

SUMMARY
ENVIRONMENTAL
IMPACT
ASSESSMENT

FOR
PUBLIC HEARING
(AS PER EIA NOTIFICATION, SEPT' 06)
OF

SHIVANI OC PROJECT

(Production capacity 1.25 MTPA (normative); 1.4375 MTPA (Peak)
AND Land area 780.00 ha)

AUGUST - 2012

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SUMMARY
**ENVIRONMENTAL
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OF
SHIVANI OPENCAST
PROJECT**

1.0 PROJECT DESCRIPTION

1.1 Introduction

The proposed Shivani OC mine is Yekona – II Extension block. The Yekona-II Extension block assessed in the present report forms the northern part of the Wardha Valley Coalfield. The presence of coal in this part was earlier proved in scout boreholes drilled by MECL and based on boreholes drilled upto Dec.'91 a geological note "Status note on exploration for coal in Manegaon and Yekona area, Wardha Valley Coalfield" was prepared by MECL in Jan.'92. This discovery of coal provided the necessary impetus to the coal proving activity in this area. Based on the findings of MECL during 1987 to 1991, two potential blocks viz. Yekona-I & II were identified by CMPDI for detailed exploration.

Yekona-II Extension Block is located to the west of Yekona-II Block across Wardha river. The area falls in the Wani tehsil of Yeotmal district of Maharashtra State and is located about 20 km north of Wani Township.

The Yekona –II Extn. Block extends over an area of about 2.7 sq. km (3.5 sq.km. including Wardha River section). Only one seam (Composite seam) occurs as single section in Yekona–II Extn. block for the purpose of qualitative and quantitative assessment. The lay and disposition of composite seam in the block offers opencast proposition.

The Project Report of Shivani OC was approved by WCL Board and FORM – I was prepared and submitted to MoEF for TOR. Ministry of Environment & Forests has issued Terms of Reference (TOR) vide letter dated 23.03.2012. As directed in the TOR, this draft Environment Impact Assessment & Environmental Management Plan has been prepared as per generic structure of the EIA Notification, 2006 for submission to Maharashtra Pollution Control Board for conduction of Public Hearing.

1.2 JUSTIFICATION & LINKAGE

In order to meet the ever-increasing demand for non-coking coal, WCL must expand within its command area and lead the industry by successfully introducing new and viable technology for underground and opencast mines. PR of Shivani OC proposes to mine coal from half incrop to maximum depth of about 175m. The target of the proposed mine is kept 1.25 Mty(Normative), 1.4375 Mty(Peak) for a mine life of 16 years. it would be linked to nearby power station, cement plant and other consumers already benefiting from Wani North group of mines.

1.3 LOCATION & COMMUNICATION

Location of the mine

- | | | | |
|------|----------|---|-------------|
| i. | Village | : | Shivani |
| ii. | Tehsil | : | Wani |
| iii. | District | : | Yeotmal |
| iv. | State | : | Maharashtra |

Geographical location

- | | | | |
|------|---------------|---|--------------------------|
| i. | Latitude | : | 20°14'05" to 20°15'1" N |
| ii. | Longitude | : | 78°54'23" to 78°55'25" E |
| iii. | Topo sheet no | : | 55- L/15 , 55- L/16 |

COMMUNICATION :-

The Block is connected by a 20 km long fair-weather road from Wani Tehsil township towards south.

The State Highway No.73 joining Wani with district headquarters Yeotmal, passes about 10 km from the project. The Wani town is in turn connected with Nagpur via Warora and Jam through State Highway No.85. The distance between Nagpur and the proposed Project is about 165 km.

The nearest railway station is Wani which is located towards south-east of Project at a distance of 6 km. It is on Majri-Rajur branch of central Railway, the crowfly distance between Majri and Wani being 15 Kms. Majri railway station is on Delhi-Chennai broad gauge railway line.

1.4 PHYSIOGRAPHY & DRAINAGE

The entire area is covered with black cotton soil and generally exhibits a gently undulating topography with general slope towards the central

part of the block where an east – west flowing nallah controls the drainage of the block. This nallah drains into Wardha river on the east of the block. The topography exhibits rugged and steep terrain in the north and east along the river bank. The narrow valley created by the east-west flowing nallah also exhibit steep banks.

The altitude of the area ranges between 188.25 m (Reduced Level of borehole CMWY-167) and 206.77 m (Reduced Level of borehole CMWY-188) based on borehole data. The minimum and maximum surface elevation of the area varies between 188 m to 208 m based on surface contours. Since the HFL data of the proposed block is not available hence the HFL of adjacent Yekona -II block across Wardha river is considered which is 198m.

1.5 GEOLOGY

Yekona-II Extn. Block is located in the northern part of the eastern limb of Wardha Valley Coalfield. It is located west of Yekona-II Block and is the western continuity across the Wardha River. The entire area of the block is covered by black cotton soil. Hence, the geological sequence is deciphered from the sub-surface data generated from the boreholes drilled in the block.

The geological succession in the block as worked out from the borehole data and the thickness range of different formations are given in the following Table

Geological succession, Yekona-II Extn. Block,

Wardha Valley Coalfield

Age	Formation	Drilled Thickness Range (m)		Lithology
		Minimum	Maximum	
Recent to	Soil	0.50	16.70	Black cotton soil / sandy soil
Sub - Recent		(CMWY-184)	(CMWY-169)	

Age	Formation	Drilled Thickness Range (m)		Lithology
		Minimum	Maximum	
Upper Cretaceous to Eocene	Deccan trap	1.50 (CMWY-151)	37.80 (CMWY-150)	Basalt
----- Unconformity -----				
Upper Permian to Lower Triassic	Kamthi	9.00 (CMWY-150)	42.00 (CMWY-164)	Yellow to brown fine to coarse grained sandstones, shale and clay.
----- Unconformity -----				
Middle Permian	Motur	47.00 (CMWY-149)	192.00 (CMWY-163)	Fine to medium grained variegated sandstones, clay and shale.
Lower Permian	Barakar	21.00 (CMWY-162)	245.32 (CMWY-149)	Grey to white fine to coarse grained sandstones, shale, carbonaceous Shale, shaly coal and coal.
Upper Carboniferous to Lower Permian	Talchir	4.68 (CMWY-149)		Grey and greenish shale and sandstone.
(drilled in only 1 BH)				

Structural setting within the project area

The area under report is covered by thick black cotton soil and Kamthi Formation. Therefore, the geological structure lay and disposition of coal seam and faults are interpreted on the basis of sub-surface data obtained from the boreholes drilled by CMPDI.

