

EXECUTIVE SUMMARY

OF

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PLAN

FOR

**PROPOSED GARE IV/6 COAL MINE PROJECT
(OC and UG)
OF 4MTPA IN AN AREA OF 381.420 HA AND
COAL WASHERY 4MTPA WITHIN ML AREA**

AT

**VILLAGES GARE, LAMDARHA, SARAITOLA,
KHAMHARIA, KARWAHI & TEHLIRAMPUR,
DISTRICT RAIGARH, CHHATTISGARH**

APRIL, 2013

Project Proponent:



JINDAL STEEL & POWER LTD.

PB# 16, Kharsia Road, Raigarh
Chhattisgarh - 496001

EXECUTIVE SUMMARY OF EIA/EMP

1.0 INTRODUCTION

1.1 General background

The Gare Palma Coal Sub Block IV/6 was allotted jointly to M/s Jindal Steel & Power Limited & M/s Nalwa Sponge Iron Limited by the Central Government vide MOC letter no. 13016/34/2005-CA-I at 13-01-2006 for mining coal to meet the requirement of their respective Sponge Iron Plants situated at distances of 45 km and 25 km from the Coal Block at Raigarh & Taraimal respectively.

The total mine lease area is 381.42 Ha (942.526 acres) including washery area of 12.52 Ha. The capacity of both mine and coal washery will be 4.0 MTPA.

Environmental Clearance was accorded to this project on 18.05.2009 by the MOEF New Delhi vide their letter no J-11015/110/2007-IA.II (M). The public hearing was conducted on 05.01.2008. The Environmental Clearance was challenged on 01.06.2009 in the National Green Tribunal (NGT). The NGT, in its judgment dated 20.04.2012, set aside the Environment Clearance with a direction to re-conduct the public hearing. MOEF had directed the Chhattisgarh Environment Conservation Board (CECB) on 24.05.2012 to reconduct the public hearing.

MoEF Expert Appraisal Committee (Thermal & Coal Mining), after scrutiny of application of M/s Jindal Steel & Power Ltd., in accordance with EIA Notification, 2006 has issued the Terms of Reference (TORs) vide their letter no. J-11015/214/2012IA.II(M) dated 19.10.2012 for Gare IV/6 Coal Mine Project (OC&UG) (4.0MTPA) and Coal Washery (4.0 MTPA) in an ML area of 381.42 ha.

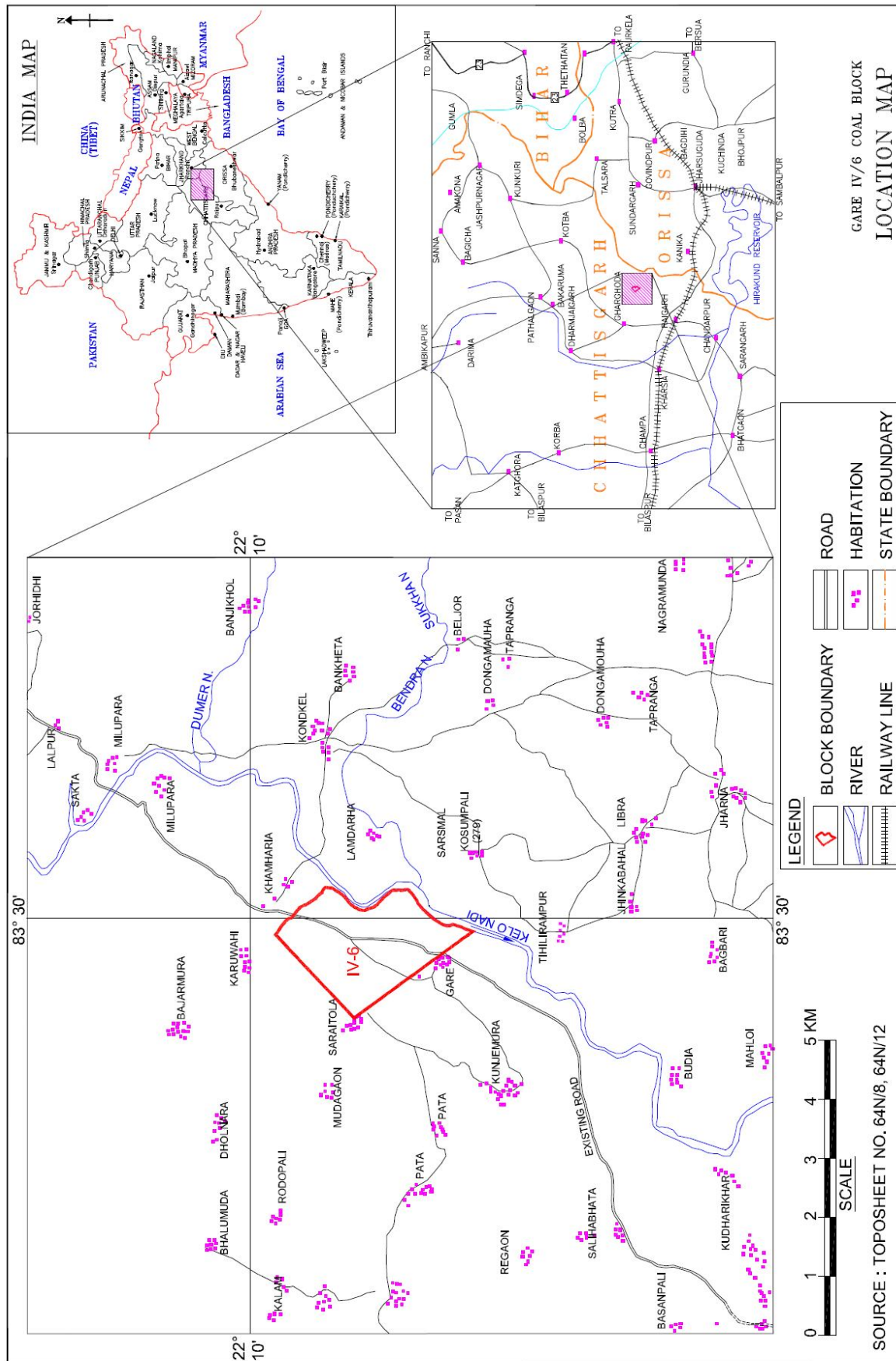
The draft EIA/EMP report has been prepared in accordance with TOR granted by MOEF and by integrating all the reports/data submitted to MOEF while seeking earlier clearance and additional studies as carried during current EIA study.

