

Chapter-II**PROJECT DESCRIPTION****2.1 Type of Project**

This is open cast coal mining project for the nominal rated capacity of 0.20 Mty and would excavate 3.889 Mt of coal in 23 years of mining life span with deployment of diesel hydraulic Shovel/backhoe- dumper combination at the initial cost of Rs. 11253.06 Lakhs.

2.2 Need of the Project

The Tirap and Tikak opencast mines are at present the only coal producing opencast mines in NEC. The projectised balance mineable reserves at Tirap OC mine would last for another 3-4 years at the current rate of production. Thus the Tirap OC mine is nearing its closure.

Tikak OC mine would be the only OC mine producing coal at the rate of 1.20-1.25 lakh tonne per annum for another 12-15 years.

By closing one OC mine producing coal at the rate of 3.40-3.50 lakh tonne per annum would bring down NEC further into red. The demand of coal as well as overall economics of the northeastern coalfields has therefore necessitated for looking at alternatives. Thus, the alternative lies in increasing opencast production in current economic situation.

The proposed project will be able to compensate partly for the loss of production due to closure of Tirap opencast mine.

2.3 Location

Proposed Tikak Extension OCP is located in north-central region of Makum coalfield, Tinsukia district of Assam. It forms a part of northern limb of Namdang syncline and it is on the west of Ledo underground mine. The block lies about 8 Km southeast of Margherita town, headquarter of the NEC. The

nearest railway station is Ledo, which is located at a distance of nearly 3 km on the Dibrugarh-Tinsukia-Lekhapani section of NF Railway. The National Highway -38 running east west passes about 1 km north of the project and connects the area with the rest of the country. Tinsukia, the district headquarter is situated about 50 km west of the project. Nearest airport Mahanbari (Dibrugarh) is at a distance of nearly 90 km from the project. The block can be approached from Margherita by NH-38 and then through the approach road of Tikak OCP and lastly rugged terrain by kutcha hilly track or temporary roads.

The project is surrounded by Ledo underground mine & Ledopani nala on the east side and Tikak OCP on the west side. The area is covered in the Makum coalfield survey sheets no. 1, 2, 3 & 4. (**Refer Plate no-I & II**)

2.4 Physiography and Drainage (Ref. Plate No-II)

The project is situated along the northern flank of the Naga-Patkai range and is characterised by rugged hilly terrain with elevations ranging from lower heights of 225 m RL at the eastern side to 425 m RL in south western side. The NH – 38 passes through flat to gently rolling terrain, having elevation of 150 m to 155 m above MSL. Terrain starts rising steeply from south side of NH –38 and attains an elevation of 365 m to 425 m within a distance of 1.5 km at the middle portion of the project and after that the hill starts to decline. In general the ground slope is towards north but it is towards south from mid sector of the project.

The Ledopani nala is flowing south to north and passes through east side of the project, which controls the drainage of the area. The project is highly dissected by rills and gullies, which are discharging the surface run off water to the Ledopani nala. The Ledopani nala is ultimately discharging water into the Dihing River, which is flowing from east to west further north of the project.

2.5 Climate

The area is characterised by humid climate varying from 87% to 91%, a short duration of summer, a prolonged period of rainy season and fairly cold winter season. The temperature during summer is as high as 36°C and in winter as low as 6°C.

Annual rainfall ranges from 300 to 425 cm. Monsoon in real sense is felt during April to September. It rains for 8 to 9 months in the area. The dry periods are generally December to March – a stretch of about 150 days in a full year.

2.6 Project Boundary

Analysis of available geological information and surface features etc. shows following constraints in designing and working of the deposit.

- Seams are incropping at the high hill region and access to the deposit is difficult.
- The area was exploited by old underground and opencast mining. Extent of these old workings, amount of coal extracted, depillared area, coal barrier left in the area etc are not exactly known.
- Conditions of old underground working are also not known.
- The area lies in the very high rainfall zone and has a prolonged rainy season.
- The area is covered by typical evergreen tropical rain forest.
- 60' seam is split in the dip side but splitting zone is not known.
- Absence of borehole data in the dip side.

All the opencast mines of NEC are earning profit whereas all underground mines are loss making. Therefore, it is necessary to exploit coal as much as possible by opencast method. The mine boundary has been designed based

on these constraints, lay and disposition of the coal seams, position of incrop etc. Cross-sections (9 nos.) and Iso-ratio lines were generated to delineate mine boundary. Boundary of the Tikak Extension OCP has been finalised based on the following criteria.

