JINDAL STEEL & POWER LIMITED

EXECUTIVE SUMMARY
OF
ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PLAN
FOR
GARE IV/1 COAL MINE EXPANSION
DISTRICT RAIGARH, CHHATTISGARH
(EXTENT : 978.654 Ha)

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EXECUTIVE SUMMARY OF EIA/EMP REPORT OF GARE IV/1 COAL MINE EXPANSION

1.0 INTRODUCTION

1.1 General background of the project

Jindal Steel & Power Ltd, the flagship Company of the Jindal Group of companies is one of earliest and currently a leading producer of sponge iron & steel in India. To meet the increased requirement of sponge iron, the Govt. of India had allotted the IV/1 sub block of Gare Block (in Mand-Raigarh coalfield) to JSPL. The present mining lease area 705.556 will be extended to 978.654 ha by acquiring additional area. The mining lease area granted for 30 and 16 years is the balance life of mine. The mine has been operational since 1998. Initially the production had been 2 MTPA which was increased to 6 MTPA in next stage of expansion and the same production shall be continued to meet the Company's steel plant requirement. The washery is being expanded (from 2.4 to 3.2 MTPA) and a coal dryer (2X200 TPH) is proposed for installation.

1.2 Location and communication

The Gare sector is located in Gharghoda tehsil of Raigarh district of Chhattisgarh state. Sub block IV/1 is in the south eastern part of Mand Raigarh Coal field and covered in Survey of India Toposheet No. 64 N/12 and 64 N/8. The coordinates of this sub block are 22°05'46'' N to 22°07'54"N and 83°31'44" E to 83°34'04" E. The lease area is located at a distance of about 26 kms from the state highway Raigarh – Ambikapur, 50 kms from nearest Railway station, Raigarh on Bombay - Howrah broad gauge main line via Nagpur. The nearest operational airport facilities is available in Raipur (215 km) towards south west from the project site. The location of the project can be seen in Fig 1.