1.2 Location and communication

The Coal Block Gare IV/6 lies in Mand Raigarh Coalfield in Raigarh district of Chattisgarh state. The Mine site is located in Gare, Lamdarha, Saraitola, Khamharia, Karwahi and Tehlirampur villages of district Raigarh in Chattisgarh. The area is covered in the Survey of India Toposheet **F 44 L 8 (Old 64 N/8) & F 44 L 12 (Old 64 N/12)**.

The location of the area is shown in **Fig 1**.

FIG 1 : LOCATION MAP



The district headquarter, Raigarh, is situated at a distance of about 45 km, SW. Mand-Raigarh coalfield is well connected by National/State Highways from Bilaspur, Raigarh and Ranchi with Trijunction at Dharamjaygarh. The nearest Railway station is Raigarh on Bombay - Howrah broad gauge main line via Nagpur, which is about 45 km from the ML. The nearest airport is Raipur at a distance of about 350 km towards southwest from the project site.

2.0 PROJECT DESCRIPTION

2.1 Geology

Gare IV/6 is a part of the Gare Sector which falls in the Mand-Raigarh Coalfield, which is a part of the Mahanadi Sub Basin. The coal bearing Barakars are exposed over a major part of the area starting from the northern faulted contact with Barren measures and upto the normal Barren measure contact in the south. The strata including coal seams strike almost NW-SE with south-westerly dip varying from 2°-4° in the entire block. Gare IV/6 sub block is almost free from any except a minor NW-SE trending fault (F'-F') of about 5m throw towards northeast.

Coal Seams : Altogether 9 correlatable coal seams viz. Seam I to IX in ascending order occur within the area. Out of the nine correlatable coal horizons, seam IX to VI incrop in the north-eastern part of the block and occur within around 100 m depth in the area. These younger packet of seams as such have been considered together for opencast mining. Seam V, which occurs as 3 sections is unworkable in almost the entire block. Older packet of seams (seams IV to I), which occur at depth in the area, have been considered for exploitation by underground method.

2.2 Reserve estimation

The assessment of reserves has been carried out only in respect of 8 standard seams viz. IX, VIII, VII, VI, IV, III, II & I.

A total of 77.712 million tonnes of net 'Proved' reserves and 80.3852 million tonnes of 'Indicated' reserves totalling to 158.0972 MT of grades varying from B to G (GCVs between 3167 to 6112 Kcal/Kg) have been estimated in the entire block. Total mineable reserves will be 90.369 MT of which 66.371 MT shall be opencast and 23.998 MT shall be underground.

2.3 Mining

Opencast mining: It is proposed to adopt mechanised opencast method on three-shift basis with deployment of drill machines, blasting and deployment of diesel operated loaders, shovels, dumpers, etc with other support equipment like dozers, graders, water tankers, etc. The proposed mining operations in the Gare-IV/6 block will commence from the northeastern portion of the lease area i.e. rise side of the deposit. Crawler-mounted type pneumatically operated down the hole drilling rigs with hole diameter of 150-250 mm and those rigs which are capable to meet the future requirement of

8 m/hr will be deployed for OB. R.B.H drills will be used for drilling 110/115 mm dia. holes in coal. Coal will be extracted after blasting off the coalfaces with shovel and dumper combination. Opencast mining will occur from 1st to 23rd year.

Underground mining: Bord and pillar method of mining in pattern of five levels development, each level 30 m apart, worked in panels or Power Support Long Wall will be used. The underground activity will be started from 3rd year onwards for making the preparation of the entry from surface by drift drivages (Two numbers) up to seam IV at a gradient of 1:4. One drivage will be for the coal transport by belt conveyors and the other one for the ventilation of the mine. The production from underground mine will start from 8th year at 0.1 MT and will be increased to 0.5 MT and 1.0 MT by 9th and 13th year respectively. Life of underground mine will be 34 years. Adequate sized ventilation fan at surface in the air shaft will be installed which will be working all the time.