- a. Northern mine boundary on the incrop side of the deposit is based on a ratio line of 1:15 or a minimum coal thickness of 1.0 m and position of existing excavation.
- b. West side of the mine boundary is extended up to east side boundary of the Tikak OCP.
- c. East side of the mine boundary is fixed considering the abandoned patch of opencast mines, existing Ledo U/G mine as well as incrop of the 60' seam.
- d. Dip side of the boundary is fixed at 1:15 cut-off ratio line.

The mine boundary has been delineated based on the preliminary geological input, certain assumptions on coal recovery & coal quality and present scale of economics, which may change with more reliable data and economics at the end of mining operations. It is also proposed that the 60' seam in the patch between incrop and fault F4-F4 should be exploited wherever it is within 1:15 ratio lines, even if, it has not been included in the proposed mine boundary, for lack of data.

This mining option will permit exploitation of total 3.89 million tonnes of mineable coal at an average stripping ratio of 9.84 cum/t. Out of 3.89 million tonnes of coal reserves contribution of 60' seam, Local/New seam and 20' seam is 3.13 million tonnes, 0.31 million tonnes and 0.45 million tonnes respectively. It is envisaged to mine coal at 0.20 Mt per annum. In this case the mine life will be 23 years including construction period. The maximum depth in this mining option will be 175.

m, minimum being 5 m. The nature of the deposit dipping at 15-25° down the rising hill and the general elevation of the topography ranging from 225m in

the east to 425m at the topmost point in the west of the proposed block. The Tikak Extension OCP is spread over 400 m to 1750 m at strike direction and 120 m to 300 m at dip direction along quarry floor. Whereas, the spread of the mine is 440 m to 2000 m at strike direction and 300 m to 450 m at dip direction along quarry surface. The surface and floor area of the pit is 72.00 Ha and 34.43 Ha respectively. The identified mine area has been proposed to be divided into three sub pits namely Sub-pit – 1, Sub-pit – 2 and Sub-pit – 3 as per sequence of their exploitation based on mine parameters and economics.

2.7 Operational Magnitude

The mine has been planned to produce at the nominal rated capacity of 0.20 MTY. The design of the mine is mainly based on lay & deposition of coal seams and intervening partings of the block as estimated in the Geological report and the HEMM productivity norms adopted in CIL mines.

Nature of the deposit in the project area makes it difficult to accommodate overburden internally. Whereas, the nature of surrounding land and present infrastructure make it necessary to minimize external dump area.

Quantity of overburden to be handled from sub-pit – 1 is 10.57 Mcum and out of this 2.41 Mcum will be accommodated internally. Rest 8.16 Mcum will be dumped at external dump. At the end of mining of sub-pit – 2, out of 25.52 Mcum of overburden 21.68 Mcum will be dumped externally. At the final stage, a total of 85 hectares of land will be needed for external dumps. External dumps will accommodate about 25.23 Mm³ of overburden. Balance 13.02 Mm³ of overburden will be accommodated in the internal dumps constituting nearly 34% of the total overburden. Dump plan at the end of Sub-pit- 1, sub-pit-2 & final stage dump plan is presented in **Plate- VIII, IX & X** respectively.

2.8 Mining Schedule

The Tikak Extension OCP is planned for a rated capacity of 0.20 MTY. Life of mine with schedule of mining, indicating seam-wise as well as year-wise & cumulative coal production, waste removal along with running & running average stripping ratios for selected boundary option is given in table-I

Coal production will commence from the Tikak Extension opencast mine from the 3rd year of mine life i.e, after two years of construction period. The project will produce 0.10 Mt coal in the third year with 1.46 Mcum of cumulative overburden. Target production of 0.20 MTY will be achieved in the 5th year of mine life and will be sustained till the 21st year of mine life thus ensuring 17 years of sustained coal production at rated capacity of 0.20 MTY.

It is proposed to excavate 0.56 Mcum of overburden in the second year & 0.90 Mcum in the third year to produce 0.10 Mt coal in the third year of mine life. Thereafter, 1.48 Mcum of overburden is required to be removed per annum till 10th year of mine life to maintain targeted coal production of 0.20 MTY. After that, rate of overburden removal will increase to 2.44 Mcum per annum to maintain the coal production rate for another 8 years and then overburden removal is gradually tapered.

