OF THE PROJECT : SHIVPURI OC

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11.2.3 NOISE LEVEL QUALITY

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

Sl. No.	Location Details	Location Code
1.	Near Manager Office	PSpON-1
2.	Colony (Vishnupuri)	PSpON-2

Name of Location : Near Manager Office : PSpON-1

Month	Date of Data collection	Noise Level in dB(A)	
		Day Time	Night Time

OCT.2016	15.10.16	56.5	54.8
OCT.2016	18.10.16	55.9	55.2
NOV.2016	04.11.16	52.4	47.8
NOV.2016	18.11.16	50.9	49.5
DEC.2016	03.12.16	53.6	53.3
DEC.2016	29.12.16	51.6	50.2
JAN.2017	14.01.17	51.5	49.7
JAN.2017	16.01.17	50.8	49.2
FEB.2017	14.02.17	51.4	49.7
FEB.2017	27.02.17	52.5	50.7
MAR.2017	04.03.17	54.2	49.1
MAR.2017	28.03.17	53.6	52.1
APRIL.2017	15.04.17	56.4	52.7
APRIL.2017	17.04.17	47.1	54.2
MAY.2017	15.05.17	51.7	48.4
MAY.2017	17.05.17	50.7	49.8
JUNE.2017	15.06.17	51.2	49.5
JUNE.2017	17.06.17	51.1	49.9
Noise Level Standard as per Env. (Protection) Amendment rule 2000		**75**	**70**

Name of Location : Colony (Vishnupuri) : PSpON-2

Month	Date of Data collection	Noise Level in dB(A)	
		Day Time	Night Time
OCT.2016	14.10.16	43.7	42.9
OCT.2016	20.10.16	44.5	43.4
NOV.2016	06.11.16	45.2	43.7
NOV.2016	18.11.16	45.4	43.2
DEC.2016	03.12.16	43.6	42.7

Month	Date of Data collection	Noise Level in dB(A)	
		Day Time	Night Time
DEC.2016	29.12.16	44.6	41.5
JAN.2017	14.01.17	45.7	43.6
JAN.2017	16.01.17	44.8	43.7
FEB.2017	14.02.17	45.1	43.9
FEB.2017	27.02.17	45.4	43.7
MAR.2017	06.03.17	47.4	43.9
MAR.2017	28.03.17	43.5	42.4
APRIL.2017	15.04.17	46.7	43.9
APRIL.2017	17.04.17	47.2	44.1
MAY.2017	15.05.17	46.2	43.9

MAY.2017	17.05.17	46.1	44.9
JUNE.2017	15.06.17	47.1	45.2
JUNE.2017	16.06.17	46.5	45.1
Noise Level Standard as per Env. (Protection) Amendment rule 2000		**55**	**45**

11.2.4 FLORA AND FAUNA

A baseline Flora and Fauna study was conducted for nearby Shivapuri OC Mine Area during Post-monsoon Season of 2013.

Endangered Flora: No endangered plant species in Core zone.

Endemic Flora: No endemic plant species have been found in Core zone.

Endangered species (as per Wildlife (Protection) Act: No Endangered Fauna was recorded in core zone.

Migratory Species of the Project areas : No endemic species were observed in Core zone.

Migratory corridors and Flight Paths : No migratory corridors and Flight paths were present in Core zone .

Endemic Species of the project areas : No Endemic species were observed in the Buffer zone .

11.2.5 SOCIO-ECONOMIC STATUS

The proposed Vishnupuri UG to OC Mine will involve shifting and rehabilitation of one village namely Kukurmunda .The population and number of projected affected families in this village as per population census, 2011/ data supplied by mine area are as follows:

Sl. No.	Villages	Population	No. of project affected families
1	Kukurmunda	550	131

11.2.6 LAND RESOURCE

The total land involved in proposed Vishnupuri UG to OC mine is 590.46 ha, out of which 560.76 ha is within the proposed mine boundary and rest 29.70 ha is outside the mine boundary. Total 173.953 ha land (40.855 ha in Vishnupuri-I & II UG Mine and 133.098 ha in Shivpuri OC Mine) are already acquired, out of which 144.253 ha falls within proposed mine boundary of Vishnupuri UG to OC Mine and 29.70 ha land is outside the mine boundary. Balance 416.507 ha land (560.76 ha – 144.253 ha)is proposed to be acquired under Surface / All Right in proposed Vishnupuri UG to OC mine. The details of land requirement is summarized in table below :