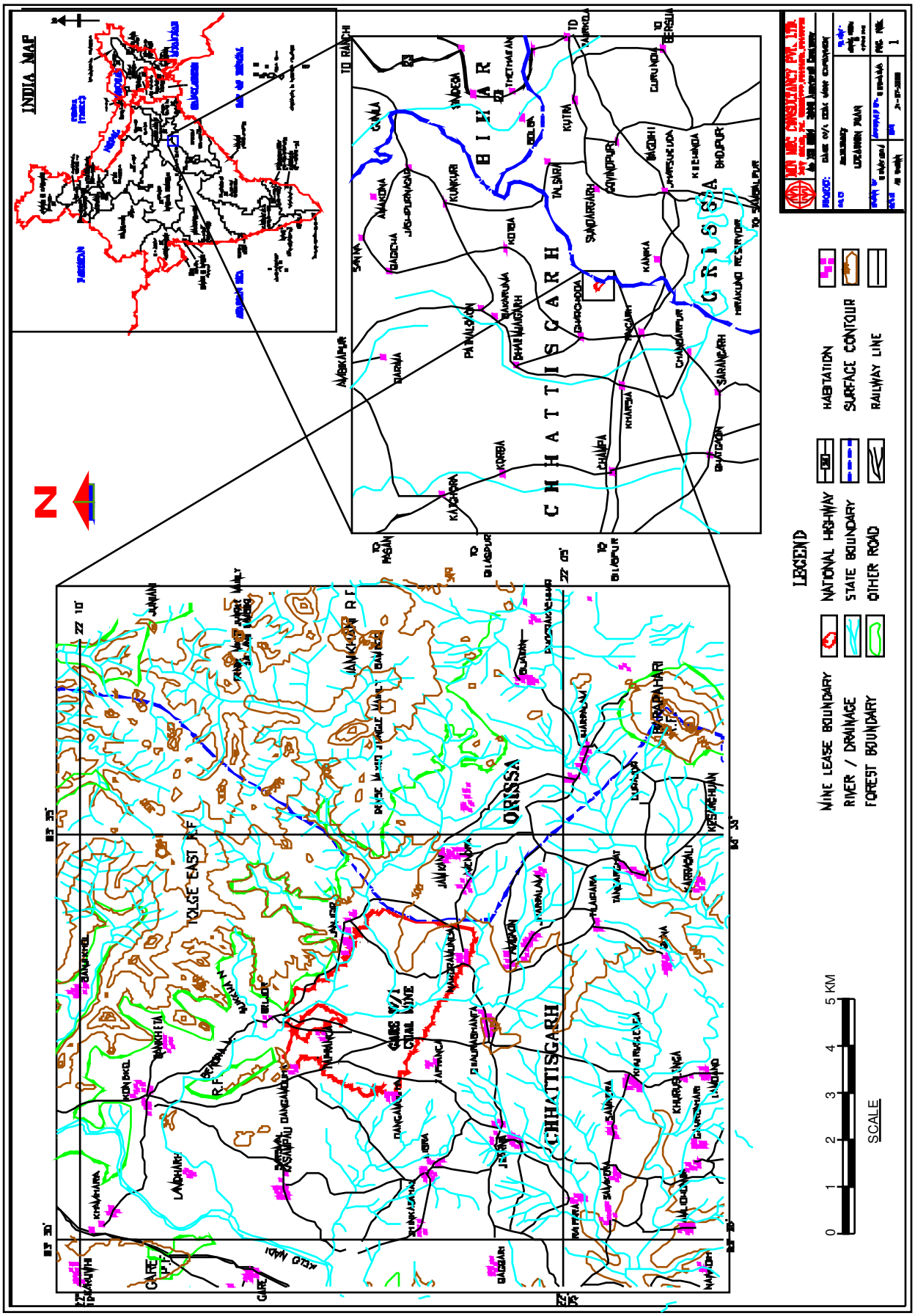
2.0 PROJECT DESCRIPTION

2.1 Geology

The Mand-Raigarh Coalfield of Raigarh district, Chhattisgarh, forms a part of Son-Mahanadi master basin and is situated between Ib-Himgiri Coalfield in the south-east and Korba Coalfield in the north-west. The entire area is covered by light sandy soil, produced by weathering of Gondwana sandstone. The general strike of the sub-block IV/1 beds of Barakar formation is North 30° to 55° W - South 30° to 55° E dipping towards south west at an angle of 3°-4°.

2.2 Reserve and grades

The geological reserves of 140.89 million tonnes in IV/1 coal block were calculated using isochores plans of all the seams. The net mineable reserves were determined after the delineation of the outer mining boundary and subsequent adjustment for batter and provision of safety zone along the mining lease. The mineable reserves in Grades D, E, F, G, UG are 5.0550, 12.3550, 20.6470, 13.4980, 0.2870 and 51.842 million tonnes, respectively, totaling to 126.49 million tonnes. The balance mineable reserves are 91.55 MT. The block has four seams namely - IX, VIII, VII and VI (not well developed and are inconsistent in thickness). The incrop of all these seams runs along the northern portion of the block. Further exploration has proved the existence of X and XA (local) seams towards south of the block. At places, the seam IX almost merges with seam VIII. The coal grade found is E to G.


INDIA MAP
BIHAR
CHHATTISGARH
ORISSA
N
LEGEND
NINE LEASE BOUNDARY
RIVER / DRAINAGE
FOREST BOUNDARY
NATIONAL HIGHWAY
STATE BOUNDARY
OTHER ROAD
HABITATION
SURFACE CONTOUR
RAILWAY LINE
SCALE
0 1 2 3 4 5 KM
GARE IV/1 COAL MINE
TALSE EAST R.F.
BARAPAHAR R.F.
JANKHORA R.F.
GARE R.F.

