

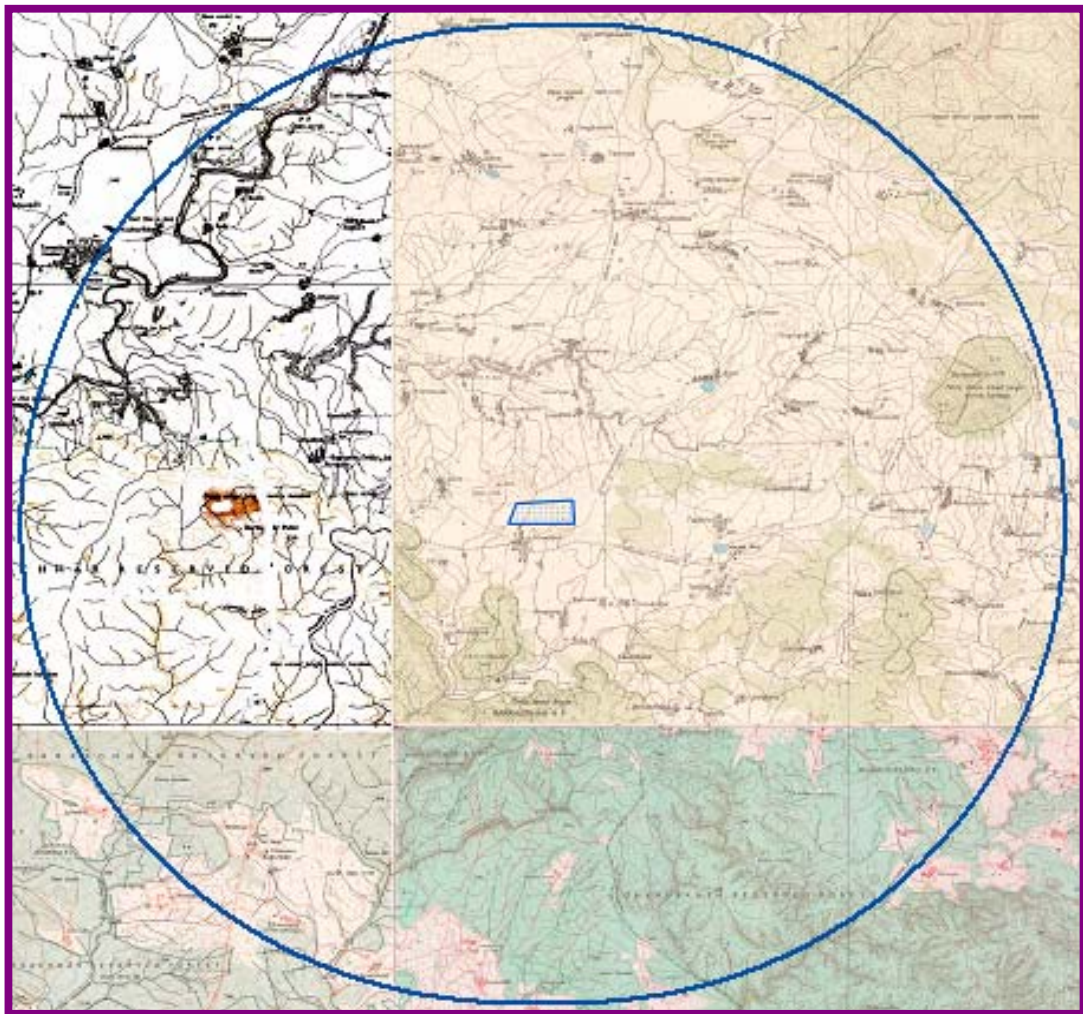
SUMMARY ENVIRONMENTAL IMPACT ASSESSMENT REPORT

of

2 x 300 MW THERMAL POWER PLANT

at

**villages Jobra & Hamirpur, Tehsil Gharghoda
District Raigarh (Chhattisgarh)**



By

Raigarh Energy Limited

OCTOBER 2010

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1.0 Introduction

Jayaswal Neco Industries Limited (JNIL) has formed a subsidiary company named Raigarh Energy Limited (REL) to develop a thermal power plant at Raigarh, Chhattisgarh. REL proposes to establish 600 MW thermal power plant near Hamirpur and Jobra village, Tehsil Gharghoda, District Raigarh.