Sl. No.	Particulars	Existing Acquired Land (Ha)		Additional land (Ha) within proposed mine boundary	Toal Land (Ha)		
		Within proposed mine boundary	Outside proposed mine boundary		Within proposed mine boundary	Outside proposed mine boundary	Total
1	2	3	4	5	6=(5)+(3)	7	8
1)	Tenancy land	144.253	29.70	189.893	560.76	29.70	590.46
2)	Government land			103.942			
3)	Forest land			122.672			
	TOTAL	**144.253**	**29.70**	**416.507**	**560.76**	**29.70**	**590.46**

11.3 ENVIRONMENTAL IMPACT

11.3.1 AIR QUALITY IMPACT

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

11.3.2 WATER QUALITY IMPACT

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

11.3.3 GROUND WATER IMPACT

A project titled “Modeling and Control of Water System in Coal Mining Environment, Chandrapur project area, Maharashtra (Dec. 1998)” under United Nations Development Programme was carried out for opencast mines.

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

11.3.4 NOISE IMPACT

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

11.3.5 FLORA AND FAUNA

122.67 ha additional forest land needs to be acquired. Impact on flora and fauna will be assessed in the baseline survey of the project and necessary mitigative measures shall be taken.

11.3.6 SOCIO-ECONOMIC STATUS

189.893 ha of additional private land will be required for the proposed Vishnupuri UG to OC Mine project. All the Project Affected Families will be suitably compensated as per As the *Right to Fair Compensation and Transparency in Land Acquisition, Rehabilittaion and resettlement Act, 2013.* Rehabilitation of 131 families from Kukurmunda village is envisaged in PR.

Impacts on Socio-Economic status would be most likely observed as change in standard of living of the project affected people. Shift in means of livelihood is also expected to occur as impact of the proposed project.

11.3.7 LAND USE

Regarding land use of 590.46 ha land (460.76 ha within proposed mine boundary and 29.70 ha outside mine boundary) during mining, in addition to excavation of quarry for coal, overburden dump will be created along with development of other mine related infrastructure. Post mining land use is shown in the following table:-

LAND USE

Sl. No.	Land use during mining	Land use (ha)				
		Plantation	Water Body	Public use	Undis-turbed	Total
A)	**Within Mine Boundary**					
1	Excavated Area	-	188.97	-	-	188.97
2	Backfilled Area	110.72	-	-	-	110.72
3	External OB dump	84.86	-	-	-	84.86
4	Road & Infrastructure	3.00	-	12.12	-	15.12
5	Area needed for rationalization and blasting zone	120.0	-	-	36.09	156.09
6	Embankment	2.00	-	3.00	-	5.00
B)	**Outside Mine Boundary**					
1	Undisturbed	-	-	29.70	-	29.70
	Total (A+B)	**141.30**	**241.20**	**11.12**	**196.84**	**590.46**

Breakup of total waste generated is given below:-

Project	Total waste generation (Mm^3)	Top soil (Mm^3)	Total OB generation (Mm^3)	Total OB in Ext. Dump (Mm^3)	Total OB Backfilled (Mm^3)
Vishnupuri UG to OC Project Total (Mm^3)	167.74	12.28	180.02	40.00	140.02

11.4 ENVIRONMENT MANAGEMENT

1 AIR QUALITY MANAGEMENT

Ambient Air quality of the existing Vishnupuri I & II UG mine Project is being regularly monitored as per Environmental Protection Amendment Rules 2000, and the same would be continued for the proposed project after getting statutory clearances.

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

2 WATER QUALITY

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

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

3 NOISE MANAGEMENT

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

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

4 FLORA AND FAUNA MANAGEMENT

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

5 SOCIO-ECONOMIC STATUS

189.89 ha of additional private land will be required for the proposed Vishnupuri UG to OC project. Adequate capital provision for this additional

land has been made in the PR as per the *Right to Fair Compensation and Transparency in Land Acquisition, Rehabilittaion and resettlement Act, 2013.* The proposed Vishnupuri UG to OC Mine will involve shifting and rehabilitation of one village namely Kukurmunda. Shifting and rehabilitation of the village is critical for mine development. All the families of the village will be suitably rehabilitated.

The proposed project will bring development in the area and its neighborhood and nearby residents will be benefited by the job opportunities created by the project. The local business and service providers will also be benefited due to several ancillary activities generated due to this project.