Dip and Strike

The general strike of the coal seam as determined from the floor contour plans of Composite Seam is East - West with a tendency to change to NW-SE in the western part of the project area. However, local variations in the strike have also been observed in the rest of the area. The dip of the formation is steeper in the central part of the area as compared to eastern, northern, western and southern parts. The gradient of the seam varies from 1 in 9.25 in central part to 1 in 16.5 in the southern part. In northern part gradient is 1 in 13. Localised steeping upto 1 in 7.75 is

observed near boreholes CMWY-154 and localised flattening is observed near borehole no. CMWY-183 in south-western part.

The number of faults and their characteristic features like location, direction, amount of throw etc in the proposed project area are given below :

Brief Description of faults in the proposed project area

SL. No.	Fault Name	Trend	Amount & direction of throw	EVIDENCES
1.	F ₁ - F ₁	North SSE	(Amount Not known) Easterly	<p>This fault is the western boundary of the block. Boreholes CMWY - 163 and CMWY -149 located on the upthrown side have not intersected coal seams upto 361.80 m and 325.80 respectively there by marking limit of coal bearing area.</p> <p>As per the regional geological plan, Vindhyan exposures are located about 800 m further west of this fault.</p>
2.	F ₂ – F ₂	NW –SE	0 -110 m due S.W.	<p>1) Abuts with fault F₁ in N.W. and dies out in the S.E. near borehole CMWY -187.</p> <p>2) Difference in floor reduced level values between CMWY - 162, 164, 186, and 154 on upthrow side and CMWY - 168, 159 and 150 on down throw side.</p>
3.	F ₃ – F ₃	Curvi-linear Almost E - W	0 - 70 m due South	<p>1) Abuts against fault F₁ in the west and dies out in the east.</p> <p>2) Difference in floor reduced level values between CMWY - 183 & 156 on the upthrow side and 184 & 171 on downthrow side.</p>

SL. No.	Fault Name	Trend	Amount & direction of throw	EVIDENCES
4.	F ₄ – F ₄	NW -SE	0 -20 m due N.E.	1) This fault extends from the adjacent Yekona-II Block in the east and dies out in the north near CMWY-152. 2) Difference in floor reduced level values between CMWY -165 & 153 on upthrow side and CMWY -158,169 & 155 on down throw side.
5.	F ₅ – F ₅	E -W	5 -10 m due North	1) This fault extends from the adjacent Yekona –II Block in the east and abuts against fault F ₂ in the west. 2) Difference in floor reduced level values between CMWY -186, 170, & 166 on the upthrow side and CMWY -151 & 153 on downthrow side.
6.	F ₆ – F ₆	NW -SE	20 m due N.E.	1) Abuts against F ₁ in NW and against F ₂ in SE 2) Difference in floor reduced level values between CMWY-185 & 176 on the up throw side and CMWY-168 & 159 on the downthrow side.
7.	F ₇ – F ₇	NW -SE	30 m due N.E.	1) Difference of RL in BH No.CMWY-71 in the upthrow block and cmwy-188 in the downthrown side

Presence of dykes, sills (igneous intrusives) etc.

Deccan Trap has been encountered in 6 boreholes in the proposed project area ranging in thickness from 1.50 m (CMWY -151) to 37.80 m (CMWY -150).

GEO – MINING CHARACTERISTICS

The seam characteristics and the profile of the quarries are as given below in Table:

Sl.No.	PARTICULARS	TOTAL
1	Area of the Quarry	
(a)	On floor (ha)	126
(b)	On surface (ha)	214
2	Average length (m)	1050
3	Average width (m)	
(a)	At surface	1500
(b)	At floor	1400
4	Depth (m)	
(a)	Initial	60
(b)	Final	175
5	Gradient of seam	1 in 10 to 1 in 13
6	Average thickness of Composite seam (m)	11.36
7	Average parting between sections (m)	NIL
8	Mineable reserves (Mt)	18.90
9	Total OB including access trench (Mm ³)	171.32
10	Average SR (m ³ /t)	9.07
11	Grade/UHV (k.cal./Kg.)	E/3649

1.6 Reserves & Mining Details:

a. Breakup of Mineable Reserve

The Summary of Coal Reserves are tabulated as under :-

Name of Seam	Area Considered in Ha.	Thickness Variation (m)	Geological Reserves Mt	Geological Losses Mt	Mining Losses Mt	Mineable Reserves Mt
1	2	3	4	5	6	8
Composite Section	126	9.0-12.91	23.33	2.33	2.10	18.90
TOTAL	126	9.0-12.91	23.33	2.33	2.10	18.90

b. Type and Method of Mining Operations :

Type	Method
Opencast	Semi- mechanized (Shovel- Dumper Combination)

Considering flat gradient of seam which falls in the range of 1 in 10 to 1 in 13, Shovel – Dumper combination is proposed for extraction of coal in Shivani OC

mine. Since gradient is flat , combined seam thickness is ranging from 9.0 m to 12.91m and average strike length is 1400 m ,and the target capacity of the proposed Quarry is kept at 1.25 Mty.

For overburden, keeping the bench height of 13 m, the width of working and non working benches are kept as 40 m and 25 m respectively. The mining system as proposed is shown in the Cross-sections.