The site is located at a distance of about 25 km north of Raigarh town and about 12 km east of Jindal BOOT Road. The captive coal blocks of JNIL namely Gare IV/4 & Gare IV/8 are located about 15 km north of the site. Orissa State boundary falls within 10 km area of the project site on the eastern side. National Park, Wildlife Sanctuary, Elephant or Tiger Reserve is not present within 10 km area around site. The Ministry of Environment & Forests, Government of India has approved the Terms of Reference for doing EIA Study of this project vide letter No. J.13012/113/2009-IA.II (T) dated 11-2-2010 and amended dated 1-7-2010. This EIA report covers all the points mentioned in the TOR.

Project Cost: The estimated project cost is Rs. 3337.26 crores.

Land Requirement: 300 acres land will be used for establishing the main plant along with ash dyke and 33% greenbelt. 180 acres separate land will be used for making water reservoir, construction / fabrication yard. The construction yard may be used later to develop staff quarters. No human settlements or reserve / protected forests are present on the identified land. Therefore no resettlement issue is involved. For laying the buried water pipeline only Right of Way will be taken for about 15 acres land from the land owners.

Water Requirement : The make up water requirement for the proposed 600 MW power plant is 2025 m³/hr. Water is proposed to be drawn from the anicut proposed to be constructed by Water Resource Department, Government of Chhattisgarh near Budia village and Kantajharia village over Kelo River. 10 MCM water from the proposed anicut has been committed for the project by Water Resource Department. Intake wells with pump house will be provided at Kantajharia anicut. Water will be transported using pipelines to the raw water balancing reservoir of REL, located inside the plant premises. The water storage capacity of the reservoir will be about 3 MCM.

Coal Requirement: The coal – middling mixture requirement for the proposed 600 MW power plant is 2.94 MTPA (9260 TPD). 1.0 MTPA middlings will be brought from the captive coal washery and 1.94 MTPA coal will be obtained through linkage from Ministry of Coal. Middlings and coal will be transported by 80 tons trucks. The estimated truck movement is about 232 per day. Coal storage yard of about 15 days requirement will be developed inside the plant site.

Employment Generation: 174 people will get direct employment and another 300 people will get indirect employment through contractors during the operation stage. About 1000 construction workers would get employment for a period of 33 – 39 months during the construction stage of the project.

Manufacturing Process:

The proposed 600 MW thermal power plant will use mixture of coal and middlings as fuel to produce steam from water. High pressure steam will be used to run turbines and generate electricity.

Middlings will be generated from the 1.8 MTPA coal washery proposed to be installed within the Gare IV/8 captive coal mines of JNIL. Coal linkage will be obtained from Ministry of coal.

There will be two pulverized coal fired boilers, each of 975 tons/hour steam generation capacity, working at 179 bars and 540°C pressure. The boiler efficiency will be 87%. There will be two turbogenerators, multicylinder type. The turbine heat rate will be 1960 kcal/kwh. The gross PHR will be 2250 kcal/kwh. The design coal GCV is 3500 kcal/kg. The average coal ash content will be 45% and sulphur content will be 0.5%.

The 600 MW power plant will consume 2.94 MTPA coal (9260 TPD) and generate 1.323 MTPA ash (4167 TPD). The coal storage capacity shall be 0.15 MT. Closed cycle water cooling system will be installed to conserve water.

2.0 Description of Environment

Baseline environmental data generation of study area was carried out during the period 1st April 2010 to 30th June 2010. Environmental sampling and data generation have been done by following the approved procedures of the Ministry of Environment & Forests and the Central Pollution Control Board. Study area of 10 km radial distance around the site has been considered for the EIA study.