6 LAND RESOURCE MANAGEMENT

The land use of proposed 590.46 ha land of the project (560.76 ha wihin mine boundary and 29.70 ha outside mine boundary) is as follows:

Sl. No.	Particulars	Area (ha)
1.	Quarry Area	299.69
2.	External OB dump	84.86
3.	Road & Infrastructure	15.12
4.	Area needed for rationalization and blasting zone	156.09
5.	Area outside mine boundary	29.70
6.	Embankment	5.00
	Total Land	**590.46**

The following table depicts stage wise land resource management strategy which is laid out to properly utilize land during mining and after mining scenario.

Sl. No.	Land use category	5th year	10th year	End of Mine Life /Post Mining
1	Backfilled Area (Reclaimed with plantation)	15.12 (15.12)	60.68* (15.12)	110.72* (110.72)
2	Excavated Area (Not reclaimed)/void	110.94 (0)	180.52 (0)	188.97 (0)
3	Ext. OB dump (Reclaimed with plantation)	84.86 (10.00)	84.86 (50.00)	84.86 (84.86)
4	Undisturbed area (brought under plantation)	329.72 (40)	214.58 (80)	156.09 (120)
5	Roads (avenue plantation)	4.00 (1)	4.00 (1)	4.00 (1)
6	Area around buildings and Infrastructures	11.12 (2)	11.12 (2)	11.12 (2)
7	Embankment	5.00 (2)	5.00 (2)	5.00 (2)
8	Area outside Mine Boundary	29.70 (0.00)	29.70 (0.00)	29.70 (0.00)
	Total	**590.46**	**590.46**	**590.46**

- Figures in brackets shows plantation area
*backfilled area of quarry upto GL.

Plantation would be carried out during mining and post mining. Plantation schedule is given below:-

Sl No.	Year	External Dump (OB + Top Soil)		Backfilled area		Others (undisturbed area/etc.)		Total	
		Area (ha)	No. of trees	Area (ha)	No. of trees	Area (ha)	No. of trees	Area (ha)	No. of trees
1	5th year	10	250	15.12	378	45	1125	70.12	1753
2	10th year	50	1250	15.12	378	85	2125	150.12	3753
3	End of mine life	**84.86**	2121.5	**110.72**	2768	**125**	3125	320.58	8014.5

2500 plants/ha are proposed as plantation density. It can be observed that out of 590.46 Ha area within and outside mine boundary, 219.82 Ha is

proposed as plantation in post mining scenario, which is 37.22 % of the total project area. This plantation would serve purpose of restoring a good quality of ecosystem.

11.5 ENVIRONMENT MANAGEMENT SYSTEM

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

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

Implementation of the various measures suggested, a multi- disciplinary approach is essential.

11.6 CAPITAL PROVISION

A capital provision of Rs. 157.09 lakhs has been made against environment protection for the proposed project and details are as under:

SL. No.	PARTICULARS	CAPITAL (Rs. In Lakhs)
1	Sedimentation Pond for Treatment of Mine Waste water	15.00
2	Effluent Treatment Plant for treatment of Workshop Effluent	10.00

SL. No.	PARTICULARS	CAPITAL (Rs. In Lakhs)
3	Base Line Environment Data Generation and Scientific Studies related to Environment	10.00
4	Dust suppression measures.	35.00
5	Digital Mapping for Land Use Plan	12.09
6	Plantation During First Three Years	15.00
8	Continuous Monitoring Station (CAMS)	60.00
TOTAL		**157.09**

In addition to the above capital provision, Rs. 6.00/t has been provided in Unit Cost pf production (Appendix-'C') for revenue nature of expenditure related to environmental management.

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Chapter - 12

LAND REQUIREMENT

12.1 GENERAL

The proposed Vishnpuri UG to OC mine is conversion of existing Vishnupuri – I & II UG mine into opencast mine. Shivpuri OC mine is an operating mine adjacent to Vishnupuri – I UG mine in north eastern side and the coal reserves of its approved Scheme is likely to exhaust in near future. It is proposed in this report to approach the proposed quarry of Vishnupuri UG to OC mine through the Access Trench of Shivpuri OC mine. Moreover, the abandoned decoaled void of Shivpuri OC (Phase-II) has been proposed for OB dumping of Vishnupuri UG to OC mine. Hence, the mine area of Shivpuri OC mine has been included in the proposed PR of Vishnupuri UG to OC mine. The requirement of balance land has been worked out on the basis of part of Khasra plan & land records provided by Pench area. Proposed lease hold boundary has been shown in quarry & surface layout plan.