The mining schedule is prepared considering two years of construction period. In the first year of construction, the approach to the mine and external overburden dump area will be constructed. From second year of construction, the mining operation will start with removal of 0.56 Mcum of overburden and entire overburden quantity will be dumped at external overburden dump area. It is proposed to deploy 1 no. 3.7 – 4.0 cum diesel hydraulic shovel along with 8 nos. of 35 T rear dumper for this purpose. In the third year, it is proposed to add 1 no. 2.7 – 2.8 cum diesel hydraulic backhoe and 6 nos. 35 T rear dumper to mine out scheduled 0.10 Mt. coal and 0.90 Mcum overburden. Rear dumpers are provided to transport coal at Tikak siding and overburden at external dump. Commissioning of 3rd unit of

excavator i.e., 1 no. 3.7 – 4.0 cum diesel hydraulic shovel in the fourth year will enable the project to achieve the target production of 0.20 Mt. from fifth year. Annual overburden removal will increase to 2.44 Mcum from eleventh year to maintain 0.20 Mt. coal production. 1no. 3.7-4.0 cum diesel hydraulic shovel and 1 no. 2.7-2.8 cum diesel hydraulic backhoe with support of 8 nos. rear dumper are proposed to maintain production level at target capacity. 5 nos. 160 mm drill and 1 no. 100 mm drill are proposed for drilling operation. 8 nos. 320 hp crawler dozer and 1 no. 300 hp wheel dozer are provided for dozing, leveling and reclamation works.

Table-I

Mining Schedule

Year	Seamwise coal production			Total coal prod. (M t)		OB Removal (M cum)				Stripping Ratio (cum/t)	
	(M t)			Annual	Cumul.	As per Sequence		As per Scheduled		Running	Running Average
	20' Seam	NEW Seam	60' Seam			Annual	Cumul.	Annual	Cumul.		
-2				-	-	-	-	0.00	0.00		
-1				-	-		0.00	0.56	0.56		
1	0.000	0.001	0.099	0.100	0.100	0.89	0.89	0.90	1.46	9.00	14.60
2	0.000	0.004	0.146	0.150	0.250	1.36	2.25	1.48	2.94	9.87	11.76
3	0.000	0.013	0.187	0.200	0.450	1.69	3.94	1.48	4.42	7.40	9.82
4	0.001	0.008	0.191	0.200	0.650	1.51	5.45	1.48	5.90	7.40	9.08
5	0.008	0.015	0.177	0.200	0.850	1.38	6.83	1.48	7.38	7.40	8.68
6	0.013	0.017	0.170	0.200	1.050	1.28	8.11	1.48	8.86	7.40	8.44
7	0.016	0.016	0.169	0.200	1.250	1.41	9.52	1.48	10.34	7.40	8.27
8	0.024	0.016	0.160	0.200	1.450	1.69	11.21	1.48	11.82	7.40	8.15
9	0.040	0.019	0.141	0.200	1.650	2.43	13.64	2.44	14.26	12.20	8.64
10	0.039	0.019	0.142	0.200	1.850	2.02	15.66	2.44	16.70	12.20	9.03
11	0.041	0.020	0.139	0.200	2.050	2.10	17.76	2.44	19.14	12.20	9.34
12	0.041	0.020	0.139	0.200	2.250	2.36	20.12	2.44	21.58	12.20	9.59
13	0.037	0.021	0.142	0.200	2.450	2.38	22.50	2.44	24.02	12.20	9.80
14	0.029	0.016	0.156	0.200	2.650	2.18	24.68	2.44	26.46	12.20	9.98
15	0.039	0.024	0.137	0.200	2.850	3.40	28.08	2.44	28.90	12.20	10.14
16	0.040	0.021	0.139	0.200	3.050	2.95	31.03	2.44	31.34	12.20	10.28
17	0.034	0.019	0.146	0.200	3.250	2.70	33.73	2.39	33.73	11.95	10.38
18	0.025	0.017	0.157	0.200	3.450	2.26	35.99	2.26	35.99	11.30	10.43
19	0.016	0.012	0.172	0.200	3.650	1.30	37.29	1.30	37.29	6.50	10.22
20	0.006	0.006	0.138	0.150	3.800	0.61	37.90	0.61	37.90	4.07	9.97
21	0.004	0.004	0.082	0.089	3.889	0.35	38.25	0.35	38.25	3.93	9.84
Total	0.451	0.309	3.129	3.889		38.25		38.25		9.84	

2.9 Technology & Process description

Highly inclined seams in the proposed mining area attain a depth of nearly 70 m within a length of 200 m and surface level varies from 225 m to 425 m within a distance of 1.50 km. Presence of faults and underground workings make the mining conditions more difficult. The area experiences very high rainfall during rainy season, during which the mining operations have to be stopped.