Meteorology: The predominant wind direction is from Northwest direction. The wind speed mostly varies from 1.0 to 3.9 m/s. 34% Time is calm condition. Daily mean temperature varies from 28.3°C to 41.6° C. The relative humidity varies from 23% to 42%. The annual rainfall is 1602 mm.

Ambient Air Quality: PM_{2.5}, PM₁₀, SO₂, NO₂, O₃ and Hg levels were tested at downwind locations where maximum impact is anticipated and upwind location. The observed 24-hour average PM₁₀ level in the study area was found to vary from 40 to 50 µg/m³; PM_{2.5} from 17 to 26 µg/m³, SO₂ from 5.0 to 7.5 µg/m³ and NO₂ from 6.2 to 12.3 µg/m³. The observed 8-hour average ozone level in the study area varied from 20 to 32 µg/m³. Mercury was not detected in any of the samples. The ambient air quality of the study area is well within the prescribed National Ambient Air Quality Standards (November 2009); PM_{2.5} – 60, PM₁₀ - 100 µg/m³; SO₂ - 80 µg/m³, NO_x - 80 µg/m³ and O₃ - 100 µg/m³.

Ambient Noise Quality: The observed noise level in residential area ranges from 46.2 dB(A) to 50.0 dB(A) during day time and 40.0 dB (A) to 42.4 dB (A) during the night time. The noise levels are found to be within the standards (National noise standards for residential area are 45 dBA during night time and 55 dBA during day time,).

Water Quality: The groundwater quality of the study area is found to be meeting the prescribed drinking water quality standard (BIS 10500). No metallic or bacterial contamination has been found in the groundwater samples. The surface water quality of Kelo river and other small streams are found to be of satisfactory nature, meeting the best designate use criteria of CPCB.

Soil Quality: The soil quality of study area is sandy loam type (Matasi). Bhata type soil is also found in some area. Pal kachhar type soil (silty loam) is found along the river banks. The soil contains moderate amount of organic matter, nitrogen, potassium and phosphorus.

Land use: 16% of the land area is covered under agriculture. 28% under dense forest, 35.5% under open forest. Built-up area is 0.7% and remaining area comes under open land, water bodies, etc.

Demography and Socio-economics: The study area falls under Gharghoda tehsil of Raigarh district and Hemgiri tehsil of Sundergarh district. There are 63 villages in the 10 km area around project site. The total population is 38528 (2001 Census Records). 10.5% are Scheduled Castes and 44% are Scheduled Tribes. The literacy rate is 67%. The infrastructure resource base is average in the study area. Transport, educational and health care facilities are moderately developed in the study area.

3.0 Anticipated Environmental Impact and Mitigation Measures

Impact Assessment study has been carried out to identify the potential impacts of the project on the environment. Based on the study various measures have been proposed to mitigate adverse impacts on the environment during construction and operation phases of the project. These include the following.

- 220 m tall stack will be provided to reduce ground level concentration of air pollutants. The diameter of each flue will be 4.8 m, exit gas temperature will be 413°C and exit gas velocity will be 25 m/s.
- Installation of high efficiency electrostatic precipitators for control of particulate matter emission (99.99% efficiency). The SPM emission will be kept within 50 mg/Nm³, which is international standard.
- SO₂ emissions will be kept below 2000 mg/Nm³, which is international standard.

- Installation of dry low NO_x burners (DLNB) for control of NO_x emissions. NO_x emission will be kept below 700 mg/Nm³, which is international standard.
- Proper treatment of effluents and recycling the treated water for various purposes such as gardening, ash handling, dust suppression, etc.
- Ash generation would be 4167 tons/day. 100% ash utilization will be achieved within four years as per standard. Ash will be backfilled in worked out captive coal mines of JNIL, given for cement making, wasteland reclamation, making embankments, roads, building materials, etc.
- Development of 33% land as greenbelt around the power plant to mitigate air and noise pollution.

