EXECUTIVE SUMMARY

1.0 INTRODUCTION

The proposed Thermal Power Project has been planned for implementation of a coal based super critical Thermal Power Plant with a capacity of 2 x 660 MW near village Lohakhan in Raigarh district of Chhattisgarh by Jindal India Thermal Power Limited (JITPL).

In order to assess the likely impacts on various environmental components which may be affected due to the proposed project, a Rapid Environmental Impact Assessment (REIA) Study was carried out. The REIA Report consists of field data generated during the premonsoon season of 2009. An Environmental Management Plan, including proposed pollution control systems and a Disaster Management Plan (DMP) have also been included in the EIA Report.

1.1 Justification of the Project

Rapid industrialization and increase in commercial and domestic use of electricity are the main reasons for increase in power consumption. The projected peak power demand and energy requirement in the country will rise to about 35% and 30% respectively over the next five years. The major power deficit region of India at the end of XI five year plan, as per Power Survey Report by CEA, are likely to be Northern, Western and Eastern Region.

Considering the power deficit in the Western region, JITPL has proposed the construction of a power plant of ultimate capacity of 1320 MW at Raigarh District, Chhattisgarh. Since the Western region is the most power deficit region in the country, the generated power can be utilized in the region.

2.0 THE SITE AND THE SURROUNDINGS

The proposed Thermal Power Plant would be located near village Lohakhan in Raigarh District of the State of Chhattisgarh. The plant site is located at a distance of 18 km to the southeast of Raigarh town. The National Highway-200 between Raigarh and Jharsuguda passes about 3 km from the site. The site is about 18 km by road from Raigarh Railway Station, which is the nearest broadgauge railway station. The nearest airport is at Raipur, at a distance of 260 km.

The main river within the study area is Mahanadi, flowing from west to east. The river is a perennial river flowing at a distance of 7 km from the site.

3.0 THE PROJECT

3.1 The Power Plant

The principal features or highlights of the proposed Thermal Power Plant at Raigarh are as follows :

Location	:	Near village Lohakhan, District Raigarh, Chhattisgarh.
Capacity	:	2 x 660 MW
Land Requirement	:	1300 Acres.
Mode of Operation	:	Base Load
Main Fuel	:	Coal from Mand-Raigarh Coalfields of SECL
Cooling System	:	Closed circuit system with natural draft cooling towers.
Source of Water	:	Mahanadi river.

3.2 Land Requirement

The land required for setting up the plant is 1300 acres. The land is mostly barren (approx 55%) and the balance is under single crop cultivation.

The land requirement of the project at its present capacity of 1320 MW is provided below:

Main Plant and other facilities	:	450	Acres
Ash disposal	:	500	Acres
Township	:	50	Acres
Others (Access roads, greenbelt etc)	:	300	Acres
		1300	Acres

3.3 Fuel

The fuel for the power plant would be coal with an average GCV of 3500 KCal/Kg and 40% ash content. The annual coal requirement is 678 TPH for the 1320 MW station.

3.4 Stack Emissions

The combustion gases from the power plant would be dedusted through an ESP and then discharged through one twin flue stack of 275 m height. The internal diameter of the flue would be 7 m at emission point.

The operation of the power plant would result in stack emissions into the atmosphere consisting of particulates and gases like sulphur dioxide and oxides of nitrogen (NO_x). Electrostatic Precipitator (ESP) of 99.78% efficiency would be installed, that would reduce the SPM emission through the stacks to less than 50 mg/Nm^3. SO_2 and NO_x emissions would be released through one 275 m tall stack to effect wide dispersal of pollutants. SO_2 and NO_x emissions would be 6102 kg/h and 1528 kg/hr respectively. The emissions would be released at a velocity of 22.0 m/sec at a temperature of 135°C.

3.5 Water Requirement and Effluent Quantity

The water requirement of the plant would be met from Mahanadi river. The consumptive water requirement of the proposed unit is 3365 m^3/hr and would be met by drawal of water from the river.

449 m^3/hr liquid effluent will be generated from different sources of the plant. The plant is based on zero discharge concept and the treated waste water will be judiciously utilized in horticulture, greenbelt development and road washing.

3.6 Power Evacuation

Power will be evacuated by a 400 KV line to the nearest sub-station.

4.0 BASELINE ENVIRONMENTAL SCENARIO

The baseline environmental status for various environmental attributes within the study area of 10 km radius around the plant site (Refer Exhibit-1) has been generated through primary and secondary sources. The major environmental disciplines studied include hydrology, meteorology, landuse, air quality, water quality, soils, ecological environment, socioeconomic conditions and noise.