2.3 Mining

It is an open cast coal mine operating in shovel-dumper technology. The mining operations were started in 1998 and the annual production of coal, OB/IB and top soil annually are 16.186, 43.782 and 0.59 million tonnes. The average OB: Coal ratio during past years (Sept 2003-March2007) has been 2.76 (Cum: te). It is proposed to continue mechanized opencast method on three shift basis with the deployment of drill machine, loaders, shovels, dumpers, R.Ds and leveling machinery and the production of coal will be remain same at 6.00 MTPA. The mining of the total area will be carried out in two sectors simultaneously- one towards the West of Bendra Nala (Sector A) and the other towards the East (Block B). The mining will be restricted to seam VII since the working of lower seam namely seam VI will prove to be uneconomical considering the seam thickness and parting thickness as well as the grade of coal available in the seam. The lower most seam namely seam IV and Seam III is not viable for underground mining in present technological scenario. The mine achieved 2.0 MTPA rated capacity in 5th year (2002-03) of its production. Subsequently, the mining operations were expanded to achieve 6.0 MTPA from September 2004 for which the second mining plan was prepared and got approved. The total OB and top soil generation in the remaining life of the mine would be 309.49 MT.

The life of mine will be about 16 years as per the calendar programme of production worked out which will attain the peak production capacity of 6.0 MT by 1st year. The maximum depth of working would be 161 m and bench height 4-10 m.

2.4 Washery and drier

There are two washeries operating in the mine lease. One is of 600 TPH (3.6 MTPA) called Washery-III and another of 400 TPH (2.4 MTPA) called Washery-II. The 400 TPH washery is proposed for expansion to 484 TPH (3.2 MTPA) at a cost of Rs. 5 crores. Both the washeries are established over 12.8 ha of area. The quantity of make-up water requirement for the two coal washeries has been estimated to be about 90 m^3/hour. Elaborate waste water treatment systems have been provided for 100% recirculation. Fugitive dust emissions are controlled using water sprinkling and pressurized gof type dust suppression system. There are no hazardous waste or chemical storage in washery area. The total power requirement will be 7.8 MW and manpower as 72 persons. The quantum of washed coal, rejects and middlings is given in Table 1.

TABLE 1
WASHED COAL, MIDDLINGS AND REJECTS OF THE WASHERIES

Sl. No.	Parameter	Existing Washery III	Existing Washery II	After expansion Washery II
1	Capacity	600 tons/hour (3.6 MTPA)	400 tons/hour (2.4 MTPA)	484 tons/hour (3.2 MTPA)
2.	Raw Material ROM Coal	3.6 MTPA	2.4 MTPA	3.2 MTPA
3	Product (Clean Coal)	180 TPH	145 TPH	182 TPH
4	Byproduct (Middlings)	330 TPH	215 TPH	254 TPH
5.	Rejects (Solid waste)	90 TPH	40 TPH	48 TPH

The capacity of the driers to be installed are 2 X 200 TPH with a capital investment of Rs.13.0 Crores and manpower requirement of 15 persons.

2.5 Site services

The services such as office, stores, first aid centre, canteen, etc. are existing at the site satisfying the provision of the statute For regular repair of equipment and machinery a work-shop with machine shop facility is provided. The power line of 220 KV has been drawn from Raigarh power station of Jindals to the local substation from where the power is supplied to mines, township and functional buildings. The power requirement is about 15 MW. Four bore wells have been sunk within ML area and this water is used for drinking. The water requirement for the existing mine, colony and washery is 2324 m^3/day. Out of which 680 m^3/day is required for mining and allied activities (including plantation and greenbelt) and 244 m^3/day is utilised for domestic purpose. The 244 m^3/day domestic water is drawn from ground water well. The 680 m^3 mine water requirement is drawn from sump water (which is partly contributed by rain water and partly ground water) and also from treated waste water from the STP (162 m^3/day). Additionally about 1400 m^3/day water is supplied to the washery.

2.6 Manpower

At present 1036 persons are employed in the mine and 36 in each washery. Since there is no increase in production, additional employment shall not be generated at the mine or washery.