Water Environment: Water will be required for steam generation and condenser cooling purpose. The hot water will be taken to cooling towers and after cooling it will be recycled back for condenser cooling. The cooling tower blowdown will be taken to common monitoring basin (CMB). DM plant regeneration wastewater / RO plant rejects will be taken to neutralization pit and then to CMB. Boiler blowdown will be taken to CMB. The quality of outlet water from CMB (445 kl/hour) will be checked and then it will be used for coal dust suppression and ash handling. No wastewater will be discharged outside the plant premises. Sewage Treatment Plant will be provided to treat the sewage water generated from plant. The treated sewage water will be used for gardening. The storm water drain will be provided with sedimentation pits and oil-water interceptors. The storm water will be harvested using suitable structures and surplus water overflow will be discharged into nearby nalla. Spent oil and lubricants will be collected in drums and given to authorized recyclers. Rainwater harvesting pits will be constructed and rooftop rainwater will be diverted towards

these pits for recharging the groundwater. Such measures will be adequate to protect the adverse environmental impact.

Air Environment: Particulate matter, sulphur dioxide and oxides of nitrogen are the main pollutants generated from the power plant. For control of fugitive emissions water sprinklers will be used. Dust emissions from boilers will be controlled using Electrostatic Precipitators. The SPM emission will be kept below 50 mg/Nm³. 220 m tall stack will be provided for wide dispersal of flue gases. Water spraying will be done to suppress the dust generated during construction activity. All internal roads will be made pucca. All roads and shop floors will be cleaned regularly. Appropriate ventilation system will be provided in all work areas including coal bunkers. Ozone friendly refrigerants will be used inside the plant. All process parameters will be optimized for energy conservation. Greenery development will be done at 33% of the land area and all available open spaces will be made green. Mathematical modeling on air pollution dispersion studies proved that the ambient air quality will remain within the National Ambient Air Quality Standards.

Noise Environment: The compressors, rotating machines, mill operations, turbines, movement of trucks and plant machinery are the major sources of noise. Movement of trucks and dumpers will be properly scheduled to minimize construction noise. All activities will be carried out inside sheds and buildings. Turbine will be provided with acoustic enclosure. Sound absorbing material will be provided in the room where both the source and receiver are present. In noisy work areas soundproof duty rooms will be provided. Workers working in noisy areas will be given ear plugs. Mathematical modeling studies proved that the ambient noise quality will remain within the National Noise Quality Standards. Such measures will be adequate to protect the noise environment.

Land Environment: About 50% trees present on the site will be retained as greenbelt. Balance 50% will be transplanted to the maximum extent feasible. Permission of Forest Department will be taken to cut the required number of trees. Flyash will be collected in dry form in silos. It will be utilized as per Notification dated 3rd November 2009. Unutilized ash will be stored in ash pond. Detailed geotechnical investigations of the site stratigraphy, permeability and SPTN values revealed that compacted clay lining of ash pond will be adequate to prevent the contamination of soil strata and groundwater. Garbage will be segregated and recyclable materials will be given to kabadis. Biodegradable garbage will be composted. Inert material will be given for land filling. No plastic materials will be handled inside the plant. Used batteries will be given back to dealer, while purchasing the new batteries. Such measures will be adequate to protect the adverse environmental impact.

Ecology: Fugitive emissions from the ash silos, coal bunkers, coal conveyors, transfer points, etc will be controlled using bag filters, covering the conveyors and by providing adequate ventilation system. Wastewater will be reused. Greenery development will be done; all available open spaces will be made green. Such measures will be adequate to protect the surrounding ecology.

Workers Health and Safety: Workers will be provided clean drinking water, canteen and toilet facility. Regular training and awareness programs will be conducted. Exposures to dust, noise, heat, mechanical injury, fire in coal storage are the hazards identified. Workers will be given mask, ear plugs, goggles, gloves, boots, etc. Hospital equipped with doctors, medicine, ambulance and other medical equipment to take care of emergency and first aid cases will be established. The workers will be checked for any clinical complaints and abnormal symptoms by the in-house medical department. Such measures will be adequate to protect the workers healthy and safety.