Coal of these seams is soft and powdery in nature and overburden contains weathered rock as well as hard sandstone, shale etc. which require blasting. 0.20 Mt. Of coal will be produced per annum from three coal seams and quantity of OBR is 2.44 Mcum per annum from numerous benches. Limited strike length of benches and narrow working space have been considered in the proposed mining system. Technology options are guided by these factors mainly.

Limited extent of the deposit, variable thickness of coal and floor structure makes shovel-dumper combination more suitable under the prevailing geo-mining conditions. Shovel-dumper application has been considered for coal, interburden and lower horizons of OB which largely comprise of sandstone and shale.

3.7-4.0 cum diesel hydraulic shovels along with 35T RD and 2.7-2.8 cum diesel backhoes along with 35T RD have been considered for OB removal and Coal production.

2.10 Project Description

2.10.1 Land

Total Land requirement is 192.00 Ha. Out of 192 Ha land, 120 Ha is settlement land belong to NEC. 72 Ha of forest land for mining is to be acquired. Head-wise requirement of land are presented in Table below.

Head-wise Requirement of Land (in Ha)

Sl. No.	Particulars	Land (Ha)
1.	Mining	72.00
2.	Mine Periphery including haul roads, power supply arrangements etc.	35.00
3.	External dumps	85.00
4.	Office, workshop, Stores & Repair facilities, coal stock yard etc.	0.00
5.	Rehabilitation Colony	0.00
	Total	192.00

2.10.2 Infrastructure

The mine site infrastructure includes the power distribution system, water supply, sewerage, communications, roads and other buildings.

2.10.3 Power Supply

Source of power for the OCP will be 33/11 kV Ledo sub-station of ASEB that would supply power to Tikak Extension main sub-station through 11 kV overhead line. This sub-station will be installed in existing Tikak Extension sub-station. Proposed combined colony of Ledo & Tikak extension, . mine pumping, quarry lighting and workshop will be supplied from this sub-station.

The maximum demand and energy consumption with all the equipment working is estimated 300 KVA:

The contract demand with ASEB shall be decided after selection of type of working, option, study of present demand at Tikak sub station and tariff pattern of ASEB.

2.10.4 Water Supply and Sewerage

The total water demand has been estimated as 0.23 MGD. This includes potable water requirement of 0.19 MGD for the Tikak Extension OCP and Ledo OCP. The industrial water requirement for the two options has been estimated as 0.04 MGD.

Separate sewerage system for industrial sewage has been envisaged for the Project.

Industrial water supply

Tirap river has been identified as the source of water for the industrial water demand of project. Water from this river shall be drawn through an intake well to the ground reservoir located in the proposed industrial area. This water shall be treated first and pumped to an overhead tank. From this tank, water for industrial purposes has been considered to be delivered to the various industrial buildings, administrative complex & quarry sites and is proposed to be distributed by gravity to the point of consumption through a distribution network.

For fire fighting purposes in the industrial areas like quarry area, separate distribution networks have been proposed from the ground reservoir. Provision towards requirement of water for public utilities like garden, afforestation etc. has been made in this report. It has been envisaged that the distribution network for fire fighting purposes shall also be utilised for these purposes.

Industrial sewerage

It has been considered that the industrial wastes from industrial establishments would be led through oil & grease traps. The effluent coming out of the industrial premises is proposed to be treated and led to the settling tank and to be recycled for various industrial uses for this project. The domestic sewage generated in industrial premise has been considered to be dealt in septic tanks and soak pits.

2.10.5 Road Network and Culverts

Heavy duty Road

A provision of 0.5 Kms heavy duty road has been made in the present report.

Approach road to Project

Approach road of 2.5 Km length has been proposed with an estimated apportioned amount for Tikak Extension OCP has been detailed. An RCC overbridge of 200 m length over Tikak Railway siding has also been envisaged.

2.11 Geology

2.11.1 General Geology

Central part of Baragolai OCP block, which is a continuous property of existing Tikak OCP, is being considered to exploit by opencast mine and named as Tikak Extension OCP. The proposed area lies between existing Ledo incline on the east and Tikak OCP on the west. Out of 42 nos. of boreholes, based on which "Report on Coal Exploration in Baragolai OCP Block" was prepared, only 9 nos. boreholes fall within the proposed project area and 4 nos. of boreholes are adjacent to the area.