2.4 Mineral processing (Washery)

In order to maintain consistent quality of washed coal to be fed to the DRI plants at the ash level of around 24%, it is proposed to set up a Coal Washery within the ML area of Gare-IV/6, adopting cyclone process. The capacity of Washery will be 4.0 MTPA. Washery will yield 3 washed products (dry basis) i.e. Clean Coal at 24% ash, Middling at 53% -54% ash and Reject coal > 77% ash. Water required for washery (900 KLD) shall be met from mine sump.

2.5 Transportation

The excavation shovels/Front End Loaders deployed for coal will be used for loading the coal at the face. The OB will be transported by 25/50 T R.D trucks to surface dumps and later on, as soon as decoaled area is available suitable for backfilling, to the site of backfilling. The coal will be transported by 25 T R.D. trucks to the coal receiving pit/crusher and washery in NE corner of the ML, at the pithead. Washed coal will be transported to the end use plants by trucks through road till railway line is established by the Government in the area.

2.6 Blasting

The consumption of explosive will be 8.96 t/day for overburden and 1.57 t/day for coal, totaling 10.53 t/day. Two 9.5 T capacity (each) magazine are existing at Gare IV/1 mine for storage of primers, detonators, fuse, etc., which are adequate to cater to the requirement of this mine also. A service magazine for underground mining shall be established for Gare IV/6.

2.7 Mine drainage

During open cast working, the water table will be intersected and the quantum of ground water accumulated and rainwater runoff will be

evacuated. Adequate capacity pumps shall be established and stage wise pumping will be undertaken.

In case of underground mine, only the groundwater seepage will take place. The seepage water from the individual coal seam will be collected in main sumps via face pumps and clean water will be pumped to the surface reservoir from where it will be used for industrial needs of the mine and surplus water, if any, will be discharged into water channel flowing in the block (to be diverted along lease boundary) after treating in a limited manner, if required to meet the discharge standards.

2.8 Site services

Infrastructure like power, road, telecommunication, service buildings viz. office, store, first aid centre, canteen, etc. for employees of the project will be developed at mine site. Garage-cum-workshop-cum-engineering stores meant for regular repairs and maintenance of earth moving equipment and dumpers etc. for quarry operation will be established.

The power requirement for the coal washery shall be around 8 MW and 2 MW for mining operation shall be met from the pit head Dongamohua Power Plant of JSPL (near Gare IV/1 coal mine).

Total requirement (peak) of water for mining, coal washery and allied activities are estimated as 1346 m³/day. Initially, the water required for the project shall be sourced from the borewell. Later on, only drinking water will be continued to be sourced from borewell while industrial water shall be sourced from mine sump.

2.9 Manpower

The mine and washery will have a total strength of 750 who shall be of both technical and non-technical background.

