EXECUTIVE SUMMARY OF
RAPID
ENVIRONMENTAL IMPACT ASSESSMENT
AND
ENVIRONMENTAL MANAGEMENT PLAN

FOR

Madanpur South Coal Block
Hasdo-Arand Coal Field
Dist: Korba,
State : Chhatisgarh

OF

Madanpur South Coal Company Limited

BY

GEOMIN CONSULTANTS (P) LIMITED
267, KHARAVELANAGAR, BHUBANESWAR
PIN- 750 001

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1. PROJECT DESCRIPTION

The Coal deposits of Madanpur South Coal Block, south of Bisrar nala covering an area of 7.1395 sq.km i.e., 713.952 hectares has been allotted by Ministry of Coal, Govt. of India to M/s Madanpur South Coal Company Ltd. (MSCCL), a joint venture company of (i) M/s Hindustan Zinc Limited (HZL), (ii) M/s Akshay Investment Pvt. Ltd (AIL), (iii) M/s Chhattisgarh Steel & Power Ltd. (CSPL), (iv) M/s Chhattisgarh Electricity Company Ltd. (CECL), (v) M/s MSP Steel & Power Ltd. (MSP SPL) and (vi) M/s Consortium of (a) Ispat Godavari Ltd. (b) Vandana Global Ltd. (c) Indo-Agro Synergy Ltd. (d) Bajrang Power and Ispat Ltd. (e) Nakoda Ispat Ltd for their captive use for sponge iron production and power generation.

This mine is planned to be developed for production of coal to meet the captive use of M/s MSCCL. It is planned to be opencast and fully mechanized with eco-friendly operation. The zero date will start after the Surface Rights are available when due clearances are obtained. Starting the mine development from 1st year with gradual increase in coal production, the target of annual production of 5.4 MTPY would be achieved during 5th year. The production decreases gradually from 27th onward up to 30th year when the total mineable coal reserves would be extracted. Mine closure operation will start from 30th year which may take additional 5 to 7 years.

The area under Madanpur South Block which is under consideration covers the southern parts of Madanpur block and Bisrar block south of Bisrar nala as per the geological report of MECL. It falls in Survey of India Toposheet no. 64 J/9 bounded by 82^{o} 38'02" E to 82^{o}40'22"E longitude and 22^{o}45'19" N to 22^{o}47'09"N latitude. It falls in Katghora Tehsil of Korba district, Chhatisgarh. (Fig.1)

The State Highway No: 5 (S.H.-5) joining Bilaspur and Ambikapur runs on the southern part of the block. The nearest Tehsil town Katghora is connected by S.H.-5. Bilaspur is about 120 km away in the South-west and Ambikapur is located about 80 km NE of Morga village. Rail heads are 70 to 90 km away from the block. Korba railway station is located about 70 km South of the block and can be approached via Katghora. Pendra road railway station is about 80 km to the west of the block. Bishrampur and Chirimiri railway stations are 90 km to north east and 100 km to north, respectively of the block.

The ML area is an undulating and rolling topography. The general slope of the ground is towards north with local undulations. The slope is gentle in the southern part and becomes steeper towards north. Bisrar nala which is the northern boundary of the applied area is the main drainage channel of the area and it flows westward into the Hasdo River at a distance of 10 km west of the block. The existing land-use pattern is as follows.(Fig.2 and 3)

Table – 1
EXISTING LAND-USE PATTERN OF MINING LEASE (ML) AREA

Type of Land	Area in ha	Category
Khesra Forest (Protected Forest)	490.902	660.26 Govt. land
Revenue Forest	169.358	
Agricultural Land	53.408	53.692 Private land / Communal land
Communal Land	0.284	
Total	**713.952**	

The seam wise, grade wise, extractable coal within quarry boundary after considering the statutory slope and seam I as floor is given in Table below.

Table – 2
SEAM-WISE AND GRADE-WISE COAL RESERVES IN QUARRY/MINE BOUNDARY

Fig in Mt.

Seam Name	Gr-B	Gr- C	Gr-D	Gr-E	Gr-F	Gr-G	Total Coal
Seam -V				0.05	0.24	0.06	0.35
Seam-IV				0.33	2.08	3.79	6.20
Seam-III			1.16	35.90	53.28	1.65	91.99
Seam-II	0.02	0.67	9.57	6.89	0.40		17.55
Seam-I	0.19	2.07	7.88	7.81	3.22	0.05	21.22
Total Coal	**0.21**	**2.74**	**18.61**	**50.98**	**59.22**	**5.55**	**137.31**

Additional coal of 22.15 MT can be attempted for recovery from the slopes during mine closure.