3.0 PRESENT ENVIRONMENTAL SCENARIO

3.1 Topography & drainage

The area in general is uneven and undulated ground and the north-east boundary is full of weathered rocks in the shape of small hillocks. The elevation within the ML area ranges between 268 m and 301 m. The whole study area can be broadly divided into three subregions, Northwest to eastern upper elevated thick forest tract, Middle western to southeastern region agricultural tract, South westerly small elevated degraded forest tract.

Drainage of study area is controlled by Kelo river with tributaries like Bendra nala, Dumer nala, Koledega nala, Chini nala etc. The drainage pattern of the study area is dendritic.

3.2 Climate & micro-meteorology

The climate is subtropical characterized by hot summer and mild winter. Average annual rainfall (1994-2005) is 1314.4 mm between June and September. Maximum and minimum temperatures recorded are 45.7°C and 10.8°C respectively. The relative humidity varies from 19% to 98% and the wind speed ranges from 1.4 to 6.8 kmph.

Micro-meteorological survey was conducted from September 2007 to November 2007. Temperature varied from 13.50 to 35.50°C with an average of 26.06°C., relative humidity between 22.0% and 90.0% with an average of 70.11%., wind speed from calm to 21.00 km per hour with an average of 2.77 km/hour and predominant wind direction was NW (11.77%).

3.3 Ambient air quality

Five air sampling stations were established in the study area including one in core zone and four in buffer zone during monitoring period. The observed values of SPM ranged from 61 to 269 µg/m^3., of RPM between 25 to 108 µg/m^3, SO_2 between 5.1 to 15.2µg/m^3 and NO_X between 7.3 to 21.3 µg/m^3.

3.4 Water environment

In core zone, Bendra Nala is the main drainage within the leasehold area. A number of small streamlets drain the terrain in vivid directions giving a sub-dendritic drainage pattern. The primary source of drinking water in the core zone is mainly bore wells drilled by the company.

In buffer zone, Kelo Nadi flows in the NE-SW direction. Koledega nala flows in EW direction, while the Dumer nala flows in NW-SE. Almost all the seasonal nalas surrounding the lease hold area ultimately merge into Kelo river. Other than these nalas there exist a number of water bodies like rainfed ponds/dugwells and tube wells within the buffer zone.

The ground water in the study area generally occurs within the primary porosity of alluvial material at shallow depth in unconfined state and in Gondwana sandstone, which occurs at deeper level. The depth of water table over the study area varies between 2-10 m below ground.In the study area annual ground water utilization is 3.985 MCM Annual Groundwater Recharge is 35.94 MCM and Balance Groundwater is 31.955 MCM.

Water Quality tests were conducted from 8 ground and 7 surface water samples The ground water quality of the study area is observed to be potable and hardness of water is within the permissible limits of the drinking water standard. The water quality of the Kelo river both up-stream and down-stream was found to be satisfactory.

3.5 Land use pattern and soil quality

Total area of core zone is 978.654 ha after extension from 705.556 ha. of the extension area, 154.031 ha is private land and balance 119.067 ha is government land. Most of the agricultural land is non-irrigated, barren and wasteland.

According to 2001 census 95 villages falls in 2 district in buffer zone. 48.71% the total area is occupied by unirrigated agricultural land while irrigated agricultural land is only 1.08%. Out of the total area, 35.91% area is under Reserved/Protected forest followed by the area not available for cultivation is 6.68% and culturable waste land 7.62%.

The area is covered by black cotton soil. Samples were drawn from two locations in and around the mine site. Nitrogen, phosphorus and calcium are optimum and organic matter and iron are rich in both of the samples. pH is strongly acidic to medium acidic. Conductivity is normal in both samples.

3.6 Noise and traffic density

Ambient noise level were studied at five locations and was found to be between 55.40 and 64.0 dB(A) during day and 45.50 and 53.0 dB(A) during night.

A traffic density survey was conducted at Tamnar to Libra-Dongamouha road. Total number of vehicles on the road were 2598 including Cycles.