4.1 Meteorology

The climate of the area is generally dry, except in the monsoon and may broadly be divided into four seasons : Summer/premonsoon (March-May), monsoon (June-September), post-monsoon (October and November) and winter (December-February). Mean maximum temperatures reach about 48.4°C in summer, while mean minimum temperatures of about 8.2°C occur in winter. The annual rainfall is about 1118.3 mm.

The air is generally dry.

4.2 Landuse

The project site of 1300 acres is located near village Lohakhan. The study area (Refer Exhibit-1) falls under the Raigarh district in the state of Chhattisgarh.

The landuse of the area has been spatially depicted in Exhibit-2. The map has been based on the landuse map of District Planning Map Series of Raigarh District by the National Atlas and Thematic Mapping Organisation. The map has been updated in some areas through reconnaissance survey. The total study area has been classified under four different landuse categories.

a) Cultivated Land/arable land - 81.15 %
b) Water body - 12.76 %
c) Forest - 3.49 % and
d) Residential area - 2.60 %

4.3 Air Quality

Ambient air quality was monitored at 4 locations around the project site. The results indicate that the concentrations of Suspended Particulate Matter (SPM), Sulphur Dioxide (SO_2) and Oxides of Nitrogen (NO_x) is below the National Ambient Air Quality Standards for industrial areas. The 98 percentile pollutant levels observed covering the 4 stations are presented in Table-1 below :

Table-1

Ambient Air Quality in the Study Area

Parameters	P-98 AAQ levels ($\mu g/m^3$)	AAQ Standards for residential/rural areas ($\mu g/m^3$)	AAQ Standards for Industrial areas ($\mu g/m^3$)
SPM	288	200	500
SO_2	16.1	80	120
NO_x	40.2	80	120

4.4 Water Quality

To assess the physical, chemical and bacteriological properties of water in the region, water samples were drawn from total 5 stations. Three (3) stations representing surface water quality are SW1 on Mahanadi river near Mahuapali ghat, SW2 on Mahanadi near Chhotahaldi ghat and SW3 on Kelo river near Kanaktura village and 2 stations covering tubewells for determination of ground water quality were located at Chhapora and Barajharia villages. The analysis results indicate that pH of the surface water varies between 7.75-8.10, TDS varied between 80-302 mg/l, TSS ranged between 6-74 mg/l,

DO is consistently high and BOD levels ranged between 0.6-0.8 mg/l. Comparison of water quality between the 3 stations does not reveal significant spatial variation in the monitoring stretch.

The analysis results of groundwater indicate that the pH varies between 7.11-7.41, hardness ranges from 164-280 mg/l, chloride ranges from 31.5-53.2 mg/l, while coliforms in the tubewell water are found to be absent. The groundwater quality is generally good.

4.5 Soil Quality

5 stations were selected within the study area for determination of soil quality. The sampling sites are S1 (Chhapora village), S2 (Lohakhan village), S3 (Kandagarh village), S4 (Amunda village) and S5 (near the proposed ash pond area). Samples were collected from the above sites and analysed for physical, chemical and fertility characteristics. The soils can be classified as sandy silt in nature. The soils are close to neutral (avg pH:7.83). The organic content is low (0.233-0.909%).

4.6 Ecology

The landscape pattern of the study area were broadly classified as follows :

- Denuded land of vast expanse without vegetation
- Eroded land with no vegetation
- Scrub land with scattered trees of *Butea monosperma* and *Acacia nilotica*
- Scrub land with scattered trees of *Butea monosperma*, *Acacia nilotica, Albizia procera* and *Albizzia lebbek*
- Denuded land with scattered *Madhuca indica*
- Occasionally cultivated land with marginal tree crop of *Albizzia procera* and *A. lebbek.*

The vegetation of the study area indicates a mixed deciduous type falling into Champion and Seth's classification of Northern Dry – Mixed Deciduous Forest.

The study area was found to have a clean ground cover with minimum number of shrub or even a few conspicuous herbs due to heavy grazing, ground fire and dry soil.

No Sanctuary or National Park exists within 10 km radius of the study area.