Haul road would be constructed on the floor of the quarry at a gradient of 1 in 16 with a width sufficient for dumper/trucks movement, dozer path, drainage and electrification etc. Flank roads shall be developed on side batter for transport from different horizons.

c. Total Land area : 780.00 ha

Land use details;

S.N.	LAND USE	Within ML Area (ha)	Outside ML Area (ha)	Total
1	Agricultural land	708.60	30.00	738.60
2	Forest land	Nil	Nil	Nil
3	Waste land/Govt land	39.08	Nil	39.08
4	Grazing land	Nil	Nil	Nil
5	Surface water bodies	Nil	Nil	Nil
6	Settlements	2.32	Nil	2.32
7	Others (specify)	Nil	Nil	Nil
	Total	750.00	30.00	780.00

Post-mining Land use pattern of ML/Project Area (ha)

S.N.	Land use during mining	Land use (ha)				
		Plantation	Water Body	Public use	Undisturbed	Total
1	External OB Dump	201.00	-	-	-	201.00
2	Top soil dump	49.85	-	-	-	49.85
3	Excavation	24.00	108.00	-	82.00	214.00
4	Roads	1.43	-	2.25	-	3.68

5	Built up area	-	-	2.88	-	2.88
6	Green Belt	-	-	-	-	-
7	Undisturbed Area	98.57	-	-	168.02	266.59
8	Embankment area				42.00	42.00
	Total	374.85	108.00	5.13	292.02	780.00

d. Drilling & Blasting

Drilling pattern in overburden, with a bench height of 10 m, the burden has been assumed as 4.0 m and spacing of 5m. The powder factor of 3.00 m³/kg has been considered for planning purpose.

For coal depending upon the thickness, bench height of about 10 m is being proposed. For bench height of 10m, drilling pattern with burden and spacing of 5.0 m & 5.0 m respectively has been proposed. A powder factor of 7 t/kg has been considered for blasting in coal for planning purpose. However 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 and local geology of the blast site and accordingly powder factor for OB & coal may be deviated after final trial of blasting.

3 Nos. Service Magazines of about 3t capacities has been proposed for catering the requirement of explosives. This magazine will be constructed near the proposed Chinchala- Chikalgaon Amalgamated OC mine

f. Shifting of Shivani village –

Shivani village which is on the Eastern rise side of the proposed access trench (shown in quarry layout plan) is to be shifted & rehabilitated . Rs 21.2369 Crores is proposed for shifting and rehabilitation of Shivani village.

g. Man Power - The total manpower proposed is 463.

2.0 Description of Environment

One season Baseline Data is yet to be generated for this project, the baseline data generated for nearby proposed Yekona OC mine is given below to get an overview of the existing Environmental Scenario of the proposed Shivani OC project. New baseline data generated for this project will be incorporated in final EIA/EMP.

The analysis of wind pattern during the season shows that the predominant wind direction is from East with wind frequency of 16.81%. It is followed by North - East with 11.03% frequency and North with wind frequency (7.06%).

The calm conditions prevail 36.70%. The wind speeds of 0.6-1.5 m/s, 1.6-2.5 m/s and > 2.5 m/s were recorded for 44.94%, 14.85% and 3.51% of the total time respectively.

Ambient Air Quality in Core & Buffer zone

CORE ZONE

(SA - 1)

At this location, SPM and RPM concentration are in the range of 104 to 152 $\mu\text{g}/\text{m}^3$ and 42 to 61 $\mu\text{g}/\text{m}^3$ respectively. SO_2 and NO_x concentration are in the range of 5.0 to 7.9 $\mu\text{g}/\text{m}^3$ and 7.8 to 12.0 $\mu\text{g}/\text{m}^3$ respectively.

WANOJA VILLAGE CORE ZONE (SA - 2)

At this location, SPM and RPM concentration are in the range of 89 to 149.0 $\mu\text{g}/\text{m}^3$ and 34 to 55 $\mu\text{g}/\text{m}^3$ respectively. SO_2 and NO_x concentration are in the range of 5.2 to 8.1 $\mu\text{g}/\text{m}^3$ and 7.1 to 12.8 $\mu\text{g}/\text{m}^3$ respectively.

Buffer Zone:

BARORA VILLAGE - (SA - 3)

At this location, SPM and RPM concentration are in the range of 82 to 136 $\mu\text{g}/\text{m}^3$ and 23 to 38 $\mu\text{g}/\text{m}^3$ respectively. SO_2 and NO_x concentration are in the range of 5.0 to 7.6 $\mu\text{g}/\text{m}^3$ and 7.6 to 12.9 $\mu\text{g}/\text{m}^3$ respectively.

YEKONA VILLAGE - (SA - 4)

At this location, SPM and RPM concentration are in the range of 86 to 144.0 $\mu\text{g}/\text{m}^3$ and 25 to 42 $\mu\text{g}/\text{m}^3$ respectively. SO_2 and NO_x concentration are in the range of 5.0 to 7.8 $\mu\text{g}/\text{m}^3$ and 7.1 to 12.1 $\mu\text{g}/\text{m}^3$ respectively.

MARDA VILLAGE (SA - 5)

At this location, SPM and RPM concentration are in the range of 88 to 142.0 $\mu\text{g}/\text{m}^3$ and 26 to 41 $\mu\text{g}/\text{m}^3$ respectively. SO_2 and NO_x concentration are in the range of 5.0 to 7.9 $\mu\text{g}/\text{m}^3$ and 8.0 to 11.4 $\mu\text{g}/\text{m}^3$ respectively.

DANDGAON VILLAGE (SA - 6)

At this location, SPM and RPM concentration are in the range of 88 to 138 $\mu\text{g}/\text{m}^3$ and 26 to 40 $\mu\text{g}/\text{m}^3$ respectively. SO_2 and NO_x concentration are in the range of 5.4 to 7.9 $\mu\text{g}/\text{m}^3$ and 8.2 to 12.2 $\mu\text{g}/\text{m}^3$ respectively.