3.7 Ecology

The forest of the study area as per revised classification is of Indian Forest types belongs to sub group 5B/C1 (Northern Tropical Dry Deciduous Sal Bearing Forests) and 5B/C2 (Northern Tropical Dry Mixed Deciduous Forests). The main species existing in the forest are Sal, Tendu, Mahua, Palas, Neem etc. The height of the dominant trees ranges from 6 m to 12 m.

Apart from monitor lizard, monkey and bear who are the only Schedule-I species, some species of birds, reptiles and other creeping animals are also found in the buffer zone.

3.8 Socio-economic condition

In core zone there will be rehabilitation of 113 household from the villages of Aamgaon, Tapranga, Dongamahua (also known as Muradipa) and Nagaramuda on acquisition of the extension area.

Total population of the villages is 67360 and area of 476.82 sq.km. having density of about 141 per sq.km. The main workers, marginal workers and non workers constitute 35.40%, 17.13% and 47.46% of the total population, respectively. The strength of schedule tribe 47.22% categories are higher than the schedule caste 9.51%. Adivasis are the main dominating caste within the study area followed by Harijans.

3.9 Industries

There is no industry around the mine lease area except an underground coal mine (under development) at a distance of about 4 km in north belonging to M/s Monet Ispat Ltd., adjacent Gare IV/2 & 3 mine and Raigarh Thermal Power Plant of M/s Jindal Steel & Power Ltd. at Tamnar in west direction at a distance of 6.8 km, which is under construction.

3.10 Places of tourism/religious/historical interest

There are no places of historical/tourist/religious or archaeological importance in either core zone or study area. However, there are local places of worship at some village.

4.0 ENVIRONMENTAL IMPACT ASSESSMENT AND MITIGATION

4.1 Climate

Impact: The climatic conditions including temperature variations, wind direction and speed, rainfall and humidity are governed by regional factors and the monsoons. As such the mining and other allied activities will not tend to influence the climate.

Mitigation: The operations are to be carried out in a limited area, vertically below the ground surface; as a result no climatological impacts are anticipated. Implementation of afforestation and rehabilitated plantation work in ML area will contribute in positive manner.

4.2 Air environment

Impact: Dust generation due to material handling will be occurring within the mine pit, over haul roads as well as dumping areas. At the same time the HEMM operations and truck movement will generate air emissions from exhaust. The incremental values of GLC have already been achieved as the production of 6 MTPA has already been achieved. However, in later years, due to increase in stripping ratio, the OB handled would increase despite static coal production and contribute to GLC's to a tune of maximum 14.35 $\mu g/m^3$.

Mitigation: Air pollution control measures includes providing drills with dust collector, suitable burden and spacing of blast hole, suitable charge per delay, controlled blasting using short delay detonators and non electric initiation system, dust suppression systems (like water spraying) at faces before and after blasting, on haul roads and during loading, Speed limit of various types of vehicles has been specified and are displayed at various locations, Avenue plantation has been done along the roads, coal bunkers are provided with water sprinklers to control fugitive dust, Belt conveyors from ROM bunker to crusher plant, from crusher plant to washery are covered etc.

4.3 Water environment

Impact: The mining activity causes accumulation of water through mine seepage as well as rainwater accumulation. The immediate impact of ground water movement is observed in the upgradient of water table. During heavy rains, washing from the coal handling plant and slimes would load the surface water with higher concentration of suspended solids, oil and grease. Uncontrolled releases of such water can affect as cause siltation of reservoirs and reduced oxygen content of water and hence, adverse impact on the aquatic biota. The domestic waste has extra load of BOD and suspended solids, which will cause the adverse impact on surface and ground water quality.

Mitigation: The mine water discharge is stagnated in a settling pond at surface. The domestic effluent from colony is treated by activated sludge process after removal of oil and grease by oil/water separator/trap. To control water pollution, measures like using leak proof containers for storage and transportation of oil/grease, Underground impervious drains for sewage waste, regular monitoring of water quality, providing proper garland drains around excavation and toe drains around the dumps, provision of peripheral bunds and check dams along with catch pits will prevent solid from wash off, Workshops effluent is passed through oil water separator and re-circulated and reused etc have been implemented. The sewage treatment plant is designed to treat raw sewage and treated water reused to the extent possible.