Mining plan proposes total opencast operation upto the bottom of seam I. Coal would be directly mined utilizing surface miners which would not require drilling and blasting while the sized ore produced directly would not require further crushing and screening. As such coal mining operation will be eco-friendly creating dust free environment. Drilling, blasting, handling of over burden along with haulage of coal have been planned with utmost care for pollution control like sprinkling of roads, controlled blasting etc. All material loading and transportation would be using loader/excavator and dumpers. Temporary dumps for top soil and over burden are required for initial period only where necessary provisions would be for pollution control. Total mined out area will be reclaimed by backfilling of over burden and then spreading of top soil separately mined and preserved on the top of backfilled reclaimed land. Total mined out area will be reclaimed with land scaping, afforestation, with and green belt development, water bodies for future utilization.(Fig.4 and 5)

The geomining particulars are placed below.

Table – 3
GEO-MINING CHARACTERISTICS

Sl. No.	Particulars	Unit	Value
1	Quarry floor area	ha	372.196
2	Quarry surface area	ha	653.54
3	Mineable reserve	Mt	137.31
4	Overburden	Mcum	830.75
5	Stripping ratio	cum/t	6.05
6	Life (including construction)	Years	30
7	Average seam gradient		1 in 20
8	Quarry depth		
	Maximum	m	250
	Minimum	m	65

Drills, ripper dozer, hydraulic shovel, loader, dumper, surface miners, tipper, water sprinkler, fuel tanker, vibrating compressor, van, crane, ambulance etc. are the main equipments will be used for mining activities.

It will give employment around 800 employment of all category including contractual worker. The project is ecological viable. Adequate provisions have been made in the budget for abatement of pollution and environmental care.

2. DESCRIPTION OF THE ENVIRONMENT

The applied M.L area belongs to Sub-tropical climate. The annual average rainfall of Korba District is 1525mm. During the study period (winter of 2007-08), temperature recorded was from 6.0^0C to 36.3^0C while the relative humidity varied from 20% to 36%. The calm condition is 72.34%. The predominant wind direction varied from south-east.(Fig.6)

For the environmental analysis, meteorological, air, noise, dust fall, water and soil qualities are analysed during the study period of summer season within 10 km radius. Seven locations were fixed for air, noise and dust fall and five locations were fixed for soil quality. Five locations were fixed for ground water and six for surface water. (Fig 7)

The CPCB value for rural and residential areas for SPM, RPM, SO_2, NO_x and CO are 200,100,80,80 and 2000µg/cum respectively. From the study it is observed that SPM conc. varied from 53.83µg/cum. to 140.0µg/cum, RPM conc. from 6.39µg/cum. to 33.11µg/cum, SO_2 from 1 µg/cum. to 14.2µg/cum and NO_x from 1.3 µg/cum. to 15.9 µg/cum. The concentration of CO was less than 1000µg/cum. All the air quality

parameters are well within the prescribed standards of CPCB are for residential / rural areas. The analysis results are presented below.

Table – 4
Air Sample Analysis Result

Station Codes	Stations		SPM	RPM	SO_2	NO_X
			Microgram/cubic meter			
A1	Morga	Max	112.40	28.06	9.1	9.2
		Min	83.34	11.25	4.2	4.5
		Average	97.329	20.244	7.043	7.269
		95 Percentile	110.36	24.91	8.87	8.7
A2	Ketma Village	Max	93.84	16.82	7.8	5.9
		Min	64.84	6.39	1.0	1.3
		Average	77.402	12.291	3.881	3.656
		95 Percentile	89.51	16.7103	6.9	5.82125
A3	Madanpur Village	Max	140.00	31.92	11.1	13.5
		Min	107.05	20.92	5.3	5.0
		Average	124.092	26.981	8.288	8.655
		95 Percentile	134.674	31.6025	10.5138	11.956
A4	Dhajug Village	Max	99.30	32.32	8.9	8.9
		Min	64.49	12.93	1.5	4.0
		Average	82.743	18.923	4.455	6.721
		95 Percentile	96.7235	22.495	7.681	8.765
A5	Thihal Village	Max	123.29	26.57	13.9	11.9
		Min	78.40	14.88	3.8	5.5
		Average	103.497	20.736	7.828	7.900
		95 Percentile	112.713	25.5225	12.425	11.625
A6	Khirthi Village	Max	94.69	16.84	9.5	9.8
		Min	53.83	9.32	1.5	2.0
		Average	66.315	12.978	4.620	4.727
		95 Percentile	76.4375	15.9575	7.556	8.0275
A7	Jambahar Village	Max	126.91	33.11	14.2	15.9
		Min	101.79	16.35	8.2	9.0
		Average	113.740	23.284	11.832	12.225
		95 Percentile	124.483	31.8348	13.7	14.725