Rehabilitation Plan: There will be 138 land oustees; 80 from Hamirpur village and 50 from Jobra village. Other 8 persons whose partial land has been acquired will be given financial compensation for the land. Rehabilitation will be done as per the R&R Policy of Central Government and Chhattisgarh Government. Permanent employment will be given in the power project, coal mines and other group companies to one member of each family, whose entire land has been acquired (130 persons) for the project. Nature of employment in the project shall depend on the ability, qualification and experience. In case any person is found unfit for employment due to old age or diseases, then they will be offered shops staff colony / nearby villages / Raigarh as per their option. Sustainable livelihood programs and training programs will be conducted as per CSR plan to sustain the livelihood of the land oustees.

4.0 Environmental Monitoring Plan

Environmental Management Department (EMD) will be established in the plant premises. EMD will be under the direct control of Chief Executive with full-fledged environmental laboratory and qualified scientists and engineers. EMD will be responsible for the following functions:

I. Regular monitoring of :

1. Stack emissions, fugitive emissions, work environment and report any abnormalities for immediate corrective measures.
2. Ambient air quality at upwind and downwind direction of plant and at three locations at plant boundary.
3. Re-circulating water quality & testing the inlet & outlet water quality of CMB.

4. Ground water quality inside plant, and surrounding villages.
5. Noise testing of equipment, noise monitoring at the plant boundary, work areas and nearest habitation.
6. Quantity & quality of ash and their reuse in cement making.
7. Development and maintenance of greenbelt and greenery within the plant boundary and in surrounding villages and barren land.

5.0 Risk Assessment

Diesel will be stored in tanks (2 x 400 KL for LDO and 2 x 400 KL for HFO) for use as supporting fuel during start-up, during shut down and low load conditions. The oil tanks will be designed and located as per standards of Oil Industry Safety Directorate, secured with bunds, pipelines, isolation valves and other safety devices. Modeling studies proved that there will be no off-site risk due to any fire or explosion in the Diesel tanks. Onsite emergency response plan will be prepared in consultation with the District Administration. Approval of Chief Controller of Explosives will be taken for the layout and design of oil storage tanks. Elaborate fire fighting system with fire extinguishers, hydrant system, sprinkler system, pumps and pipeline network will be provided as per standards. Water for fire fighting will be taken from the water reservoir.

6.0 Project Benefits

The project will create direct employment for 174 people and employment through different contractors for 300 people. During the construction phase on an average about 1000 people every day will get employment for 33 - 39

months. REL will prefer employing local people during construction and operation, depending upon availability of skilled and unskilled persons.

The project will create opportunities for indirect employment to more than 2000 persons (as drivers, conductors and attendants of new trucks, passenger carrying vehicles, technicians in workshops and garages besides the plumbers, electricians and masons). The project will create opportunities for indirect employment due to increase in trade opportunities like stockiest / retailers of building materials, groceries, provision shops, medical stores, garment shops, furniture shops, etc.

REL has earmarked Rs. 13.5 crores to be spent on CSR activities (0.5% of the project cost). REL will adopt 3 surrounding villages. Namely Hamirpur, Jobra and Khurselenga villages. REL will make Dispensary in Hamirpur village, School in Hamirpur, Jobra and Kurselenga villages and Develop the road from plant via Kurselenga village upto the Coal Mines. REL will form a Committee for monitoring the CSR activities.

7.0 Environmental Management Plan

Environmental Management Plan (EMP) has been prepared for effective management of pollution control and related aspects. In order to implement the recommended mitigation measures and institutionalise the EMP, budgetary provision of Rs.165 crores for capital expenditure has been provided. Provision for recurring annual expenditure of Rs 65 crores has been also provided.