4.4 Noise, traffic density and ground vibration

Impact: During the proposed mining the noise pollution can take place due to operation of machinery and by blasting operation. The vibration due to blasting can cause damage to the nearby structure. The daily movement of trucks to Raigarh and back is 400 truck trips per day. There is no increase anticipated due to the extension of the mine since no additional production is envisaged.

Mitigation: To prevent noise levels peripheral plantation and greenbelt will be done to screen noise levels, periodic maintenance of machinery and vehicles, air silencers for noise reduction on machines, imposition of speed limit on HEMM near

residential areas, reducing the exposure time of workers and providing ear muffs to them, etc, are being followed.

4.5 Topography and drainage

Impact: Mining, waste handling, infrastructural facilities, and transport action will affect the existing land surface over an applied area. Evacuation will change the physiography by digging of top soil and removing the vegetation. The meander of Bendra nala passing through this block, has been shortened and aligned along the ML boundary line. The diversion brings the water nearer to the Tolge RF. Besides, the downstream consumers of Bendra nala are not at all affected as only a meander is shortened which does not affect the water quality or quantity.

Mitigation: The mining activities of block IV/1 are not anticipated to cause any considerable adverse impacts on the drainage pattern. Hence, no further requirement is concerned for their management. Since the land degradation is restricted only to the mining area the reclamation strategy must include the programme to reclaim the disturbed land. The excavated area will be 718.76 Ha of the total ML area out of which 127.65 Ha will remain in the form of a void and the rest will be backfilled which will change the topography of the ML area.

4.6 Land Environment

Impact: Land degradation is inevitable during mining, particularly, in open cast mines, where the original soil ecosystem and structure are drastically destroyed within the core zone.

Mitigation: Out of total excavated area 718.76 Ha, 591.11 Ha area will be backfilled and 127.65 Ha area converted into water reservoir. The water body will be used for irrigation, watering the forest at earlier stages and it will also attract avifauna. The depth of the water body will be 161 m.

4.7 Solid waste management

Impact: Displacement of soil will lead to the loss of its fertility. The solid waste will also lead to land degradation impact on topography and visual aesthetics. The sludge from ETP and washing of vehicles as well as the oil and grease contribute degradation of quality of water and soil.

Mitigation: It is estimated that 0.598 M.cum of top soil will be generated during the first five year of mining operation and 2.007 M.cum at the conceptual stage. This top soil will be eventually re-used for reclamation and plantation. The overburden produced during the mining operations will be dumped partly in the external dumps and partly in the inside dump and in-pit dump. The ultimate external dumps will be graded, leveled and finally afforested.

4.8 Ecology

Impact: Ecological impacts from open cast mining result in loss of vegetation by excavation and dumping thereby affecting the species for which such vegetation was the host, Migration of animals to neighboring areas who were dependant upon effected vegetation, migration of animals and birds due to noise, vibrations and lights.

Mitigation: The precautionary measures taken for control and management of ecology include construction of boundary or fence along the mine perimeter, the roads leading to and from the mine shall be having boards with caution warning, drivers shall be sensitized not to hit stray animals on the road, the emissions from the mines shall always be kept within the norms, Care shall be taken that no food or degradable waste is openly disposed.

To reduce the impact of air pollution towards the sensitive area it has been proposed to create and maintain a green belt around the mine. To fulfill the requirements of nursery plants, a nursery has been established at the site. Of the 12.8 ha area of the washery, 33% has been planted by greenbelt.

4.9 Socio-economics

Impact: No habitation was falling within the present ML area, hence rehabilitation of population was not warranted so far. There were about 350 land oustees having 562.624 Ha land as well as indirectly effected people are considered as project-affected people as per the proposed resettlement and rehabilitation plan of Jindal Steel & Power Ltd. All the persons were suitably compensated or rehabilitated as per their requirement and suitability.