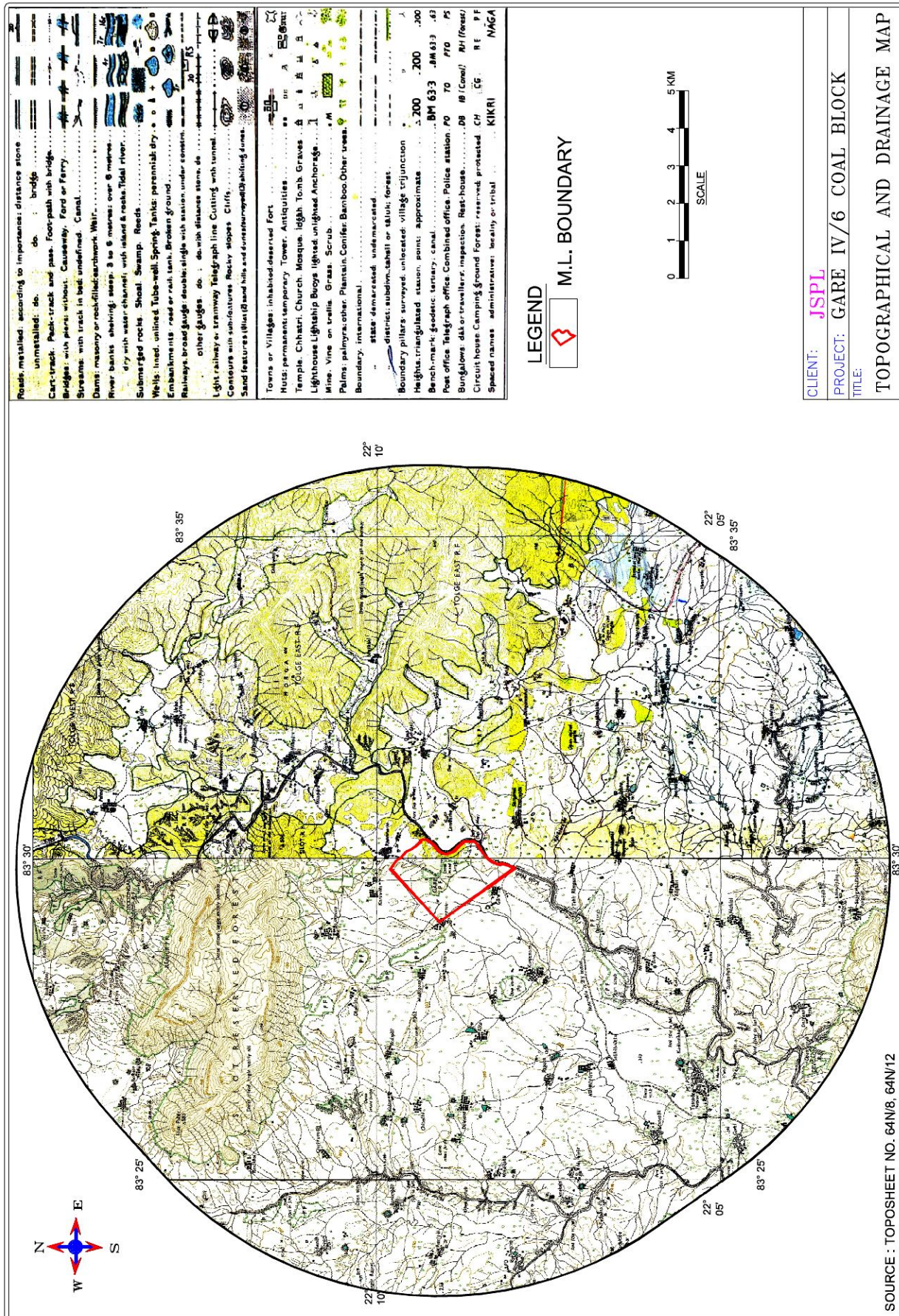
3.0 PRESENT ENVIRONMENTAL SCENARIO

Core Zone (ML area) and Buffer Zone (area falling within 10 km from boundary of Core Zone) combined together form the study Area (Refer **Fig 2**). Monitoring period for the primary data collection is Post Monsoon season – 1st October to 31st December 2012.

3.1 Topography and drainage

Core zone: Gare IV/6 is generally characterized by a gentle topography with slope towards Kelo river in the east. However, in the area adjacent to Kelo river and in the south-western part, the topography is relatively rugged due to the presence of nalas. The elevation of the core area varies from 250 m in the south-eastern part near Kelo river to 284 m in the north-western part.

FIG 2 : STUDY AREA



The drainage is sub-parallel and dendritic in nature. The seasonal nala passes through the north-west part of the ML area.

Buffer zone: Elevation of buffer zone range between 240 m and 640 m. The area is drained mainly by Kelo River and its tributaries namely Bendra, Dumer, Karanara and Koledaga on the east bank and Pajhar with its sub-tributories Digi and Chini on the west bank.

3.2 Climate and micro-meteorology

The climate of the study area is of subtropical type, and is characterized by an oppressive hot summer, a mild winter and well-distributed rainfall during the South-Western monsoon season. The nearest meteorological station of IMD is at Raigarh. Average annual rainfall (1999-2008) was 1189.2 mm. Average annual minimum and maximum temperatures recorded were 20.41°C and 33.67°C respectively. The relative humidity varies from 30% to 87%.

The micro-meteorology was monitored at the site from October 2012 to December 2012. The temperature was recorded between 7.50 to 34.90°C. Relative humidity varied from 33.20 to 97.20%. The wind speeds were found in the range between 1.50 km/hr and 25.50 km/hr, with an average value of 4.93 km/hr. The predominant wind direction was observed from NE with 28.32% of occurrences.

3.3 Ambient air quality

Ambient air quality was studied at nine locations, one in core and eight (Kunjemura, Khamharia, Kosampali, Karuwahi, Gare, Tamnar, Kerakhol and Kondkel villages) in the buffer zone. The PM10 concentration of the study area ranged from 36.0 to 64.2 µg/cum, PM2.5 from 17.7 to 37.8 µg/cum, SO₂ from 6.6 to 21.7 µg/cum, NO_x from 8.9 to 29.0 µg/cum, CO from 125 to 625 µg/cum. It has been found that the maximum concentration of PM2.5, SO₂, NO_x and CO is within limits well within standards specified by NAAQS, 2009 while PM10 is slightly higher.

3.4 Water environment and quality

Surface water : Kelo river is the main perennial surface water source or surface water body within the study area which forms the eastern boundary of the ML area. It ultimately drains into Mahanadi river.

Ground water: Three aquifer groups are identified over the ML area between 10 to 30 m depth, 60 to 100 m depth and 170 to 370 m depth. In the study area, the depth of water table in pre-monsoon ranges from 3.1 to 14.3 m below ground level and in post-monsoon between 1.6 to 6.0 m below ground level. Study area water level fluctuation varies from 1.0 to 8.3 m. Annual ground water resource is 70.63 million cum in the area while

balance after draft is 64.93 million cum. Stage of ground water development is 7.66%.