The vehicular movement and other mining operations are the main noise sources during the study period. The noise level ranges from 43.7 dBA to 63.8 dBA and 36.4 dBA to 51.0 dBA during the day and night respectively which is within the prescribed limit.

Ground water samples were collected from tube wells and surface water samples were collected from streams, reservoir, pond and nala and analysed. The ground water samples were analysed with IS 10500 and surface water as per IS 2296. From the analysis results, it is observed that the water quality is safe for drinking, agriculture and other purposes. The analysis results are presented below.

Table – 5
Ground Water Analysis Result
Season: Winter

Parameter	Unit	Standard	GW1	GW2	GW3	GW4	GW5
PH		6.5-8.5	6.7	6.9	6.7	6.75	7.25
Colour		Colour less	Colour less	Colour less	Colour less	Colour less	Colour less
Odour		Unobjectable	Odour less	Odour less	Odour less	Odour less	Odour less
Taste		Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
Turbidity N.T.U (MAX)		5.0	3.0	3.30	3.6	3.5	1.0
Total dissolved solids	mg/l	500	122	126	139	213	206
Total Hardness as $CaCO_3$	mg/l	300	95.5	125.5	80	87.5	91
Chlorides as Cl.	mg/l	250	45	35	50	30	45
Sulphate as SO_4	mg/l	200	20	25	25	15	15
Free residual Chlorine	mg/l	0.2	BDL	BDL	BDL	BDL	BDL
Total Alkalinity	mg/l	200	169	136	165.5	187.5	173
Iron as Fe	mg/l	0.3	0.1	0.1	0.05	0.1	0.05
Fluoride as F	mg/l	1.0	BDL	BDL	BDL	BDL	0.08
Calcium as Ca	mg/l	75	40	50	30	35	30
Manganese as Mn	mg/l	0.1	<0.01	<0.01	<0.01	<0.01	<0.01
Mineral oil	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium as Cd	mg/l	0.01	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc as Zn	mg/l	5.0	BDL	BDL	BDL	BDL	BDL
Selenium as Se	mg/l	0.01	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate as NO_3	mg/l	45	5.0	2.0	3.0	2.5	2.5
Phenolic compound as C_6H_5OH	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aluminium as Al	mg/l	0.03	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic as As	mg/l	0.05	<0.005	<0.005	<0.005	<0.005	<0.005
Boron as B	mg/l	1	<0.1	<0.1	<0.1	<0.1	<0.1

Standard: IS 10500

GW1:	Morga village tube well water	-	Core zone
GW2:	Bhulasiobhavana village tube well water	-	Buffer zone
GW3:	Dhujag village bore well water	-	Buffer zone
GW4:	Kendol village bore well water	-	Buffer zone
GW5:	Madanpur village dug well water	-	Buffer zone