In the proposed project area three coal seams namely 60' seam, Local/ New seam and 20' seam are incroped and affected by two faults F3-F3 and F4-F4.

The thickest and base seam i.e. 60' seam was exploited extensively by Bhaska method. The 60' seam has no dirt bands within the project area except in borehole no. CMBM-002. The seam has range of moisture content 2.1 to 17.2%, ash content 3.8 to 13.4%, volatile matter content 34.2 to 42.6%, sulphur content 1.4 to 3.4% and CV range of 6885 to 7385 Kcal/kg.

Local/New seam occurs above 60' seam with a parting range of 35 to 50 and has a thickness range of 2.0 to 4.0 m within the proposed mine area. The seam is devoid of any band and quality of coal of this seam is comparatively poor than 60' seam and 20' seam. The coal of this contents 5.20 to 16.70% moisture, 2.60 to 10.10% ash, 35.30 to 40.30% volatile matter, 3.50 to 4.00% sulphur. Borehole wise details of seam structures and coal qualities are presented in table below.

The stratum contour plan of floor and roof of the seam is not available and while modeling of the seam an average parting of 35 m above 60' seam and a seam thickness of 2.50 m is considered.

The 20' seam is the top most seam and incroped in the batter of the proposed mine. The seam is intersected only in one borehole CMBM-16 within the proposed area of OCP. An average seam thickness of 7.50 m has been considered to prepare roof contour from available floor contour. Chemical analysis of part thickness of coal seam shows a moisture level 12.80%, ash content 8.30% and volatile matter content 43.10%. The seam has strong caking property.

5.55 Mt. of gross coal reserves has been projected within the proposed area based on inband thickness of seam. Out of the total gross coal reserves, contribution of 60' seam, New seam and 20' seam is 4.35 Mt., 0.49 Mt. and 0.72 Mt respectively. Due to insufficient data, geological disturbances,

burning of coal in the old underground working etc., a geological loss of 20% for 60' seam and 30% for New seam & 20' seam has been considered to work out net geological reserves. 4.32 Mt. of net geological reserves is available for exploitation from the mine area out of which 3.48 Mt. from 60' seam, 0.0.34 Mt. from New seam and 0.50 Mt. from 20' seam.

2.11.2 Status of Exploration

The "Report on Coal Exploration in Baragolai OCP Block" was prepared to establish the opencast potential of 60' seam up to 100 m vertical depth line from Tirap on the east to Namdang on the west. A mineable reserves of over 7.50 Mt., only from 60' seam, was assessed from the identified area.

The boreholes drilled within the proposed Tikak Extension OCP area and previous mining activities prove the presence of two additional potential coal seams namely Local/New seam and 20' seam in the area. Local/New seam, thickness ranging from 2.0 to 4.0 m, is intersected in all the boreholes drilled after incrop zone of the seam, which shows that the seam is well developed within the area. The 20' seam is well developed in the Makum coalfield and the borehole, which has intersected the seam in the proposed project area shows a seam thickness of over 19.0 m. However, the seam thickness of 20' seam is generally 7.0 to 8.0 m in the Makum coalfield. These three coal seams have been considered for estimating the mineable reserves.

These coal seams in the proposed Tikak Extension OCP area were exploited by underground as well as small opencast mining. The coal seams are steeply inclined and the area has hilly terrain with patches of overburden dump. It lies between Ledo underground incline and Tikak opencast project. The 60' seam is composite in major part except near borehole no. CMBM-002. Though the area has experience of mining activities, which provides information regarding coal seam of the region still seam structures are not

established beyond doubts. Majority of the boreholes drilled in the area were in the incrop zone or at shallow depth region as the geological report was prepared by CMPDI in August'1987 keeping in mind that an opencast mine would be proposed in this block. Stratum contours in the deep region were mainly based on old mine working plan or extrapolated. It is recommended to drill more boreholes in the deep region to establish the seam structures of the deeper side with more confidence level and it may enhance the probability of exploitation of coal from further deep zone by opencast method.