Water quality was assessed for 6 ground and 4 surface water samples. The ground and surface water quality of the study area is observed to be potable and within the permissible limits of the drinking water standard except for iron.

3.5 Land use pattern and soil quality

Core Zone: The lease area is 381.42 Ha. It covers six villages. Private agricultural land is 254.341 ha, Government land 33.513 ha and Forest land 93.566 Ha. Forest land involves 51.066 Ha of chote jhaad ke jungle and 42.5 Ha of bade jhaad ke jungle for which Stage-I Forest Clearance has been accorded on 30.12.2010.

Buffer Zone: As per Census 2001, 51.24 % of the total area is occupied by unirrigated agricultural land while irrigated agricultural land is only 1.00%. The area not available for cultivation is 6.33% followed by culturable wasteland is 11.40%. Forest area is 30.04%.

As per satellite imagery interpretation of Feb 2012, the land use comprises 60.19% of agricultural land, 5.17% mining and industrial areas, 1.12% water bodies, 0.1% road, 2.86% habitation and 30.56% forests. In comparison to 2007, the mining & industrial areas with associated habitation have increased by approximately 5% with a corresponding decrease in agriculture and forests.

Soil Quality: Three top soil samples were collected and analysed, one from the core zone and two (Kondkel and Saraitola villages) from buffer zone. The colour of the soil is found to be reddish to light black, silty clay in texture and pH is acidic in nature.

3.6 Noise and traffic density

The noise levels were measured at ten locations. Noise level (Leq) varied between 45.70 to 61.20 dB(A) during day time and 37.00 to 49.80 dB(A) during night time.

Traffic density survey was conducted round the clock from on 05-06/01/2013 at Tamnar to Lailunga Road. Total numbers of vehicles were found as 1851 including cycles. The movement of all vehicles is more during day than night.

3.7 Ecology

Flora: The predominant species in the forest of the core zone are Sal, Beeja, Shisham, Saja, Sisa, Dhawda, Aam, Neer, Char, Jamun, Harra and others. The forest type in the study area is categorised under North Indian Moist Deciduous Peninsular Sal forest (3C/C2e) and Northern Tropical Dry

Mixed Deciduous Forest (5B/C2) as per the Indian Forest Classification of Champion and Seth. The forests are mainly of sal type, where the soil is derived from the parent rock.

Fauna : Fauna in the core zone includes common langur, jackal, hare, garden lizard, field rat, three striped squirrel, bull frog, Indian rat snake, etc. and that in the buffer zone includes sloth bear, fox, monkey, spotted dove, blue jay, parakeet grey quail, Indian cuckoo peafowl etc. among others.

About 52% of the study area belongs to the agricultural land category. Both (Rabi and Kharif) type of cropping practice is prevailing in this area and the type of crops includes paddy, ragi, green gram and black gram. Til, groundnut, mustard, jute, sugar cane etc are the major commercial crops grown in the study area. Banana and mango are the major fruits grown in this area.

The study area does not form part of any national parks/sanctuaries and is not a part of Elephant corridor. However, wild elephants have visited the villages of Raigarh Forest Division in the past with reports from villages within 10 kms radius of the project area i.e. Nawapara, Chhirwani, and Semijor.

3.8 Socio-economic condition

Core Zone: There are sixteen households within ML area.

Buffer Zone: Total population of the villages in the buffer zone is 58983 including 29604 male and 29469 females. Assuming the same state decadal growth rate of 22.59% for the tehsils, the total population in the study area at present is expected to be in excess of 72,300 people. The main workers, marginal workers and non workers constitute 35.42%, 15.01% and 49.56% of the total population, respectively. The strength of schedule caste 9.28% categories is lower than the schedule tribe 52.55%. Literacy rate is 61.36%.

3.9 Industries around the project area

Besides few brick kilns, there are several industries including mines proposed or operational in the study area. The mines are Gare I, Gare II, Gare III, Gare IV/1, Gare IV/2&3, Gare IV/4, Gare IV/5, Gare IV/7, Gare IV/8, Jamkhani and Tilaipali coal block. Some of the mines have pit head washeries. In addition, various power plants at Dongamahua and Tamnar are operational while those at Jobra & Kolam proposed.

3.10 Places of archaeological/historical/tourist/religious importance

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 village.

4.0 ENVIRONMENTAL IMPACT ASSESSMENT AND MITIGATION

4.1 Topography and drainage

Impact on Topography: During opencast mining operations, topography of core zone will change progressively with advance of excavation and as much as 371.49 Ha area will be excavated out of 381.42 Ha core area. No impact on topography of buffer zone is anticipated. Washery will be established over an area of 12.52 ha along with facilities. This area will not get excavated till the end of the life of mine.