Water quality:

Ground Water:

The Physico-chemical characteristics of the ground water samples collected from both the locations during Post - monsoon (Oct'2010-Dec'2010) are in good agreement with IS:10500. TDS, Alkalinity and Total hardness are above the desirable limits but are within the permissible limits specified under Drinking Water Standard (IS: 10500). As regards heavy metals, except Iron and Zinc, the others were not traceable. The ground water after proper disinfection and filtration can be safely used for potable and drinking purposes.

Surface Water:

Physico-chemical characteristics of the surface water samples show a good resemblance with respect to almost all the parameters and are well within limits specified in Surface Water Standard IS: 2296. As regards heavy metals, except Iron and Zinc, values for all the others are either below the detectable limit or not traceable.

From the above, it may be concluded that all the parameters of the surface water samples are under the limits of IS: 2296 Class 'C'. However, it is safe to use ground water than the lotic system of surface water in the project (mining) area.

Ambient Noise Level in Core & Buffer zone

From the results, the noise level for core zone was observed in the range of 40.7 dB (A) to 53.7 dB (A) during day time and 38.2 dB (A) to 41.8 dB (A) during night time whereas the maximum average noise levels in the area were observed to be 47.9 dB (A) during day time and 40.4 dB (A) during night time. Thus, from the observation it may be concluded that the noise levels in the area were in good compliance with prescribed limit for industrial area which are 75 dB (A) for day time and 70 dB (A) for night time.

Similarly, the noise levels in close vicinity of the project area were observed in the range of 41.2 dB (A) to 54.9 dB (A) in day time & 38.4 dB (A) to 41.5 dB (A) in the night time, whereas the maximum average noise levels in the area were observed to be 49.4 dB (A) during day time and 40.4 dB (A) during night time. Thus, from the observations it may be concluded that the noise levels in the area were well within the prescribed limit for residential areas which are 55 dB(A) for Day time and 45 dB(A) for Night time.

From the above observations, it may be concluded that the Noise levels are in good compliance with the National Ambient Air Quality Standards (NAAQS) for Industrial and Residential areas which is graphically depicted below:

Soil quality

The soil quality of the project area appears to be good and would support vegetation after suitable reclamation / modification.

3.0 Anticipated Environmental Impacts and Mitigation Measures

Identification of impact is an important task in any EIA study. This helps in focusing attention upon relevant environmental parameters and relating them with the activities involved. As far as mining projects are concerned, the following parameters are important in the Environmental Impact Assessment. **However the detailed impact assessment study has been carried out and the same is incorporated in Chapter – IV.**

a. Impact on Air Quality :

The mining and its related activities create ambient air pollution. The impact of mining on ambient air quality are highlighted as under:

- (a) The ambient air quality is influenced due to the presence of RPM, SPM, SO₂, NO_x, etc., which are generated due to various activities like drilling, blasting and handling related to the project. Further, the ambient air quality is affected marginally to a varying degree due to the mining

activities of other nearby opencast and underground coal mines of the same coalfield. The concentration of pollutants may vary depending upon the various micro-meteorological parameters and the seasons of a year.

So the ambient air quality will have no harmful effect on human being, flora and fauna, soil quality, surface structures and aesthetic value of the surrounding environment as suitable mitigatory measures will be taken to make the operation eco-friendly.

b. Impact on Water Quality :

✿ Impact assessment

Mining and its related activities may create water quality problems. The impact of mining at the project on both surface and ground water sources has been assessed and given below:

(a) Surface water sources

- Deterioration of water quality and pollution of water bodies due to discharge of mine effluent, if not treated. Change in relief pattern due to mining may cause flooding, siltation, choking and pollution. Mitigatory measures would involve provision of (i) garland drains on periphery to prevent surface run-off from entering into the quarry , (ii) catch drain around the dumps for avoiding siltation and (iii) sedimentation ponds for reducing the pollution of surface water bodies.
- Possible overflow of water from nearby rivers/nallahs must be safeguarded by stone pitching and strengthening the embankment along the side of the water course
- However, due care will be taken to treat the mine water discharge by sedimentation for the proposed project. Effluents from workshop is proposed to be treated in ETP and moreover water will be mostly recycled in Workshop & CHP. As such, possibility of adverse impact on natural watercourses after mixing is very remote. Garland drain around the OB dump & coal dump will be made to avoid siltation of natural water course.

As indicated earlier, this being a proposed mine, the quality of mine pumped out water will be monitored once in every fortnight.

Based on the data collected at similar coal mine, it can be concluded that the impact due to proposed mining operation, the adverse impacts on water both surface as well as ground water will be insignificant..

IMPACT OF MINING ON WATER REGIME :

The mining activity creates dis-equilibrium in environmental scenario of the area and disturbs the groundwater conditions/regime in particular. The impact on water regime due to mining activity can be broadly classified as under:

- i) Impact on topography & soil
- ii) Impact on surface water and quality
- iii) Impact on groundwater & quality

A brief description/out-line on these aspects are given below:

Impact on topography & soil :

A local change in ground topography will be created at Shivani OC mine area due to mining operations such as open pit, embankments, dumps of overburden and coal, diversion of nallah and roads, mine voids etc. As a result, there would be marginal change in the drainage and surface run-off. During these courses, soil is most susceptible for changes due to erosion, leaching phenomena/process etc. Further the fine dust particles of coal & overburden may adversely affect the physical & chemical characteristics of soil.

Within the core zone area, cracks and loosening of soil would be resulted in due to mine and associated activities such as drilling, blasting etc thereby physical/textural changes would occur in soil/formations. This mine induced process increases the rate of infiltration and recharge. The studies carried out in Wardha Valley coalfield have established that rainfall-infiltration rates have been increased by 100% (doubled) in the core zone area of opencast mines thereby increasing the scope of groundwater recharge. So also the back filled area may be a good media for high groundwater recharge due to high induced permeability. Further, the void proposed to be left out would store substantial quantity of rain water which can be utilised for domestic & agriculture use and also for recharging the groundwater source. It may be appropriate to highlight the fact that temporary groundwater loss/deficit created during active mining stage would be compensated by these different means in the post mining stage so that the initial groundwater levels are regained to normalcy at the earliest for the utility of the area. Appropriate reclamation measures would be adopted to normalize the ground topography and soil as far as possible. However,

overburden dumps; embankments etc. are unavoidable structures to be left in the post mining stage.