12.2 LAND REQUIREMENT

The tentative break up of type of land already acquired as well as land proposed to be acquired for Vishnupuri UG to OC mine is as follows :

Break-up of land Requirement

Sl. No.	Particulars	Existing Acquired Land (Ha)		Additional land (Ha) within proposed mine boundary	Toal Land (Ha)		
		Within proposed mine boundary	Outside proposed mine boundary		Within proposed mine boundary	Outside proposed mine boundary	Total
1	2	3	4	5	6=(5)+(3)	7	8
1)	Tenancy land	144.253	29.70	189.893	560.76	29.70	590.46
2)	Government land			103.942			
3)	Forest land			122.672			
	TOTAL	**144.253**	**29.70**	**416.507**	**560.76**	**29.70**	**590.46**

12.3 LAND USE OF THE PROJECT

The land use of 590.46 ha land (560.76 ha within mine boundary and 29.70 ha outside mine boundary) is as follows:

LAND USE

Sl. No.	Particulars	Area (ha)
1.	Quarry Area	241.20
2.	External OB dump	84.86
3.	Road & Infrastructure	15.12
4.	Embankment	5.00
5.	Area needed for rationalization and blasting zone	214.58
6.	Area outside mine boundary	29.70
	Total Land	**590.46**

The capital provision for tenancy land has been made as per the provisions of *Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and resettlement Act, 2013.* The land cost has been considered as two times the market value and 100 % solatium of the total value including assets attached to the land. Rate for government land has been considered @ Rs 14.82 lakh/ha and rate for forest land (with compensatory afforestation) has been considered @ Rs 14.27 lakh/ha. The detailed estimation of capital provision are shown in Appendix- A.1.

12.4 STATUS OF LAND ACQUISITION

The land already acquired under Surface Right in Shivpuri OC mine is 133.098 ha. Similarly, the total land already acquired under Surface/All Right in Vishnupuri – I & II UG mine is 40.855 ha. Thus total land acquired in these two mines is 173.953 ha, out of which 144.253 ha is falling within proposed mine boundary of Vishnupuri UG to OC mine and 29.70 ha land is outside the mine boundary.

12.5 STATUS OF FORESTRY CLEARANCE

122.672 ha Forest land is involved in proposed Vishnupuri UG to OC project for which Forestry Clearance will be required.

12.6 COMPENSATION & REHABILITATION

As the *Right to Fair Compensation and Transparency in Land Acquisition, Rehabilittaion and resettlement Act, 2013* has come into force, the provision for acquisition of 189.893 ha tenancy land and rehabilitation and resettlement of project affected families have to be carried out as per this Act.

The land rate has been considered as per the ready reckoner rate given by the area authorities and considering the multiplying factor of 2.0 for rural area and 100 % solatium of the total land value including assets attached to the land. In absence of data for number of Project Affected families, 131 families of Kukurmunda village has been considered as PAFs. For estimation of compensation as per Schedule-II, Rs. 5 lakh per family has been provided for 100% of project affected families. In case, job is offered to eligible PAFs, then compensation will be reduced accordingly.

It is proposed in this report to shift and rehabilitate Kukurmunda village which is located in the proposed mine area. About 131 families of this village will have to be shifted and adequate capital provision has been made for this purpose including infrastructural facilities at the rehabilitation site.

It is contemplated that the entire exercise of land notification processes including forest land shall be completed upto 01.04.2020 (zero date of the project) so that physical possession of land could be acquired in 2020-21 (1st year of the project). Mining activity will be started from 2nd year after acquisition of land. Break up of capital provision for land acquisition & compensation package has been given in Appendix-A.1.

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Chapter - 13

MINE CLOSURE PLANNING

13.1 LEGISLATIVE REQUIREMENTS

Mine closure planning has to be done at the starting point of the mining operations and needs periodic review and revision during its life cycle to cope with the geo-technical constraints, safety and economic risks, social & environmental challenges.

13.1.1 Objective of Mine Closure

The various objectives of mine closure planning are as follows:

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

b) To protect public health and safety.

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

d) To minimise adverse socio-economic impacts.