Impact on Drainage: There are no surface water bodies in the mine lease area except a seasonal nala that crosses the ML through NW part. The seasonal nala will be diverted along the western boundary of the ML in the third year of operation to avoid any impact on the drainage pattern of the area. The diverted nala shall have adequate capacity to carry the diverted water. The diversion shall occur stage wise as the mine progresses. There will not be any impact on the path of the Kelo river due to mining in the Gare IV/6 coal block. The natural seepage from Kelo will increase during monsoons while the flow will be augmented by rainwater as well as mine sump water discharge.

Since the opencast mining area is vertically above the areas proposed for underground mining, the impact of subsidence on water bodies, habitation, forest or agricultural land shall not be there as the land on surface would have been acquired for open cast mining purpose.

Management: After completion of open cast mining, the area will be backfilled to ground level and converted into an afforested area till no void will be left.

Due to underground working if the tensile strain is found to exceed 3 mm/m, then the surface cracks formed during extraction would immediately be filled in with soil to prevent breathing of air and inflow of water to the underground workings and suitable drainage would be made to avoid any water logging in the centre of subsidence trough.

During mining a statutory barrier of 15 m shall be left between the mine workings and the Kelo river bank. A bund shall be constructed along the western bank of the Kelo river varying in width from 21 m to 45 m and height from 4 to 10 m. The mining activities will not disturb any surface water body outside the lease area. However, in flow of Kelo due to activities in the mine lease may lead to fluctuations in the downstream sections of the river.

4.2 Climate and meteorology

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. Emission of green house gases due to combustion of fossil fuels shall be there.

Management: Development of greenbelt in the mine lease area will contribute in a positive manner towards mitigation of greenhouse gases. The company will be undertaking all possible measures to minimise the CO₂ emissions.

4.3 Air quality

Impact: The opencast mining operations are generally prone to generation of high levels of SPM, PM₁₀, and PM_{2.5} and to a very limited extent SO₂, NO_x and CO due to blasting using explosive and fuel combustion, etc. The sources will be drilling, blasting, loading, crushing and transport operations. Air quality prediction modelling has been carried out to estimate GLC of various pollutants. The incremental values due to mine and washery have been estimated as 44.9 µg/m³ for PM₁₀, 25.6 µg/m³ for PM_{2.5}, 6.1 µg/m³ for SO₂, 12.1 µg/m³ for NO_x and 3.15 µg/m³ for CO. The incremental values due to transportation have been estimated as 0.4 µg/m³ for PM₁₀, 0.23 µg/m³ for PM_{2.5}, 5.4 µg/m³ for SO₂, 24.3 µg/m³ for NO_x and 19.7 µg/m³ for CO.

Management: Adequate control measures are proposed to be taken during mining operation, transportation and crushing/loading operations. Dust suppression system will be adopted at faces before and after blasting and while loading. Wet drilling system will be adopted and dust suppression system will be installed at all CHP, rotary crusher and transfer points. Green belt will be planted round the mine, washery and loading facilities. Dust masks will be provided to the workers and good quality of explosive will be used. The ambient air quality will be regularly monitored and appropriate measures will be adopted in case of any exceedence.

4.4 Water environment

Impact: The seasonal nala flowing within the ML area on west side will be disturbed due to the mining. It will be diverted along the western boundary by constructing a water channel which joins the same nala. Thus, the flow from north to south shall be maintained through this diversion.

Opencast as well as underground mining will be occurring within a distance of 36-60 m of the bank of Kelo river. Hence, the natural seepage from Kelo will increase during monsoons. Excavation of catchment area will lead to marginal reduction of runoff into Kelo. However, there will be addition of water into Kelo from the pumped out mine sump water. The fluctuation in Kelo are anticipated to be within 1% of current flow.

Water table will be intersected. The total loss of ground water through mine seepage will be 2730 cum/day during opencast mining which will continue till 23rd year and during underground mining the maximum seepage loss is estimated as 3093.4 cum/day. Thus, total annual loss during opencast

mining will be 0.974 MCM and during underground mining 1.12 MCM. The total loss of ground water due to mining activity is insignificant as compared to available annual ground water balance of 64.93 MCM.

The surface water quality is not likely to be affected if the unutilised mine water is discharged after appropriate treatment. No ground water pollution from dump leachates is anticipated due to its inert nature. The other sources of waste water are domestic sewage from mine office, sewage from colony, washery waste water and workshop water.

Management: All effluent from mine, washery, workshop, and domestic water shall be treated to the prescribed norms prescribed by regulatory agencies prior to discharge. For the workshop, an oil water separator and desilting chamber shall be provided for removal of oil and grease and settling the suspended solids. The water after treatment shall be recirculated in washing of vehicle. The sewage waste from mine office will be treated in septic tank and soak pit system. Coal washing will be based on closed water circuit; hence all wastewater shall be treated and recirculated in the system. Mine sump unutilised surplus water will be discharged into seasonal nala flowing in the block after treatment to meet the discharge standards.

A state-of-art rain water harvesting system in consultation with CGWB will be provided.

4.5 Land environment

Impact: The total mine lease area is 381.42 Ha out of which 371.49 Ha i.e. 97.40% of the land will be disturbed by excavation. About 2.60% land will be occupied by green belt. During the tenure of mining, the disturbed area within ML will comprise of excavated land, external dumps, area occupied by infrastructure, roads, etc.