Impact on surface water & quality:

As mentioned earlier, there would be minor change in the ground topography and infiltration capacity/rate of soil/formation due to mining operations resulting in some local change in drainage pattern and surface run-off in core zone. It is established that high infiltration zone would serve as good media for high groundwater recharge and reduces the surface run-off considerably in the core zone. In view of this, the mine has to handle more water in the monsoon besides the additional contribution from the surface run-off from the catchment area. As such the surface run-off contribution to the natural drains from the mining area would be minimum thereby some minor change is expected in hydrologic regime of the river/nallah system.

The surface run-off from the dumps of overburden material and coal and mine water discharge/effluent are laden with suspended particles of coal and other associated materials. This water is collected by foot drains with stoppage arrangement and passed through sedimentation tank/pond. This treated water will be utilised for mine site requirement and the surplus would be utilised to supplement the water shortage for domestic & agriculture use of villages if required or otherwise discharged into land surface/natural drains. Further, the groundwater quality is also satisfactory / good and its mixing is not going to adversely affect the quality of surface water.

Impact on groundwater & its quality:

Mining is associated with groundwater problems, particularly when it is below water table. The impact of mining on groundwater is dependent mainly on mine and aquifer parameters, groundwater recharge-discharge process etc. In the opencast mining, the unconfined aquifer gets affected more whereas the semiconfined aquifers are least affected due to continuous gravity drainage and conventional sump pumping or advance dewatering schemes for efficient and safe working. As such, during this exercise, basically the water level is to be depressed/depleted below the working seam depth in which case large scale mine water pumping can not avoided. Consequently the mine dewatering would drain out some area around the mine with decline in groundwater levels. However, these mine induced effects are temporary as increased infiltration rate at as rain water harvesting to balance the mine dewatering. Further, the mine effluent would contaminate the other resources of water if discharged untreated. However, water quality monitoring would be undertaken at the stipulated intervals immediately after the mine development starts and continued during the mine life.

Groundwater inflow and mine influence area have been estimated and the groundwater monitoring would be undertaken as corrective measure to avoid adverse effects. The mine discharge after passing through sedimentation pond / tank would be discharged into land/natural drains with earthen check dam at suitable locations so that the groundwater gets additional recharge by the return flow. The artificial recharge by water conservation structures in mine influence area proper may not be a viable solution because of the reason that recharged water would drain to the mine at a faster rate due to the steep hydraulic gradients resulted in during mining activity. As mentioned earlier the mine impact may be for temporary period during mine life and the area would regain the normalcy/benefits in many ways by appropriate reclamation measures during post-mining period. However, the temporary water shortage in the mine influence area would be supplemented from the treated mine water discharge for both domestic & irrigation use of affected villages if any.

c. Impact on Noise Level:

Proposed mine would be associated with following activities that may generate noise during operation :

- (a) Drilling
- (b) Blasting
- (c) Shovel operation
- (d) Dozing
- (e) Movement of dumper
- (f) Operation of CHP / Workshop

The following are some of the important activities responsible for high noise level generation, with their expected noise levels :

- a. All mining activities i.e. drilling, blasting, shoveling, dozing and dumping are associated with high noise level [about 100 dB(A)].
- b. Operation of most HEMMs produce high noise level. The noise level are in range of 80 – 100 dB(A). Noise level have been found to be related to engine capacity.
- c. Crusher – General noise level due to crusher ranges from 90 dB(A) – 105 dB(A). Some of noisy equipment produce noise whose level is around 120 dB(A).

The average sound pressure level of some of the HEMM associated with mining operation which are responsible for high noise level generation are as follows :

EQUIPMENT	NOISE LEVEL [dB(A)]
Dozer	98
Dumper	92
Power shovel	93
Drilling machine	96

d. Impact on Land:-

The total land involved in Shivani OCP is 780.00 ha. The land is mainly cultivated or revenue land. This land is free from forest land and there is one village shifting involved.

PROPOSED LAND USE PLAN DURING OPERATION OF THE PROJECT

780.00 hectares of land proposed for the project would be utilized for different purposes to carry out the project operation as stated below:-

Post-mining Land use pattern of ML/Project Area (ha)

S.N.	Land use during mining	Land use (ha)				
		Plantation	Water Body	Public use	Undisturbed	Total
1	External OB Dump	201.00	-	-	-	201.00
2	Top soil dump	49.85	-	-	-	49.85
3	Excavation	24.00	108.00	-	82.00	214.00
4	Roads	1.43	-	2.25	-	3.68
5	Built up area	-	-	2.88	-	2.88
6	Green Belt	-	-	-	-	-
7	Undisturbed Area	98.57	-	-	168.02	266.59
8	Embankment area				42.00	42.00
	Total	374.85	108.00	5.13	292.02	780.00

Details waste generation-OB & Top soil

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)
Original Project (ha)	171.32	13.00	158.32	119.11	52.21

Expansion Project (ha) (Balance life)					
Total (Mm ³)	171.32	13.00	158.32	106.11	52.21

Plantations on external OB dumps will start tentatively after 12th year and over internal dumps after 15th year . Till 12th year plantation activity will be along roadside , in slopes of embankment, around service buildings & infrastructures and in land for rationalization for finalising lease hold boundary of the mine(strictly in non coal bearing area). Presently backfilling is about 31 % of total OB. This would increase, if quarry is extended in future

f. Impact on socio-economic profile of the area

The activities listed under the two phases of this running project are likely to affect the environment to varying degrees. The environment is a very complex system and so many factors are interlinked and interdependent of each other, that any prediction concerning the impact on the environment as a whole may not always be very precise. So relevant aspects of environment are isolated as parameters and the impact due to various activities on the parameters has been identified as project activities.