Table – 6
Surface Water Analysis Result
Season: Winter

Parameter	Unit	Standard	SW1	SW2	SW3	SW4	SW5	SW6
pH		6.5-8.5	6.9	6.7	7.1	6.75	6.85	6.9
Colour		Colour less	Colour less	Colour less	Colour less	Colour less	Colour less	Colour less
Odour		Odour less	Odour less	Odour less	Odour less	Odour less	Odour less	Odour less
Taste		Unobjectable	Unobjectable	Unobjectable	Unobjectable	Unobjectable	Unobjectable	Unobjectable
Total dissolved solids	mg/l	500	220	270	190	129	110	155
Oil & Grease	mg/l	10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorides as Cl.	mg/l	250	20.0	50.0	25.0	20.0	50.0	20.0
Sulphate as SO_4	mg/l	400	10.0	15.0	10.0	10.0	10.0	15.0
BOD 5days at 20^o C	mg/l	2.0	1.0	1.5	0.5	0.5	1.0	0.5
Dissolved Oxygen	mg/l (min)	6.0	5.0	4.5	4.5	3.5	5.0	4.0
Iron as Fe	mg/l	0.3	0.15	0.10	0.2	0.10	0.2	0.15
Fluoride as F	mg/l	0.6-1.2	BDL	BDL	BDL	BDL	BDL	BDL
Arsenic as As	mg/l	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium as Cr^{+6}	mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper as Cu	mg/l	1.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Calcium as Ca	mg/l	200	35	30	25	30	30	20
Cadmium as Cd	mg/l	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc as Zn	mg/l	15	BDL	BDL	BDL	BDL	BDL	BDL
Selenium as Se	mg/l	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cyanide as CN	mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrate as NO_3	mg/l	20	2.3	1.5	1.0	1.0	1.0	1.5
Phenolic compound as C_6H_5OH	mg/l	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Coliform Organism MPN/100ml		50	3.50	4.50	1.50	2.50	3.50	3.50

Standard: Inland Surface Water Class-A IS 2296
SW1: Hasdo River (The main water course) up stream
SW2: Hasdo River (The main water course) Down Stream
SW3: Bisrar Nala close to ML area in the down stream
SW4: Bamhni Nala (North-east of the project area)
SW5: Mansar Nala (North-west of the project area)
SW6: Maniary Nala (South of the project area)

Table – 7
Soil Sample Analysis Result
Season: Winter

Sl. No.	Parameters	Units	S_1	S_2	S_3	S_4	S_5
1	pH	----	7.40	7.54	7.35	7.48	7.85
2	E.C	mohs/cm	111	103	102	110	103
3	Sodium as Na	ppm	39	34	45	46	45
4	Bulk density	gm/c.c	2.7	2.6	2.5	2.9	2.8
5	Organic matter	%	0.4	0.4	0.3	0.4	0.5
6	Chloride	%	0.015	0.05	0.015	0.02	0.01
7	Sand	%	16	15	15	19	25
8	Salt	%	36	43	40	42	45
9	Clay	%	48	43	45	39	32
10	Texture	%	Clayee	Clayee	Clayee	Clayee	Clayee
11	Porosity	%	46	45	43	42	44
12	Water holding	%	40	42	44	41	35
13	C.E.C	meq/100gm	1.49	1.40	1.25	1.6	1.4
14	Organic carbon	%	0.4	0.35	0.39	0.38	0.35
15	N	ppm	15	20	12	11	16
16	P	ppm	14	10	12	10	8
17	K	ppm	10	12	16	13	15
18	S	ppm	8	9	10	8	9

S_1 : Applied Lease area
S_2 : Morga Village Ag. Land
S_3 : Ketma Village Agricultural Land
S_4 : Madanpur Ag. Land
S_5 : Khirti Waste Land

Sal, Tendu, Mahua, Palas & Neem etc. are predominantly floras seen within the study area. Pigeon, House Crow, Myna, Quail, Cheel, Rat Snake, Dhamana, Toddy cat, Jungle Cat, Jackal, Rat, Rohu, Katla, Mrigal etc. fauna are found in the study area. The project area does not posses any rare and endangered flora and fauna species.

Table – 8
LANDUSE PATTERN OF BUFFER ZONE

LAND CATEGORY	AREA	
	HA.	%
Settlement	555.63	1.768
Agricultural land	2582.91	8.221
Dense forest	13440.36	42.776
Open forest	4819.32	15.338
Scrub forest	1389.46	4.422
Land with scrub	1479.03	4.707
Land without Scrub	2054.97	6.540
Barren Rocky area	358.88	1.142
Eroded Land	495.76	1.578
Reclaimed Land	230.35	0.733
Dry Reservoir/ river bed	297.53	0.947
River & reservoir	3708.14	11.802
Tank/ pond	7.66	0.024
Total	**31420**	**100.000**

3. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Mining activities and related operations can have beneficial as well as adverse impacts on the environment. The adverse impacts have to be mitigated. Surface miners will be used, which may decrease pollution load.

EMP has been prepared with the objective to restrict likely impacts through following measures.