13.1.2 Mine Closure Obligations

There is a need to define the liabilities, responsibilities and authorities of the mine management, other regulatory bodies, Central and State Governments after mine closure. Some obligations relating to the Mine Management Companies are as follows:

Legal

a) Health & Safety

Regulations 6, 61, 68, 106, 112 of Coal Mines Regulation, 2017 and its related DGMS Circulars.

b) Environment

1. Water (Prevention and Control of Pollution Act), 1974
2. Air (Prevention and Control of Pollution) Act 1981
3. Environment (Protection) Act, 1986 and Environment Protection Rule.
4. DGMS Directives on noise and ground vibration.

a) Forest - Forest (Conservation) Act, 1980

b) Rehabilitation

c) Decommissioning/asset disposal, etc.

13.2 TECHNICAL ASPECTS

The proposed Project has been planned upto about 150 m depth at the floor of Seam VB2. After complete exhaustion of proposed Vishnupuri UG to OC mine, the mine may be extended in dipside subject to economical viability of the project at that time. In case mine closure is done after completion of proposed Vishnupuri UG to OC mine, the following technical aspects would be reviewed in the final mine closure planning. Details can be worked in closure plans envisaged to be prepared 3-4 years before completion of coal mining.

13.2.1 Safety Hazards Including Management of Fire

There should be provision of surface audit prior to the surface demolition/restoration of all surface structures, spoil heaps, lagoons, etc. to assess whether there are any hazardous materials that could cause problems viz; explosives, chemicals, mine fire etc. A list of surface assets should be prepared and made available to potential purchasers. Prospective purchasers could be invited and asked to submit sealed bids. This could ensure that the sale of assets give better financial gain.

13.2.2 Management of Pit Slopes and Waste Dumps

The final quarry slopes shall be so designed and then subsequently developed that after the closure of the mine, there is no likelihood of any slope failure. In proposed Vishnupuri UG to OC mine, the final slope of the quarry has been designed with above consideration. However, strict compliance with the proposed final slope of quarry would be made as given in Quarry layout Plan and subsequent slope stability studies.

The external waste dump must be developed as per the proposed design so that slope failure do not create any safety hazard to the local community. Waste dumps shall be provided with garland drains and vegetation cover on surface of these dumps.

13.2.3 Management of Hydrology and Hydro-Geology

In the mine closure plan, the surface flow pattern of precipitation and mine water would be clearly developed and water channel suitably laid down so that it does not disturb the general hydrology of the area.

13.2.4 Details Of De-Commissioning Of The Infrastructures And Plant And Machinery

The decommissioning of the various infrastructures developed for the mine like office complex, residential complex, roads, pipelines and transmission line etc. shall be planned in details so that the land occupied by these infrastructures are released. However, before such decommissioning, the possibility of re-use of these infrastructures for the neighboring mines shall be explored.

13.2.5 Fencing Around Mined Out Areas

The access trenches made for entry to the opencast mine shall be properly closed after mine closure and proper planning shall be made in mine closure plan for closure of access trenches.

13.3 ENVIRONMENTAL ASPECTS

13.3.1 Management of Final Void

In the mine closure plan, voids due to mining are to be dealt and the final land use plan will include filling of the voids for land reclamation where possible and for hydro reclamation where feasible. In the proposed Vishnupuri UG to OC mine, the opencast mine has been planned upto a maximum depth of around 150m at the floor of Seam-VB_2.

In internal dumping, the OB will be dumped maintaining adequate slope of benches taking into consideration the angle of repose, gradient of seam etc. However, the study on slope will be made by some scientific agency and in final closure plan their suggestions will be incorporated. The backfilling as proposed in the report is shown in Post Mining Land Use Plan.

13.3.2 Reclamation of Forest/Vegetation

After the management of final voids, reclamation of forest/vegetation shall be included in the mine closure planning. The dumps and other area shall be properly planted as a part of reclamation.

13.3.3 Management of Recharge Areas

The pre-mining and post mining scenario on the hydrogeological recharge system would be included in the closure plan.

13.3.4 Acceptable Surface And Ground Water Flows

In the final closure plan of the mine, wherever the mine water is likely to form a reservoir, the quality of water from such mines would be assessed in the final plan.

13.3.5 Alternative Use of Land

The land acquired for mining will be planted with trees. The void created will be used for the purpose of storage of rainwater. This water can be used for fishing purpose or drinking purpose at the end of mine life.