4.7 Socioeconomic Environment

As per 2001 Census reports, the study area covers rural areas. The study area falls under the jurisdiction of Raigarh district. The total rural population in the study area was 53,329 in 2001, with a household size of about 4.86. The literacy rate was about 68.10%. Main workers comprised 32.47% of the total rural population, while the percentage of non-workers was about 52.02%. The percentage of Scheduled Caste (SC) to the overall population was 15.45, while the Scheduled Tribe (ST) population percentage was 20.74.

4.8 Noise

Ambient noise levels were measured at 6 locations around the project site. It is observed that the day and nighttime noise levels vary between 33.17-49.30 dB(A) and 30.22-47.39 dB(A), respectively.

As normal, the nighttime noise levels are lower compared to the daytime values. The average difference between day and nighttime levels in the area is of the order of 3.09 dB(A).

5.0 IMPACT ASSESSMENT, ENVIRONMENTAL MITIGATION AND MANAGEMENT PLAN

The impact analysis results and the mitigation measures adopted in the cardinal environmental disciplines are discussed in the following sections.

5.1 Landuse

Land to the tune of 1300 acres would be used for the proposed project. The existing landuse of the affected land is barren (approx 55%) and the balance is agricultural in nature under single crop cultivation. The diversion of these lands would result in no impact as such.

5.2 Air Quality

The fuel for the project would be coal, resulting in emissions to ambient air from its combustion. The point source emissions would consist of particulates, sulphur dioxide and oxides of nitrogen (NO_x). The prediction of the atmospheric dispersion of the stack emissions and estimation of the long term and short term incremental concentration and resultant ground level concentrations of SPM, SO_2 and NO_x have been done with the Industrial Source complex (ISC3) Model developed by USEPA.

Based on the emissions from the power plant, the long term (seasonal and annual) GLCs for the plant operation of SO_2, NO_x and SPM works out to 4.32, 1.41 and 0.33 $\mu g/m^3$ respectively. The maximum short term incremental concentrations of SPM, SO_2 and NO_x are predicted to be 3.29, 43.18 and 16.19 $\mu g/m^3$ respectively at the project site. The 98 percentile ambient air concentration of SPM, SO_2 and NO_x being 288, 16.10 and 40.2 $\mu g/m^3$ during the premonsoon season, the maximum resultant concentration of SPM, SO_2 and NO_x would be about 291.29, 59.28, and 56.39 $\mu g/m^3$ (Refer Table-2), which are much lower than the National Ambient Air Quality Standard for industrial areas.

Table-2

Maximum Resultant Concentration Due to Incremental GLCs

Pollutant	Overall 98-percentile AAQ Concentrations Recorded ($\mu g/m^3$)	Incremental Concentration due to operations of the Power Plant ($\mu g/m^3$)	Resultant Concentration ($\mu g/m^3$)
SO_2	16.1	43.18	59.28
NO_x	40.2	16.19	56.39
SPM	288.0	3.29	291.29

The following mitigation measures are proposed to be adopted to minimize the impact on air quality :

1. 1 no. 275 m twin flue stack to emit flue gas.
2. High Efficiency ESP (Electrostatic Precipitator) to limit particulate emission to less than 50 mg/Nm^3.
3. Dust suppression and extraction system at CHP (Coal Handling Plant) area to control fugitive emission.
4. Plantation and afforestation in the available spaces.

5.3 Surface Water Quality

The plant is designed on a zero discharge concept, with the effluent after treatment being completely reused and recycled for plant systems including horticulture, greenbelt and afforestation and road washing.

Various effluent treatment measures proposed to be installed in the plant are as follows :

1. Cooling towers to cool down the recirculating cooling water.
2. Neutralisation pit for pH adjustment of the DM plant regeneration waste.

3. Oil and grease separators to arrest oil from different operations.

4. Sludge treatment and disposal systems.

5.4 Ground Water Quality

The ash will be disposed in a concentrated form as the plant is based on High Concentration Slurry Disposal (HCSD) System. The mud like ash solidifies is about a day and hence there is no possibility of leachate generation. No impact due to leaching of toxic metals to ground water would be experienced due to laying of highly impermeable High Density Polyethylene (HDPE) geomembrane lining in the ash pond.

5.5 Ecology

The impact of the construction activities would be primarily confined to the project site. As stated in Section-5.1, 1300 acres of land would be converted to industrial use, which is mostly barren or under single crop cultivation. The plant, township and the ash disposal area would be extensively landscaped with development of green belts and afforestation, consisting of a variety of species. Such plantation activities would enrich the ecology and improve the aesthetics of the area.