EMD will ensure that all air pollution control devices, effluent treatment plant and water re-circulating systems function effectively. Schemes for resource conservation (raw materials, water, etc), ash utilization, rainwater harvesting and

forestry development will be taken up by EMD. Environmental awareness programs for the employees will be conducted. EMD will ensure cleanliness and industrial hygiene in the plant. EMD in association with the safety department will undertake full review of the potential hazard scenarios during plant commissioning. The review will ensure enforcement of the proposed safeguards for pollution abatement, resource conservation, accident prevention and waste minimization. The implementation of EMP would ensure that all elements of project comply with relevant environmental legislation throughout its life.

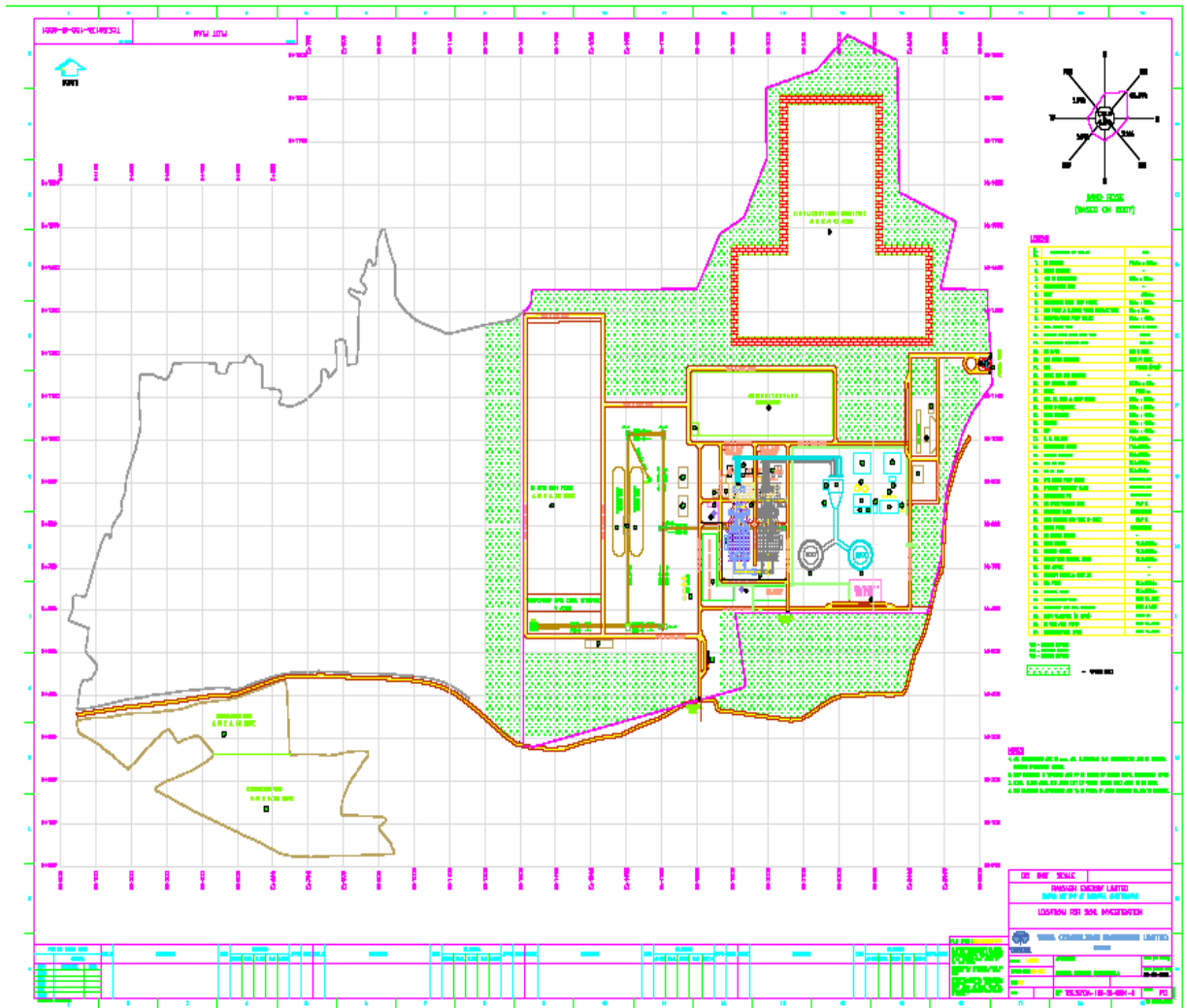
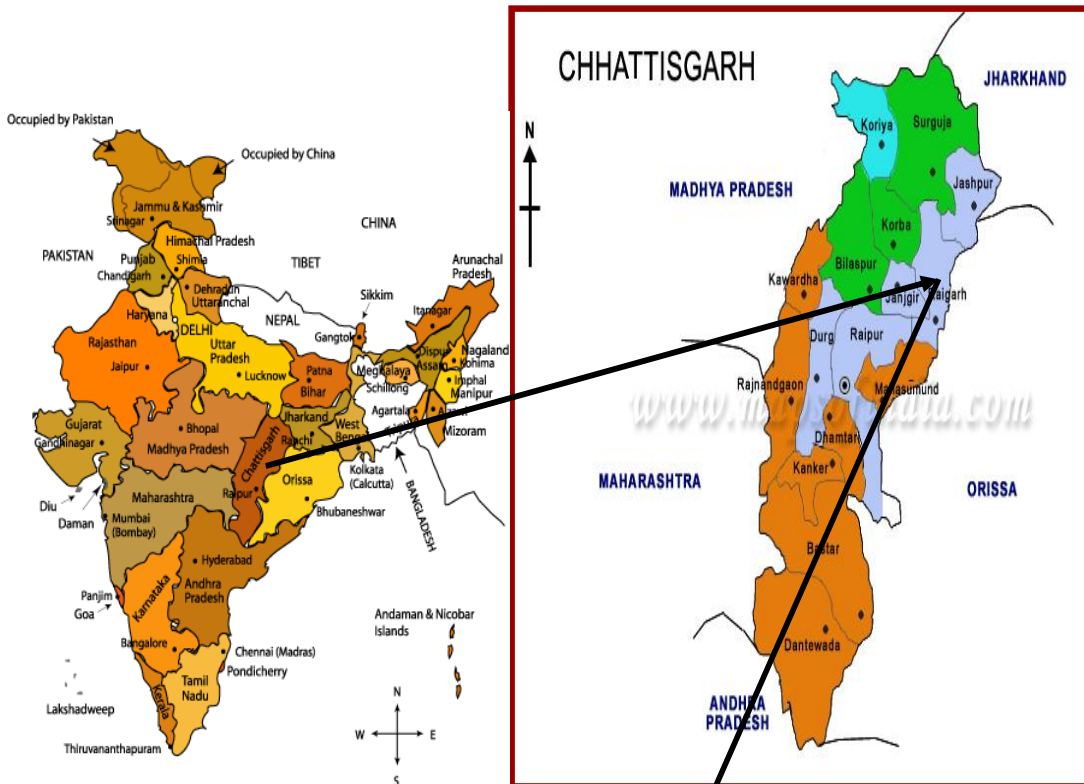