2.11.3 Coal Quality

Coal quality (Air Dried Basis)		
<u>60' Seam</u>	%	2.1-17.1
Moisture	%	3.8-13.3
Ash	%	34.7-44.3
VM	%	1.4-3.4
Sulphur	Kcal/kg	6885-7385
CV		1.34
Sp. Gr.		
<u>New Seam</u>	%	5.2-12.8
Moisture	%	2.6-16.7
Ash	%	35.1-43.6
VM	%	3.5-4.4
Sulphur	Kcal/kg	5950-7180
CV		1.34
Sp. Gr.		
<u>20' Seam</u>	%	3.3-12.8
Moisture	%	3.2-8.3
Ash	%	43.0-43.5
VM	%	4.0
Sulphur	Kcal/kg	7154
CV		1.34
Sp. gr.		

Overall, grade of product Coal is 'A'.

2.11.4 Coal Reserve

In “Report on Coal Exploration in Baragolai OCP Block”, coal reserves of 60’ seam have been estimated up to 100 m depth line. Coal reserves of Local/New seam and 20’ seam, which occur within the 100 m depth line, did not take into consideration due to very limited area of disposition and extensive exploitation. Volume of coal was estimated based on average ex-band coal thickness of boreholes within the area under consideration. A specific gravity of 1.34 was considered for 60’ seam coal to work out gross coal reserves. 20% deduction on account of poor coal core recovery, geological disturbances, fire and 25% deduction on account of extensive exploitation by “Bhaska” method of mining were considered to arrive at net coal reserves. The estimated gross coal reserves of Baragolai OCP block upto 100 m depth was nearly 13.64 Mt. over an area of 71.2 Ha with an average coal thickness of 19 m. The net coal reserves were estimated as 7.50 Mt.

2.12 Mitigation Measures for Environmental management of Project

Dust control

Green Belt through afforestation, creation of parks and avenues in the township. Dust Supression with watering including spraying and sprinkling at pollution sources points.

Preventive Steps

Proper and Periodic maintenance of vehicles and avoidance of vertical fall of coal.

Water pollutants

The dust mixed with run-off as sediments in the drainage and water regime ultimately affect the quality of water, soil and vegetation.

Water management .

Management of Mine Water Discharge & Industrial Effluent:

The mine and the drain discharge of quarters are within the acceptable limits. Ongoing measures for control of water pollution will be continued in future also.

Management of Overall Water Quality:

Overall water quality will be assured through regular monitoring.

Land Degradation

Land will be degraded due to opencast working.

Resettlement and Rehabilitation

There are no villages in the core zone.

Mitigation measures for Noise

- Planting rows of trees with thick foliage along roads and other noise generating points
- Isolating/enclosing the noisy machines/sources by using resilient paddings and proper enclosures
- Provision of ear muffs/ear plugs for workers.

Medical Facilities

Apart from dispensaries and primary health centres there is a well equipped Hospital nearby.

Solid Waste Disposal and Its Management

The total volume of OBR within the proposed area have been estimated to be 38.25 Mm³. External dumps will accommodate about 25.23 Mm³ and balance 13.02 Mm³ of OB will be accommodated in the internal dumps. The internal dumps constituting nearly 34% of the total overburden

This backfilled area will be technically and biologically reclaimed with plantation of suitable species.

Preventive measures

Regular monitoring of working environment and implementation of safety and control measures, to prevent hazards.

Use of protective equipments, clothing, helmets, ear muff, shoes, etc.

medical examination of workers once in five years to detect preventable and curable diseases at an early stage.

Progressive mine closure plan

Mine closure planning needs to be done before the commencement of mine operation and requires periodic reviewing and modification, if needed, during its life cycle to ensure safety and to cope up with social & environmental challenges. Various objectives of the advance mine closure planning are as follows:

- a) To allow 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 eliminate environmental damage and thereby encourage environmental sustainability.
- d) To minimize adverse socio-economic impacts.
- e) To protect the flora and fauna of the area.
- f) Effective use of the assets.

a. PROTECTIVE MEASURES TO BE TAKEN

Protective measures must include the following:

- (a) The protection of mine boundary, buildings and other structures of the project site against access by unauthorized persons.
- (b) The maintenance of all mechanical, hydraulic and waste management systems.
- (c) The continuation of all monitoring programs.
- (d) The control of all contaminated effluents.
- (e) The securing of all petroleum products, chemicals and waste.
- (f) The rendering of all tailings, dams and piles of earth, rock and waste resulting from work done on the project site in a stable and safe condition.

2.12.1 Assessment of New & Untested Technology for Risk of Technological Failure

Considering the geo-mining conditions of the block, the shovel-dumper combination will be used for exploitation of coal. This technology is a proven and tested technology.

The proposed project does not envisage to employ any new or untested technology for exploitation of coal.