13.4 SOCIAL ASPECT

13.4.1 Re-deployment of Work Force

The proposed Vishnupuri UG to OC mine has total life of 16 years and therefore the re-deployment of existing workforce will be required here. The manpower lost due to natural retirement in this mine will be compensated in future by surplus manpower of other mines of WCL as well as by fresh recruitment in future. At the time of closure of this mine, the available manpower will be redeployed based on :

i) Natural retirement

ii) Implementation of VRS schemes for age groups of + 50 years

iii) Retraining and redeployment of younger groups.

iv) Transfer of experienced middle aged groups to other projects.

v) Retirement of people with suitable compensation after exhausting all the above options.

13.4.2 Management of Community Facilities

The community facilities developed during the mine life like educational facilities, health facilities etc. would be continued even after the mine closure. The final closure plan will envisage interaction of mining company with the State or local bodies for running these facilities.

13.4.3 Channelisation of available water

After the closure of mine, it can be a source of water for many useful purposes. The final voids filled with water can be used as a water reservoir. All the aspects of channelisation of water shall be dealt in mine closure plan.

13.4.4 Emancipation from PAPs

The project affected persons (PAPs) are provided many civic facilities on the line of the management of community facilities dealt at point No. 18.4.2.

13.5 MINE CLOSURE COST

Mine closure planning has to be carried out at the starting of the mine and needs periodic reviewing and revision during its life cycle to cope with the geo-technical constraints, safety and economic risks, social & environmental challenges. For the Mine Closure activities, a corpus fund is created by opening an escrow account with the coal controller organization in nationalised bank. For opencast mine, an amount @ Rs 6.00 lakhs per Ha of the project area and for underground mine, an amount @ Rs 1.00 lakhs per Ha of the project area is required to be deposited in this account for final mine closure. Progressive mine closure is done with the fund provided in approved report. The above rate has been adopted as per Circular No. 55011-01-2009-CPAM, GOI, Ministry of Coal, dated 27 August 2009.

The mine closure plans for Vishnupuri – I UG mine for 122.54 ha land and balance life of 21 years, Vishnupuri – II UG mine for 321.985 ha land and balance life of 31 years and Shivpuri OC mine for 336.293 ha land and balance life of 4 years have already been approved by WCL Board in 244th meeting held on 28th January, 2013.

The corpus fund already deposited in the Escrow account during 2012-13 to 2016-17 and future payment upto 2019-20 is tabulated below :

Year	Total Corpus fund already deposited upto 2016-17 and future payment upto 2019-20 as per Mine Closure Plan approved by WCL Board in 244th meeting held on 28th January, 2013		
	Vishnupuri - I UG	**Vishnupuri - II UG**	**Shivpuri OC**
2012-13	Rs. 7.42 Lakhs	Rs. 13.20 Lakhs	Rs. 641.44 Lakhs
2013-14	Rs. 7.79 Lakhs	Rs. 13.86 Lakhs	Rs. 673.51 Lakhs
2014-15	Rs. 8.18 Lakhs	Rs. 14.55 Lakhs	Rs. 707.19 Lakhs
2015-16	Rs. 8.59 Lakhs	Rs. 15.28 Lakhs	Rs. 742.55 Lakhs
2016-17	Rs. 9.02 Lakhs	Rs. 16.04 Lakhs	-
2017-18	Rs. 9.47 Lakhs	Rs. 16.85 Lakhs	-
2018-19	Rs. 9.94 Lakhs	Rs. 17.69 Lakhs	-
2019-20	Rs. 10.44 Lakhs	Rs. 18.57 Lakhs	-
Total	**Rs. 70.85 Lakhs**	**Rs. 126.04 Lakhs**	**Rs. 2764.69 Lakhs**

In this PR of Vishnupuri UG to OC mine, the total land involved is 590.46 ha (560.76 ha within mine boundary and 29.70 ha outside mine boundary). The calculation of closure cost for the proposed Vishnupuri UG to OC mine for 590.46 ha land after adjusting the corpus amount already deposited in the escrow a/c from 2012-13 to 2016-17 and future payment upto 2019-20 i.e. Rs. 2961.58 Lakhs are tabulated below :