Mitigation: All the persons were suitably compensated or rehabilitated as per their requirement and suitability. The resettlement and rehabilitation plan is being prepared on the basis of the "Ideal Resettlement Policy 2007 of Chhattisgarh State. Compensation is being given to the land losers at market rates of approximately Rs. 3.5 lakhs per acre. The displacees have a choice between higher compensation or plot in resettlement site. There will be overall positive effect on social life of the local people as they will get job opportunities both direct and indirect. The facilities created for the project, benefits the local population.

4.9 Occupational health

The medical facilities have been provided for all the employees of the mine and colony. All the employees and contractual workers are sent for regular health check up for the occupational diseases like Silicosis, Pneumoconiosis, etc., which are prevalent in the mining industry and tests like optometric, blood tests, chest X-rays, sputum test, audiometric test, lung test, cardio-vascular etc are done.

5.0 ANALYSIS OF ALTERNATIVE

Mining industry is very much site specific and a mineral has to be mined at the place where it exists in economically feasible quality and quantity. It is an explored block allotted by Ministry of Coal to M/s JSPL with known reserves. The coal block is in Raigarh district of Chhattisgarh where mining is already active. Opencast mining method is selected in view of workable thickness of coal seams and favourable overburden to coal ratio. Conventional mining technology of drilling, blasting, loading and transportation using Shovel Dumper Combination is being used. A coal washery with cyclone process is established to wash the ROM coal at pit head to avoid waste transportation.

6.0 ENVIRONMENTAL CONTROL AND MONITORING ORGANIZATION

The management of JSPL has formed an environmental cell for the mines and plant operating in the region. The same shall provide for Gare IV/1 Coal mine. The

organisation chart is headed by a General Manager (Mine) and managed by the Project Manager Mines and supported by an Environmental Engineer.

Adequate budgetary provisions have been made by the Company for execution of Environmental Management Plan. The total investment on environmental improvement works is envisaged as Rs. 1080.28 lakhs and recurring expenditure during the stage of production is Rs. 295.43 lakhs per year.

7.0 DISASTER MANAGEMENT PLAN

The following natural/industrial problems may be encountered during the mining operation are

- Inundation- Filling of the mine pit due to excessive rains.
- Disaster due to failure of PIT slope
- Disaster due to failure of waste dump
- Disaster due to surface fire/coal stack fires
- Possible dangers due to storage of explosives in the magazine

Since the diversion has been constructed for flow observed in Nala along with margin for safety, the risk to mine due to flooding of Nala is minimum. No high risk accidents like landslides, subsidence flood etc have been apprehended. All the statutory precautions should be taken for quick evacuation as per the Mines Act 1952, the Mines Rules 1955, Rule of MMR- 1961 and the Rules of MCDR-1988.

8.0 PROJECT BENEFITS

The mine will create employment for skilled as well as semi-skilled staff directly or indirectly. The general social development of the area has been due to the improvements in infrastructure and communication system. JSPL also undertakes social welfare activities such as Revival of Youth Groups, Appointment of village animators (Sangini and Sangwari), Training on Income Generation Activities, Capacity Building Work, Apprentice training, Exposure Visit, Financial Assistance for social welfare etc.

Corporate social activities done in the last four years by company are as follow:

- Number of school buildings has been renovated among adopted villages
- Around 5 lakhs spent on renovation.
- Provided school teachers from company for particular session.
- Provided sports item like cricket kit, Volleyball kit & Kabbadi kit to interested players/team.
- To strengthen the power of women, provided sitting carpets, gas lights to different "*mahila mandals"* for their meeting at night.
- RCC road have been constructed in the village Dongamouha on which JSPL have a spent Rs. 9.50 lakhs.
- Talab Deepen work has been done.
- Bridges have been constructed in village Janjgir.
- Community halls have been constructed at Tapranga for the use of villagers etc.