The mining operations are not anticipated to cause any adverse impacts on topography outside the core zone. Negative impact on land can be caused by proposed excavation and dumping, if appropriate control measures are not adopted.

Management: Surface water reservoir at SW corner measuring 10.00 Ha will be backfilled in the final year of quarry operation. Surface dump will be rehandled between 16th and 23rd year and area below it excavated. At final stage area under infrastructure will also be excavated to retrieve coal. The mine and dump area will be fully reclaimed after the void is fully backfilled with OB, washery rejects and TPP ash and planted.

4.6 Noise, traffic density and ground vibration

Impact: The main noise generating sources during coal mining will be drills, dozers, rippers, blasting, shovels, dumpers, conveyers, service vans, crushing, washing, ventilation system and truck movement. The crushing

and other vibrating equipment in the washery will generate noise level of around 85-90 dB (A). Due to natural attenuation of noise, the ambient noise are anticipated to attenuate to 50 dB(A) at 180 m from a noise source of 103 dB(A). The resultant noise shall further attenuate due to presence of green belt.

There will be increase in the traffic density on the existing road due to the transport of coal from mine to end use plants. The daily truck movement shall be 248 vehicles per day (to & fro trips) of 25 T capacity for clean coal and 946 vehicles per day (to & fro trips) of 15 T capacity for middlings. The Lailunga-Tamnar-Raigarh road which is currently passing through the proposed lease will be realigned around the ML. Since this is a new mine, ground vibration study shall be conducted on start of operation.

Management: Provision and maintenance of green belts around facilities, washery, mine lease periphery and roads to absorb noise will be done. Maintenance of noise generation machinery including the transport vehicles will be ensured. Workers exposed to noisy areas will be provided earmuffs.

Optimum charge per delay will be used to minimise vibration noise and fly rock from blasting.

A road will be constructed along the NE boundary of block from the washery site upto the northern corner through the haul road exit after which, it will be aligned along the north-north-western boundary line (the line dividing block IV/6 and IV/7 upto the NW corner). This road will then be laid along north west southern boundary line till it meets the already existing road heading to Ghargoda.

A proposal for extension of rail line upto the Gare sector is under consideration by government. Once the rail line is commissioned, the same facility shall be used for transportation of coal from this mine. Thus, traffic load on the road will be reduced.

4.7 Solid waste impact & management

Impact: Solid waste dumping will lead to land degradation by occupying 63.22 Ha inside the ML area on southern side. Its height will be 70 m. About 1.86 Mcum (B) of topsoil will have to be handled from areas to be excavated. The sludge from washing of vehicles as well as the oil and grease can contribute considerably to degradation of quality of water and soil. The other wastes generated will be sludge from settling pond, municipal solid waste from mine office and from colony, sludge from septic tanks and from sewage treatment plant.

Management: 84.66 mil. cum OB and topsoil excavated from the mine from 1st year to 10th year and part of 11th year will be accommodated in surface dumps. Total area excavated (371.49 Ha.) will be backfilled by OB and also by washery rejects and TPP ash. After backfilling the total OB generated (including re-handling of surface dump), the pit will have a depth of 95 m

over an area of 90.40 Ha. This is planned to be backfilled with washery rejects and TPP ash. This will make the operation of UG mining safe as no water will be logged in the quarry. The municipal waste will be segregated and composted, recycled or disposed. Oil and grease shall be sold to authorised recyclers. Sludge from workshop shall be disposed in secured landfill.

4.8 Ecology

Impact: The impact on the terrestrial ecosystem due to operation of the proposed mining would mainly occur from deposition of air pollutants. There will be loss of vegetation by excavation and dumping thereby affecting the species for which such vegetation was the host. 93.566 ha forest within ML shall be disturbed. There will be movement of species away from mine lease area due to noise, vibrations and lights.

Management: Compensatory afforestation shall be carried out in lieu of the forest land de-reserved from within the ML area. A plantation program over life of the mine has been planned in a phase wise manner and will be started from first year of mining. A 7.5 m wide green belt over 9.34 ha along the periphery of the ML area, including bund, will be completed within the 5 years. Plantation over backfilled area will be commenced from third year of mining covering 371.49 ha. Plantation will be done along road also. By end of life of mine, 952075 trees over 380.83 ha will be planted. To fulfil the requirements of plants, a nursery will be established at the site.

A wild life conservation plan has been prepared and approved by the Principal Chief Conservator of Forests (Wildlife), which shall be implemented. A Habitat Management & Restoration Plan has also been prepare for implementation.

4.9 Socio-economics

Impact: About 254 Ha of private land be acquired from the land owners. Sixteen households falling within the mine lease area will have to be rehabilitated. Compensation will be given to the land losers and the home oustees as per the applicable resettlement and rehabilitation norms.

Local people will get employment directly and indirectly in the mine and related facilities and their economy will improve.