- Embankment and safety barriers around the mine with green cover is planned to restrict water from outside to enter the mine. Besides the safety zone, it would also restrict water, dust and noise to move out from the mine.

- The valuable top soil which is part of overburden would be initially removed with care before mining in the area. It would be preserved separately for future plantations and land restoration.

- The overburden removed during first 5 years only would be taken within quarry area suitable site for temporary dumping. This would be totally reclaimed by16th year and used for backfilling of voids along with the overburden being excavated from advancing faces. As the total overburden excavated would be reused for restoration of mined out area, the waste dump likely to cause pollution has been avoided.

- Drilling and blasting in opencast mine would be limited to overburden only and it would be controlled to reduce its impact.

- Further, selection of the mining method and equipments has been made to reduce dust generation. Top soil would be selectively taken by dozers before blasting and the drills are to be with dust arresters. Coal would be mined by use of continuous surface miners for dust free operation and the sized coal produced would not require further crushing.

- Adequate provisions have been made to arrest all contaminated water in sumps for settling and subsequent reuse within the mine.

- The kutcha public road for the villagers passing through quarry area would be devided by pucca metal road along the embankment of Bisrar Nala for the public use. As there is no likely displacements, adequate provisions made for local area development.

- Necessary provisions have been planned for dust suppression measures in the working mining faces, haulage roads, dumps, handling and washing areas etc.

- Adequate planning has been made for drainage control and slope stabilization in the mine slopes and dumps.

- Extensive plantations with progressive mine restoration as planned would reduce the impacts during mine operation and after also.

- Impact of air quality will be in limited scale only within the project area. Adverse affect within this area is to be controlled to maintain air quality within the prescribed limit.

- Mining activity will have some impact on surface and ground water and its quality. As no contaminated water would be discharged and necessary care, control and monitoring would be there, water quality standards would be maintained.

- Surface flow / run off in the area would be affected marginally only in the rainy season due to working of mine in 714 hectares area. It will not have any impact on flow and water quality in Bisrar nala.

- The accumulated mine water after passing through sedimentation pond / tank would be used or discharged to land / natural drains. As such, the ground water gets additional recharge by the return flow. After the cessation of mining, the ground water level would recoup and attain normalcy. As such the impact may be negligible with the corrective measures only for the temporary period i.e. during mine life.

- Due to mining operation back ground noise level will increase. However it is expected to be below 75 dBA.

- Forest area will be degraded, as some trees shall be cut for mining. It will have some impact on the ecological system of the locality, which will be attempted for restoration back progressively and then after mine closure. As such impact will be for a short period during life of the mine.

- Details of land use which will be degraded and the restoration plan is indicated in the EMP. Due to mining activity some land will be degraded which the restoration plan proposed can't bring back to original condition. However attempts would be made to restore the soil conditions of the degraded land for future uses.

- The total quantity of solid waste generated is about 830.75 million cum. during the life of the mine. These shall be initially dumped in a yard and subsequently re handled for reclamation purpose for restoration of degraded land. As such no solid waste will be there due to mining activities.

- Adverse impact due to blasting and vibration along with noise on the local environment, infrastructure and wild life will be restricted by controlled blasting which would also need frequent monitoring.

- Regular health check up of the mine worker is to be carried out besides free medical check up camps to be organized to monitor the impact of the mining operation in the locality. Health and safety aspects are also to be regularly monitored.

- The proposed mining activities would obviously have some adverse and some positive impacts on the local people and inhabitants of the area. Environment management plan has to take care of this impact to maintain cordial relationship with the people.

- The expected beneficial impacts on the society are improvement in infrastructure, education, health facilities, Employment etc. The mining operation will generate direct employment for 800 nos. of employees. It will also provide indirect employment of about 2000 nos.

The project area is having forest vegetation. The item wise break-up of the land required is as follows (Figure 3).

The applied ML area covers 660.260 ha forest and 53.692 ha private land.

Table – 9
Proposed landuse pattern.

1. Mine excavation area	653.540 Hect
2. Barrier to be left around the mine included (Embankment along Bisrar Nala, safety barrio, diversion of road)	38.062 Hect
Total	**691.602Hect.**
3. Pit office, infrastructure facilities and mine office and welfare facility area(including plantation area).	22.350 Hect.
Grand Total :	**713.952 Hect.**

Top soil will be removed and stacked for future plantation.