Mine Closure Cost

Sl. No.	Details	Qty
1	WPI for All Commodities for Aug 2009 (Old Series)	129.6
2	WPI (New Series) for Aug., 2009	83.02
3	WPI for All Commodities for Dec., 2017 (New Seies)	115.7
4	Ratio of WPI = (3) / (2)	**1.3935779**
5	Total land area requirement for the project (ha) =	590.46
6	Mine closure cost @ Rs 6 lacs/ha (Rs in Lakhs) =	3542.76
7	Mine closure cost after indexing from August, 2009 to Nov, 2017 (Rs. In Lakhs) = (6) x (4) =	**4937.11**
8	Mine closure cost escalated @ 5% per year upto 2020-21 (Rs in Lakhs)	**5715.32**
9	Corpus fund already deposited from 2012-13 to 2016-17 and to be deposited upto 2019-20 as per Mine Closure Plan approved by WCL Board in 244th meeting held on 28th January, 2013.	**2961.58**
10	Net amount of Corpus Fund in 2020-21 (Rs. In lakhs) (8) – (9) =	**2753.74**
11	Life of the mine in years	**16**
12	Annual Contribution to Escrow fund as on 2020-21 (Rs in Lakhs)= (10) / (11)	**172.11**

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

Year		Annual Production (Mty)	Corpus Fund (Rs. in Lakhs)	Mine Closure Cost (Rs /t)
1	2020-21	-	172.11	To be capitalised
2	2022-23	0.50	180.72	36.14
3	2023-24	1.00	189.75	18.98
4	2024-25	1.25	199.24	15.94
5	2025-26	1.50	209.20	13.95
6	2026-27	2.00	219.66	10.98
7	2027-28	2.00	230.64	11.53
8	2028-29	2.00	242.17	12.11
9	2029-30	2.00	254.28	12.71
10	2030-31	2.00	266.99	13.35
11	2031-32	2.00	280.34	14.02
12	2032-33	2.00	294.36	14.72
13	2033-34	2.00	309.08	15.45
14	2034-35	2.00	324.53	16.23
15	2035-36	2.00	340.76	17.04
16	2036-37	0.17	357.80	210.47
Total		**24.42**	**4071.63**	
Closure Cost Capitalised (1st year)			**173.96**	
Revenue Cost (2nd to 16th year)			**3899.52**	**15.97**

13.5.1 BREAK-UP OF CLOSURE FUND FOR VARIOUS CLOSURE ACTIVITIES

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

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

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

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

Activity wise Break-up of Closure Fund

Total Corpus Fund = Rs. 4071.63 Lakhs + Rs. 2961.58 Lakhs (upto 2019-20)

= Rs 7033.21 Lakhs

Sl. No.	Activity	% of Total Mine closure Cost	Amount (Rs.in Lakhs)	Remarks
A	**Dismantling of structures**			To be included in final mine closure plan.
	Service Building	0.2	14.06	
	Residential Building	2.67	187.79	
	Industrial Structures like, Workshop, Field substation, etc.	0.3	21.10	
B	**Permanent Fencing of mine void and other dangerous area**			To be included in final mine closure plan.
	Random rubble masonry of height 1.2 meter including leveling up in cement concrete 1:6:12 in mud mortar	1.5	105.50	
C	**Grading of highwall slopes**		0	To be included in final mine closure plan.
	Levelling and grading of highwall slopes	1.77	124.49	
D	**OB Dump Reclamation**			
	Handling/Dozing of OB Dump into mine void and preparation of Internal dump for reclamation.	88.66	6235.64	71% for progressive and 17.66% for final mine closure.
	Technical and Bio-reclamation including plantation and post care.	0.4	28.13	Equal Weightage through out the life of the mine.
E	**Landscaping**			
	Landscaping of the open space in leasehold area for improving its aesthetic and eco value.	0.3	21.10	Equal Weightage throughout the life of the mine.
F	**Plantation**		0	
	Plantation over cleared area obtained after dismantling.	0.5	35.16	To be included in final mine closure plan.
	Plantation around the quarry area and in safety zone.	0.2	14.07	Equal Weightage through out the life of the mine.
	Plantation over the external OB Dump	0.02	1.41	Equal Weightage through out the life of the mine.
G	**Post Closure Env Monitoring/Testing of Parameters for three years.**			For three years after mine closure
	Air Quality	0.22	15.47	
	Water Quality	0.2	14.07	
H	**Entrepreneurship development (vocational/ skill development) Training for sustainable income of affected people**.	0.26	18.29	Equal Weightage throughout the life of the mine.
I	**Miscellaneous and other mitigative measures.**	2	140.66	Equal Weightage through out the life of the mine.
J	**Post Closure Man power cost for supervision**	0.8	56.27	To be included in final mine closure plan.
TOTAL		**100%**	**7033.21**	

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