The resultant ambient air quality is well within the applicable standards and much below the threshold limit for damage to terrestrial flora. As such, the impact on the terrestrial ecosystem would be negligible due to this phenomena.

5.6 Social Environment

The peak labour strength during construction would be few hundred persons. JITPL officials and supervisors may constitute another few hundred persons.

However, labour camps with provision of basic amenities of water supply, sanitation etc would be provided which would go a long way in curbing the degradation of the physical and aesthetic environment.

Construction of any major industrial project invariably results in socioeconomic changes. The influx of material and money tends to change the economic status of the community. Markets, workshops and commercial centers would develop in the area.

The change in socioeconomic status almost always causes humility and discontent to the related people. Proper publicity of the beneficial aspects of the project, particularly for the local people and highlighting the new opportunities of livelihood would largely defuse the social discontent.

5.7 Noise

The major noise generating sources of the power plant are the turbines, FD & PA fans, compressors, ash handling plants and cooling towers. The noise dispersion model shows that the noise levels from these sources decrease to almost 35 dB(A) within the plant boundary. As such, the ambient noise levels presented in Section-4.8 would remain unaffected and no disturbances would be caused to the community.

The following mitigation measures to curb noise impacts would be provided in the plant :

1. Turbine generators would be provided with acoustic enclosures.
2. Silencers would be provided for the air intake system and the exhaust stacks.
3. Workers would be provided with protection equipments as helmets, earplugs etc.
4. A green belt would be implemented along the plant periphery to dampen noise effects.

6.0 ASH MANAGEMENT PLAN

Fly ash evacuated from the ESP collecting hoppers will be transported in closed pipelines by pneumatic means to the fly ash storage silo. Bottom ash will be evacuated to a separate bottom ash silo also by pneumatic conveying. The fly ash and bottom ash will then be disposed in high concentration slurry form to ash dyke. One common High Concentration Slurry Disposal (HCSD) system has been envisaged for terminal Bottom Ash silo as well as Fly Ash silo.

7.0 RAIN WATER HARVESTING PLAN

The rain (storm) water removed from the building roofs and yard area grade level surfaces will be directed through the open ditches and culverts to the storm drainage piping. All ditches will be concrete lined and located along the roads. All drainage ditches will be located to provide the shortest practical drainage path while providing efficient drainage for the yard. Grade level will be contoured such that storm water run off is directed on the ground by sheet flow, to well defined drainage paths leading to the ditches. This water would be collected and reused in the development of green belt.

8.0 DISASTER MANAGEMENT PLAN

The major areas in the plant which could be potential hazard zones are the main plant, coal & fuel oil handling plant, switchyard, cable galleries etc. The hazards could be due to fire or explosions. A comprehensive fire detection and protection system has been envisaged for the complete power plant.

The following fire detection systems would be provided :

i) Gas sensors/UVIR detectors in the gas compressor building, GT and auxiliaries.

ii) Multi sensor type, liner heat sensing cables in the cable gallery.

iii) Multi sensor types in the switchgear rooms and the control rooms.

iv) Quartzite bulbs in the oil filled transformers.

v) Smoke detectors in the office buildings and other general areas.

The following fire protection systems have been envisaged :

i) Hydrant system for complete power plant covering main plant building, turbine and its auxiliaries, all pump houses and miscellaneous buildings of the plant.

ii) Automatic high velocity water spray system for all transformers.

iii) Automatic medium velocity water spray system for cable vaults and cable galleries of main plant and switchyard control room.

iv) For protection of control room, equipment room, computer room and other electrical and electronic equipment rooms, suitable “Halon substitutes” such as “INERGEN” or “FM-200” or “ARGONITE” system would be opted.

An appropriate Disaster Management Plan (DMP) would be followed to protect the workforce, the public and sophisticated equipments in the event of accidents in the plant. A disaster would be principally managed by the Works Incident Controller (WIC), Chief Incident Controller (CIC) and the Emergency Communication Officer (ECO), or senior officials with equivalent designation supported by other key personnel.

9.0 RESETTLEMENT AND REHABILITATION POLICY

The land requirement for the project would be 1300 acres and does not have any homestead.

For the families affected due to acquisition of their land, Rehabilitation and Resettlement Programme will be formulated in close co-operation with the State Government Authorities. The R&R plan will be as per State Govt R&R Policy. As there is no homestead land involved, so the point of compensation for homestead does not arise. The compensation for agricultural and other lands will be given as per norms and rules laid down by the Govt of Chhattisgarh.