Socio-economic Impact

There will be positive impact due to community development activities already undertaken and/or to be undertaken by WCL. The opening of mine shall pave way for general improvement of economy of the area, besides, increase in revenue of the state exchequer. The impacts on socio-economic profile can be categorized and studied under the following heads:

i) Population Growth and Migration

The opening of this project will be having an impact on the people inhabiting surrounding the project area. There will be migration of people from outside due to more job opportunities in the project area. Thus, the population in this area is likely to increase.

ii) Transport and Communication

The provision of metalled approach road to the place of work and other places of public interests like shopping, education, medical services etc. is going to improve the existing transport & communication net work.

iii) Health

With the opening of this project, the facilities created in the project are likely to be extended for neighboring population also.

iv) Literacy

After coming up of this project, educational facilities developed in the project area will help to improve the literacy of the rural areas also around this project.

v) Economic Impacts

Opening of Shivani OC will definitely affect its surroundings and the employment scenario. With the proposed project the occupational structure of the area is going to change further and many people are likely to be involved in the job of mining and allied activities. Hence, income level of these people is likely to improve to significant level.

There will be creation of direct and indirect new employment opportunities in long term. The mining activities will accelerate the economic activities and urbanisation in the region with the creation of new employment opportunities including growth of other ancillary industries.

Maharashtra Government will be benefited through financial revenues in crores of rupees by way of royalty, sales tax etc. from the direct and indirect operations in the project area. Central exchequer will also have flow of funds through financial revenues by way of Income tax, Central Sales Tax etc.

vi) Rehabilitation & Resettlement

The total land involved in Shivani OCP is 780 ha. Shivani village which is on the Eastern rise side of the proposed access trench (shown in quarry layout plan) is to be shifted & rehabilitated . ₹21.2369 Crores is proposed for shifting and rehabilitation of Shivani village.

g. Effects of Traffic Movement

The following impacts are anticipated.

- Increased level of RPM & SPM in ambient air
- Noise nuisance due to movements of trucks.
- Creation of ruts and potholes on the surface of the road
- Road accidents

h. Impact on flora & fauna

- o There is no forest land in core zone.

- o There is no endangered and endemic species in core and buffer zone .
- o The area is not the migratory route for any wild animal.
- o Both core and buffer zones are found to be free from ecologically sensitive and biologically rich areas/habitats, such as, national parks, sanctuaries, biosphere reserves etc.
- o WCL in association with local people will make all efforts to conserve the flora & fauna in the immediate surrounding of the mine area.

i. Visual/Aesthetic Impacts

Suitable mitigatory measures will be taken to eliminate spots of eyesore due to excavation of coal and OB as well as transportation, water logging by provision of proper drainage, land reclamation (both technical and biological) and afforestation.

ENVIRONMENTAL POLLUTION MITIGATION MEASURES

Since Shivani OC mine is yet to start the following abatement measures will be taken in order to suppress the dust and noxious gases generation to the maximum possible extent.

Drilling Operations

In order to reduce dust generated by drilling operation, dust extractors/wet drilling in drills will be used.

Blasting Operation

In order to minimize the generation of dust during blasting, the following mitigative measures are suggested:

- (a) Blast holes are properly placed/spaced/positioned.
- (b) Blast is properly designed in respect of hole-spacing. Hole placing and blast design are looked into as a fresh case every time, by a competent Blasting Officer who takes into consideration the actual geo-mining conditions of the site.
- (c) Blasting is being done between shifts or during the rest interval when the minimum number of persons is present around the blast area. In order to quickly disperse the dust generated in blasting operations, blasting is avoided when there is wind. Blasting is avoided in the mornings and during cloudy situations.
- (d) Adaptation of Controlled Blasting Technique as permitted by DGMS.

Loading & Transport

The loosened overburden material as well as coal, as far as possible will be wetted first with help of water spray arrangements before the start of loading operations.

Movement of vehicles and HEMM on haul roads, particularly when they are unmetalled, is another major source of dust generation. To minimize dust generation due to this operation, the following abatement measures are being taken.

- (a) All long-life haul roads and service roads will be properly constructed and metalled. Unmetalled roads will be kept free of ruts, potholes etc.
- (b) All haul-roads will be regularly sprayed with water. Water sprinklers will be regularly used in the project.
- (c) Overloading of vehicles will be avoided.
- (d) Covering of loaded trucks by tarpauline.
- (e) Regular cleaning of transportation roads.
- (f) Adequate green belt will be developed all along the coal transportation road on both sides.

All the above-mentioned control measures will be continued during the entire life of the project.

OB Dumps

On the dump slopes and top surface, plantation of grass and trees will be done when the dumps become and around the dump areas. Noxious gasses are emitted through exhaust fumes during the operation of diesel / petrol operated equipment. In order to reduce such emission, regular maintenance of the diesel / petrol operated vehicles will be carried out so that the emissions from these vehicles are under control. However, wherever, the condition will permit petrol / diesel operated HEMM will be replaced by electrically operated ones.

Water sprinkling on coal stock/face, blanketing of exposed surface will be carried out to avoid spontaneous heating and minimize air pollution.

Ambient Air Quality Monitoring

The ambient air quality monitoring will be carried out on regular basis as per the Env (Protection) Amendment Rule, 2000 so as to ascertain the likely load of various air pollutants and thereby suitably modifying the various control measures.

Plantation to Check Air Pollution

Plantation will be under taken in the mine area as mitigatives measure against air pollution, noise pollution and to increase the aesthetic value. The plantation will be done at suitable places like overburden dump, along the road sides, unused land etc to arrest as well as reduce the rate of dispersion of dust generated due to various mining operations in the neighbourhood viz. quarrying, coal and OB transportation, OB dumping, CHP operation. The plantation will be carried out through Forest Development Corporation of Maharashtra and the same will be done in Shivani OCP also.

ii. Water pollution control measures :

The major source of water pollution in the opencast mine is mine pumped out water. The other sources are effluent from Workshop and residential colony. An independent Workshop Effluent Treatment Plant (WETP) has been provided with sufficient capacity to handle the requirement.