Figure Layout Map



Main Plant
Latitude &
Longitude

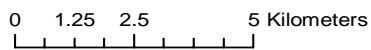
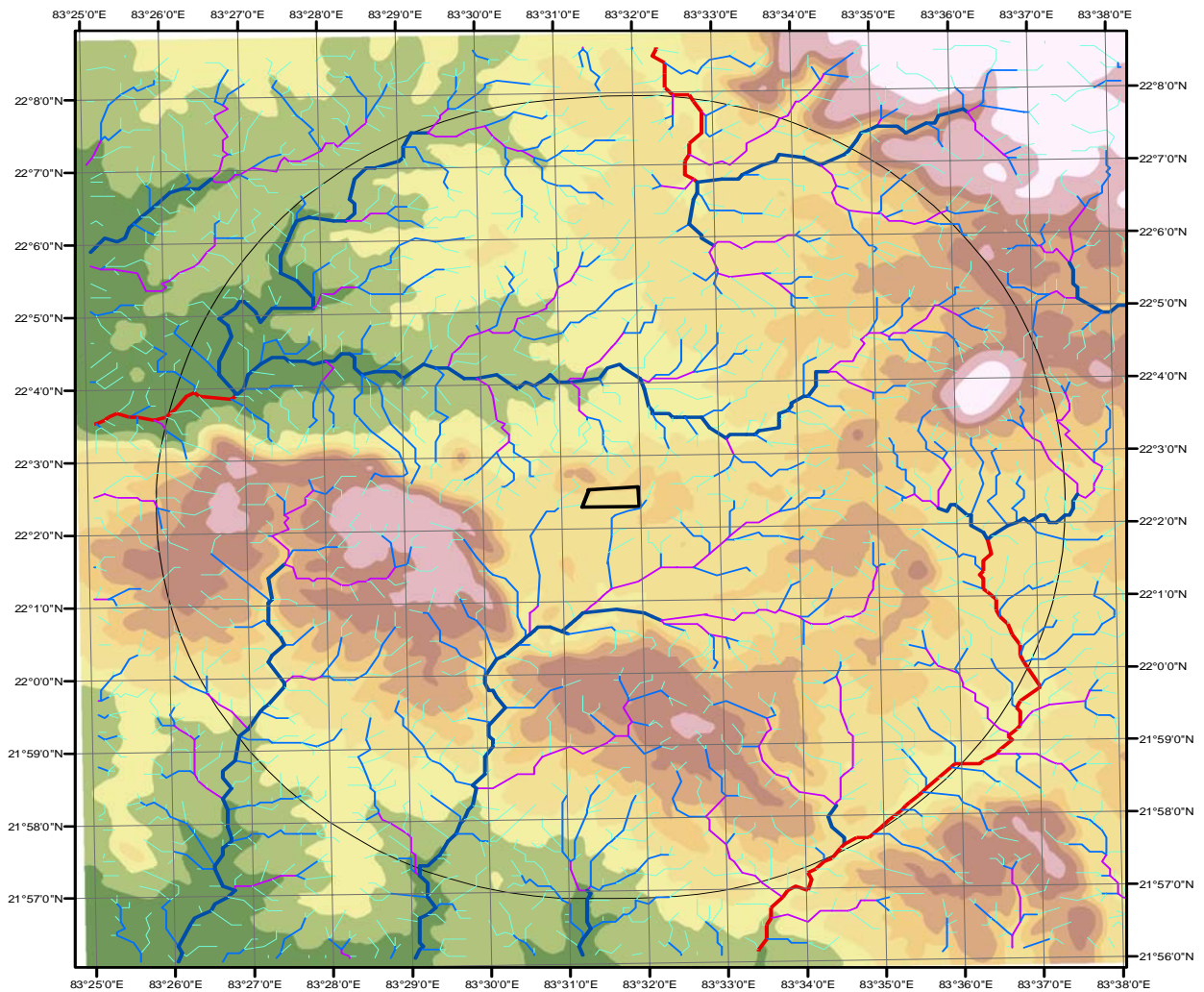
22°23'36" N
83°31'19" E

22°23'36" N
83°31'19" E

22°23'36" N
83°31'19" E

22°23'36" N
83°31'19" E

Location Map



Stream Order

- 1st Order
- 2nd Order
- 3rd Order
- 4th Order
- 5th Order

Elevation (m)

224.2 - 251.7	324.7 - 349.3
251.7 - 268.6	349.3 - 377.8
268.6 - 286.2	377.8 - 435.1
286.2 - 309.9	435.1 - 594.1
309.9 - 324.7	

Hydro-Geological Map of Study Area

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