Management: Since there will be displacement of sixteen households, a rehabilitation plan in accordance with R&R Policy of Government of Chhattisgarh has been prepared and approved by the District Level Rehabilitation Committee for implementation. Care will be taken to give preference in employment to local people in line with the Company's Policy. The company will arrange medical camps and awareness programmes to benefit the local people as part of the CSR activities.

4.10 Occupational Health

Already, the company has established well equipped occupational health center headed by an experienced Doctor with a team of nurse, Compounder and Pathologist along with two ambulances at Gare IV/6. Facilities for x-ray, lung test, eye test and pathology are already operation and being availed by villagers. Each of the persons employed in the mine will undergo initial medical examination and periodical medical examination.

4.11 Cumulative Impact from mines and plants in study area

There are several coal mines, washeries and power plants in the study area in addition to small scale units like brick kilns, etc. Some are operational and some are proposed. The project's cumulative impact with respect to ambient air quality, water resources, water quality and ecology was assessed based on information available in public domain. An ambient air quality prediction exercise was carried out for proposed mines, washeries, power plants and traffic which showed that the maximum ground level concentrations anticipated at a sampling station lying outside all OC mines areas shall be $97.1 \mu\text{g}/\text{m}^3$ for PM10 and $55.3 \mu\text{g}/\text{m}^3$ for PM2.5 (BA2-Khamharia) at 50% control measures and $5.77 \mu\text{g}/\text{m}^3$ for SO₂ and $11.99 \mu\text{g}/\text{m}^3$ for NOx (BA6-Tamnar). The typical control measures nowadays are 90%+, hence, with stringent implementation of pollution control measures, the increments will become marginal and when added to baseline, will remain well within the permissible limits in most areas. In case of water resources, the most significant water body in the area is Kelo river from where seepage will occur and also into which mines are or will discharge treated mine sump water. The ground water withdrawal has been estimated at 6.24 MCM per annum, which will increase the stage of ground water development for the study area from 7.66% to 16.53%. The ground water quality has maintained potability since commencement of mining in the last 15 years. With respect to ecology there has been a reduction of forest and agricultural cover in the study area, the trend of which will continue as more opencast mines will start operation. However, with compensatory afforestation and reclamation of mines, ecology of the area shall improve. This cumulative assessment is indicative in nature.

5.0 ANALYSIS OF ALTERNATIVES

No alternative site is proposed as coal occurrence is site specific. Thus, the mine is being established where the mineral is available. Mining will be done by opencast as well as underground mining method. For opencast mining method, shovel-dumper combination is proposed. For underground method bord and pillar method or longwall method shall be adopted. Heavy Media (HM) cyclone under wet process will be used for washery.

6.0 ENVIRONMENTAL CONTROL AND MONITORING ORGANISATION

The management of JSPL has formed a common environmental cell for the mines and plants operating in the region. An environmental cell integrated

with the existing one, reporting directly to Executive Director has been envisaged for the proposed mine to monitor and maintain the environmental parameters.

The total investment on environmental improvement works is envisaged as Rs. 1774.67 lakhs and recurring expenditure during the stage of production is envisaged as Rs. 578.06 lakhs per year.

7.0 ADDITIONAL STUDIES

Disaster Management Plan : There are various factors, which can result in a disaster in the mine. In open cast mines, the hazards are due to machineries/ equipment, accidents due to poor visibility, on haul roads, due to bench failure, pit slope failure, dump failure, blasting, explosion, fire and inundation. In underground mines, the hazards identified are due to roof and side falls, air blast, fire, explosions, inundation, blasting, haulage, conveyor and operating of machineries. The preventive and hazard management measures have been outlined. As a part of disaster management plan, a rescue team will be formed by imparting specialized training to select mining staff. All the statutory precautions shall be followed.

8.0 PROJECT BENEFITS

The mining project will have a significant positive impact on employment and occupation of the area. During operation phase, around 750 persons will be directly employed at the mine. Many more persons will be indirectly engaged either on contract basis or for provision of different services associated with the project. The Company executes its social and community welfare responsibilities in the region through “Jindal Education and Welfare society” and JSPL’s CSR Department. The company will make planned expenditure for development of the Tribals as well as the other population of the adopted villages as part of its CSR commitments. Company will spend Rs. 600.0 lakhs as capital cost (over a period of three years) and Rs. 230.00 Lakhs every year as recurring cost.

9.0 CONSULTANTS

The consultants engaged for the preparation of the EIA/EMP of the project are ISO 9001:2008 certified Min Mec Consultancy Pvt. Ltd. Company, New Delhi (established 1983). Ecomen Laboratories Pvt. Ltd., Lucknow, NABET accredited consultant have duly vetted the EIA/EMP report. Environmental monitoring has been conducted by Min Mec R & D laboratory, New Delhi (established 1994) which is NABL (certificate no. T-1157) and MOEF (Sl. No. 97) accredited. Other consultants have been involved for mine planning, hydrogeological studies, socio-economic survey, Resettlement & rehabilitation plan, inventorisation of flora & fauna, wildlife conservation plan, habitat management & restoration plan, design of embankment, Characterization studies on raw and leached fractions (Coal and overburden), ground water conservation, monitoring & recharge.