The impact prediction on ground water made in the approved EMP is for the final depth of the quarry. To assess the likely impact of opencast coal mining on ground water, regular monitoring of ground water level will be carried out as per MOEF guideline.

However, monitoring will be done as per Environment Protection (Amendment Rule, 2000) and in case, any undesirable element noticed, immediate corrective action will be taken.

Salient controls measures have been taken are as follows:

i) Industrial Effluent

The wastewater from workshop which normally remains laden with oil and grease, suspended and dissolved solids etc. will be treated in the Effluent Treatment Plant (ETP) proposed in PR. Clear water coming out from the treatment plant is taken into the closed water circuit and recycled for its reuse. All parameter of ETP waste discharge will be monitored regularly as per Env. (Protection) Amendment Rule, 2000.

ii) Mine Water

Most of the suspended particles will get settled in the mine sump made at the floor of the seam and the supernatant water will be pumped out. This water will then be passed through sedimentation pond at surface before being discharged in to natural drain.

iii) Surface Run-off

Adequate numbers of vegetation is proposed to be grown on the top surface and slopes of the dumps in order to arrest the erosion of soil and it also reduces surface run-off, which helps averting siltation of natural watercourses.

In order to arrest siltation from OB dump, catch drains of adequate size will be provided around the periphery of external OB Dumps. Further, garland drains will also be provided around the quarry edges.

Water/Effluent Quality Monitoring

Regular water quality/effluent quality monitoring as being done in all the operating mines to ascertain the likely load of pollutants and thereby suitably modifying the control measures. As seen from Analysis Data of the neighbouring mine, the pumped out water does not contain significant pollution load and the discharge water quality even without treatment is quite satisfactory. The same fortnightly monitoring of mine pumped out will be carried out in the proposed mine also during the entire life of the mine.

Remedial measures to control ground water depletion

The following methodology and remedial measures will be taken to minimize the mine induced impact on ground water levels and also adverse effects in the area.

- (i) The water shortage in the villages, if any, in the influence area can be supplemented by supply of water from the mine water after treatment.
- (iv) While reclamation of the mined area, void at the deepest portion of the pit has to be left. This residual pit void would initially serve as access for future expansion and subsequently it could be backfilled.
- (v) Well water monitoring in nearby villages is being carried out quarterly as per MoEF's guidelines. No adverse remarks have so far been observed.
- (vi) Regular water quality/effluent quality monitoring will be carried out so as to ascertain the likely load of pollutants and thereby suitably modifying the control measures.

NOISE POLLUTION CONTROL MEASURES

Monitoring of the noise levels as being done in all the operating mines will be done for this mine also after opening on regular basis as per the Env (Protection) Amendment Rule 2000. While planning for an effective noise attenuation measures, the concept of source, path and receiver has been considered.

(A) Noise Control at Source

There are two areas where the noise generation can be checked at source.

(i) Proper Design

Since the generation of noise can be reduced by reducing the vibration amplitude, the area of vibrating part and frequency of vibration is being taken care that all loose contact between metal parts avoided.

Shock absorbing pads are being fixed in the foundation of vibrating equipment / machines. In case of aerodynamic noise producing sources, mufflers are provided with the machines.

(ii) Proper Maintenance

All machines and equipment will be properly maintained. Sound muffler system and bearing lubricating system etc. of equipment will be kept in proper condition.

(A) Noise control in Transmission Path

The measures are to be taken for control of noise along the transmission path have been put in following two categories:

- (i) Air borne path
- (ii) Ground borne path

(i) Air Borne Path

The control in air – borne path has been planned in a number of ways as:

- (a) The crusher house, screen house etc., which are source of high level noise generation are to be enclosed.
- (b) Planting of furrows of trees along the thick foliage around the compound and wall of CHP, workshop and other industrial buildings. This will reduce the spread of noise. It can be also used as an acoustic enclosure to reduce ambient noise.

(ii) Ground Borne Path

It has been proposed to provide vibration isolators in the form of vibration absorbing pads placed at the base of vibrating equipment.

(C) Noise Control at Receiver End

Even after adopting above measures, if desired noise level is not achieved at receiver end, in that case, following measures are suggested:

- Regular monitoring of ambient noise level in core zone as per Env.(Protection) Amendment , Rule,2000.

- All provisions of Coal Mines Regulations, 1957 will be followed.
- The quantity of explosive will be decided as per condition imposed by DGMS.
- Blasting will be done in daytime during the shift change over period as per requirement keeping in view DGMS permission, meteorological conditions, geo-mining condition and method of mining.
- Proper conformation to measures for safe blasting, to avoid damage to any structure or annoyance to the people in the colony area or neighbouring villages.
- A safe blasting zone is kept around the periphery of the quarry. This zone will be kept free from village habitation and community infrastructure and thus impact of vibration after blasting on the surface structures is avoided.
- Controlled blasting will be done near built-up areas and surface features, as and when required as per DGMS permission.

Plantation is an important tool to combat air pollution & noise pollution, for development of ecosystem, waste water reuse, use of waste land to improve environmental quality and soil erosion etc. In addition to these it gives an aesthetic look to the area.

Stage-wise cumulative plantation

[illegible]

3	5 th year			0.00	0.00	0.00	0.00	8.00	20000	8.00	20000
4	10 th year			0.00	0.00	0.00	0.00	60.00	150000	60.00	150000
5	15 th year			36.00	90000	0.00	0.00	100.00	250000	136.00	340000
6	20 th year			96.00	240000	24.00	60000	100.00	250000	220.00	550000
7	3 years after end of mining			250.85	587125	24.00	60000	100.00	250000	374.85	897125

vi. Occupational Health & Safety

The circulars and orders of DGMS including the rules and regulations under Mines Act, 1952 are being and will be adhered to in respect of occupational health and safety during balance life with enhanced production capacity. However, some measures regarding occupational health and safety are:

- a. Periodical medical examination of work force.
- b. First aid facilities.
- c. Refresher training to workforce as per statute.

vii. Traffic movement effect control measures

- Plantation on both sides of the roads on the surface.
- Proper maintenance of road to remove ruts and potholes.
- Proper illumination of roads including haul road.

viii. Visual/aesthetic effect control measures

- Physical and biological reclamation of mined out area to the extent possible to ameliorate the environment.
- Regular supervision to detect the spots of eyesore and to remove the same immediately.

ix. Control measures to reduce the impact on flora & fauna

- The enhancement of green belt/ afforested area will occur due to measures like biological reclamation, arboriculture/afforestation, and creation of greenbelt and avenue plantation.
- The water body created by the final voids will be beneficial to flora & fauna.
- Adequate measures for conservation/protection will be taken.