The over burden to be generated from the mining activity shall be dumped externally for initial 5 years. After 5th year of operation concurrent backfilling shall be done.

- No impact on Bisrar Nala and its water flow.
- No direct discharge to any water courses.
- No displacement of persons. Only a kachha village road connecting to high way will be diverted with a better pucca road.
- Sprinkling in coal stack yard to prevent fire.

4. ENVIRONMENT MONITORING PROGRAMME

An environmental monitoring cell will be formed for regular environmental assessment on air, water, noise and soil qualities at nearby habitational area. Four permanent Air quality stations will be fixed as per the SPCB guidance to monitor the AAQ in quarterly basis. Quarterly water samples of ground water and surface water shall be collected and analyzed. Noise level monitoring at Noise generating points and AAQ locations shall be done in quarterly basis.

5. ADDITIONAL STUDIES

Additional studies like soil erosion and nutrient quality at riverbed soil will be taken up.

6. PROJECT BENEFITS

M/s MSCCL will be benefited and add to the earning of revenue. It will also directly and indirectly improve the life style of the local people and will also create awareness for preferring permanent services than periodical agricultural activities.

7. ENVIRONMENT MANAGEMENT PLAN

The post mining reclamation plan is as follows. (fig.8)

Table - 10

Sl. No.	Description	Land use (ha)				
		Plantation	**Water Body**	**Public Use**	**Undistrubed**	**Total**
1	Embankment along Bisrar Nala, safety barrier, diversion of road along the peripheri.	28.00	--	10.062	--	**38.062**
2	Pit office, infrastructure facilities and mine office and welfare facility area(showing features of plantation area).	17.00	--	5.35	--	**22.350**
3	Mining (quarry) including reclaim area	605.793*	4.123	43.624	--	**653.540**
Total		**650.793**	**4.123**	**59.036**	**--**	**713.952**

*477 ha will be planted with tall species and 128.793 ha with dwarf and bushy type.

The lease area consists of 660.260 ha of forest land. After the closure the area will be with plantation over 650.793 ha. The balance area is left out for diverted roads and maintenance of plantation besides water reservoir for future utilization.

The mining activities will have certain adverse effects on the existing environment like air, water land and noise. The table given below shows the stage-wise green belt development.

Table – 11

Environmental Impact and Management Stage-wise Cumulative Plantation										
Year	**Green belt**		**Internal Dump Reclaimed**		**Dump Area**		**Topsoil Dump**		**Total**	
	Area (ha)	**Trees**	**Area (ha)**	**Trees**	**Area (ha)**	**Trees**	**Area (ha)**	**Trees**	**Area (ha)**	**Trees**
1	5	12500	--	--	--	--	--	--	**5**	**12500**
2	10	25000	--	--	--	--	--	--	**10**	**25000**
3	15	37500	--	--	--	--	--	--	**15**	**37500**
4	20	50000	--	--	--	--	--	--	**20**	**50000**
5	30	75000	--	--	--	--	--	--	**30**	**75000**
6	30	75000	--	--	--	--	--	--	**30**	**75000**
7	30	75000	--	--	--	--	--	--	**30**	**75000**
8	30	75000	--	--	--	--	--	--	**30**	**75000**
9	30	75000	--	--	--	--	--	--	**30**	**75000**
10	30	75000	--	--	--	--	--	--	**30**	**75000**
Ultimate/ Post Mining	**45**	**112500**	**605.793**	**1514483**	**--**	**--**	**--**	**--**	**650.793**	**1626983**

The following protection measures will be adopted to minimize pollution.

- Disaster management plan is prepared to prevent possible accidents due to open cast bench slope failure, accidents due to operation of machinery, blasting.
- To suppress fugitive dust, provision of water sprinkler, dust extractor etc at the dust generation source
- Adoption of control blasting techniques (using advance non-electric detonator.
- Construction of garland drains around the quarry area and dumps with proper gradients so as to stop soil erosion and to stop water entering into the mine in rainy season.
- Proper maintenance of plant and machinery
- Providing sound proof cabins with proper ventilation
- Provision of personal protective equipments to the workers.
- Stone pitched walls in garland drains will be prepared to arrest flow of loose sediments.
- Provision of speed breaker (stone pitching) at regular intervals in garland drains
- Phase-wise reclamation through backfill
- Plantation around operational areas shall be covered with suitable species to prevent soil erosion impact on air and noise propogation etc.