- Water will be discharged only after treatment only after suitable treatment. So, no adverse impact on downstream aquatic life of surface water courses is expected during balance life with enhanced production capacity.
- The expansion project is not likely to have any impact on the floral & faunal species diversity within the terrestrial and aquatic habitats.

x. Blasting vibration control measures

- All provisions of Coal Mines Regulations will be followed.
- The quantity of explosive will be decided as per condition imposed by DGMS.
- Blasting will be done in daytime during the shift change over period as per requirement keeping in view DGMS permission, meteorological conditions, geo-mining condition and method of mining.
- Proper conformation to measures for safe blasting, to avoid damage to any structure or annoyance to the people in the colony area or neighbouring villages.
- A safe blasting zone will be kept around the periphery of the quarry. This zone will be kept free from village habitation and community infrastructure and thus impact of vibration after blasting on the surface structures is avoided.
- Controlled blasting will be done near built-up areas

xi. Peripheral Development

As per the present practices in WCL coal mines, adequate steps are being taken for the local villagers by providing various infrastructural and welfare facilities and giving assistance in health care under CSR Programme.

However, further community development works will be taken up as directed by MOEF and after survey of the "felt needs" of the community around the project.

xii. MINE CLOSURE PLANNING

Mine closure planning has now become an essential part of mine planning and operation (i) to allow a productive and sustainable after-use of the site which is acceptable to the mine owner and the regulatory authority, (ii) to protect public health and safety, (iii) to alleviate or eliminate environmental damage and thereby encourage environmental sustainability and (iv) to minimise adverse socio-economic impacts.

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

ENVIRONMENTAL MONITORING PROGRAMME

The environmental monitoring programme will be as per details given below: -

S N	Items	Parameters	Frequency	No. of Stations	Submission
1	Ambient Air Quality Monitoring	SPM, RPM, SO ₂ , Nox, CO & Fugitive dust	Every Fortnight as per Environment Protection (Amendment), Rule 2000	4	Quarterly Report will be submitted to SPCB & MOEF
2	Water Quality Monitoring	1) 4 Parameters viz. pH, Total Suspended Solids (TSS), Chemical Oxygen Demand (COD) & Oil and Grease. 2) 35 Parameters	Every Fortnight Once in a Year	2	Quarterly Report will be submitted to SPCB & MOEF
3	Noise Quality Monitoring	Noise Levels	Every Fortnight	2	Quarterly Report will be submitted to SPCB & MOEF
4	Environment al Statement		Annual		Annually Report will be submitted to SPCB before 30 th September.
5	Ground Water Level Monitoring & Quality	Water Level & Quality Parameters.	Water Level – Quarterly. Water Quality – Yearly.	In Buffer Zone Villages.	Quarterly Report are submitted to SPCB & MOEF
6	Complianc e Report of EC Conditions.	All conditions both Specific & General	1 st June & 1 st December	Not Applica ble	Half yearly Report will be submitted to & MOEF

5.0 ADDITIONAL STUDIES

5.1 PUBLIC CONSULTATION

To ascertain the concern of local affected and others who have a plausible stake in environmental impacts of the project / activity public consultation will be done at project site or close proximity for local affected persons with the following activities.

The process in which public would be directly involved or participate and indirect responses would be received through different modes of communications.

District Magistrate will preside over the Public Hearing process to get public concerns incorporated in the EIA report.

Videography of proceedings would be done and would be enclosed with the application for Expert Committee.

The proceedings will be signed by DM/ADM in the same day of hearing.

The proceedings will be displayed in web site and other Govt. offices.

5.2 DISASTER MANAGEMENT PLAN

The mine will be worked with due permission from DGMS as per statute. All provisions of the statute will be followed to avoid any eventuality. Mine Emergency Response Plan shall be prepared and mock rehearsal will be done regularly.

6.0 PROJECT BENEFITS

The benefits of the project can be summarized as below:-

- The physical infrastructure in the area will be improved substantially by following ways:-

- a) Development of road, thereby improving the communication.
- b) Improvement in Power, Telephone (including Mobile) facility.
- c) Improvement in Health Care facility & Educational facility.
- d) Improvement in Market / Trade & Business.

- The social infrastructure by way of cultural mixing of people of other states with local community glorifying "UNITY IN DIVERSITY".

- Substantial employment in the project & indirect employment for business & trading, contractor, transportation, vehicle contractor, nursery development.

7.0 ENVIRONMENTAL MANAGEMENT PLAN:

In order to effectively implement the programme of plantation , land reclamation and other control measures for maintaining the environmental quality of air, water , noise, soil etc. the project personnel in close co-ordination with Area General Manager , Wani North Area , along with General Manager (Environment) , WCL (HQ) , will make concerted effort to carry out and monitor progress at each level and effectively implement the various control measures for environmentally sustainable mining in the area. This has been discussed in detail in the relevant chapter in the EIA/EMP.

8.0 Conclusion

In view of the above and as per the Terms of Reference (TOR) dated 23.03.2012 for proposed Shivani OC project, Tahsil – Wani, Dist. – Yeotmal for production capacity 1.25 MTPA (Normative); 1.4375 MTPA (Peak) and Land area 780 ha, Public Hearing may be conducted as per EIA Notification 2006.
