JSW Energy (Bengal) Limited
Godrej Water Side, Tower-1, 10th Floor
Unit No. : 1003, Plot DP - 5, Sector - V
Salt Lake City, Kolkata - 700 091
Phone : 033 - 4000 2020
Fax : 033 - 4000 2021
Website : www.jsw.in
CIN No. : U40300MH2010PLC199844

Ref: Proposal No: IA/WB/THE/19480/2013 dated 07Aug, 2013
Date: 28/03/2017

To,
The Director,
Ministry of Environment, Forests & Climate Change,
Government of India,
India Paryavaran Bhawan
Jor Bagh Road,
Jorbagh, New delhi – 110003

Sub: Proposed 1x660MW Super-critical Power Plant at Salboni, District: Medinipur, West Bengal

Dear Sir,

Pursuant to the email "Additional Information to PP" dated 17th December, 2016, mentioning additional details sought by concerned Member Secretary after consideration of proposal in EAC Meeting (copy attached for ready reference), we are pleased to submit 1 Hard copy (signed) and 1 soft copy of the complete EIA/EMP Report, with all the details sought, for your kind perusal.

We look forward to the early processing of this very prestigious project.

Thanking You,
Yours Faithfully,
For JSW Energy (Bengal) Ltd

Aloke Bhattacharjee
(Associate Vice president – Projects)

Enclo: As above

Sujatha Chakraborty <sujatha.chakraborty@jsw.in>

Fwd: Additional Information to PP

Purnendu Pandey <purnendu.pandey@jsw.in> Sun, Dec 18, 2016 at 4:11 PM
To: Sujatha Chakraborty <sujatha.chakraborty@jsw.in>
Cc: Aloke Bhattacharjee <aloke.bhattacharjee@jsw.in>

FYI

Thanks
Purnendu Pandey

——— Forwarded message ———
From: <s.kerketta66@gov.in>
Date: Dec 17, 2016 16:57
Subject: Additional Information to PP
To: <purnendu.pandey@jsw.in>
Cc: <s.kerketta66@gov.in>, <monitoring-ec@nic.in>

Email alert to proponent, if any, Additional details are sought by concerned Member Secretary after consideration of proposal in EAC Meeting

A proposal for EC, as per the details given below has been examined by the Member Secretary

The said proposal has not been accepted on account of the Additional details sought as per the statement uploaded on the portal of Ministry. Please upload the Additional details sought by Member Secretary.

1. Proposal No.	: IA/WB/THE/19480/2013
2. File No.	: J-13012/18/2013-IA.I(T)
3. Category of the Proposal	: Thermal Projects
3. Name of the proposal	: Proposed 1x660mw super- critical Power plant
4. Date of submission	: 22 Nov 2016
6. Details Sought	: 1. Point wise reply against each ToR condition is not available. Only Section no. and page no. is mentioned. A brief against each ToR condition may mentioned. 2. Page numbering may done for annexures appended to EIA. Same is to be mentioned in the Index also. 3. As per Ministry's OM dated 05.10.2011, Undertaking from Project Proponent for owning the contents may be submitted. 4. Validity of the Accreditation of the "Ghosh, Bose & Associates Pvt Ltd., Kolkata" is up to 17.11.2016. The certificate of extension may be furnished. 5. As per Ministry's OM dated 04.08.2009, a document in support of claim of being authorized signatory for the proposed project may be furnished. 6. As per Ministry's OM dated 04.08.2009, Undertaking from consultant that the prescribed ToR has been complied and the data submitted is factually correct. Name of the all experts associated with/involved in the preparation of EIA report along with functional area expert certificate from NABET may be submitted. Name of the laboratory along with NABL Certificate and whether the laboratory is approved under E(P)

Act may be mentioned. 9. Original reports of baseline data collected for one season by the laboratory may be annexed to EIA report. 10. As per ToR no.3(ii), Executive Summary is missing and may be submitted. 11. As per ToR no.3(v), approved site and ash pond location to be superimposed on toposheet and NRS satellite map with confirmed GPS readings may be submitted. 12. As per ToR no.3(vii), land requirement may be clearly indicated vis-à-vis CEA specifications. 13. As per ToR no.3(viii), land use as per revenue records may be clearly indicated which is proposed for TPP, Coal handling, pipeline laying and other facilities. 14. Legible copy of Exhibit 2.3 may be submitted. 15. No information available at page.2 regarding location of national parks, sanctuaries and other protected areas within 10 km radius of the project site. Authenticated map of CWLW may be furnished for the protected areas within 10km radius of the project, if any. 16. Detailed land use pattern for study area as well as project may be furnished specific to forest, agricultural, common property lands such as grazing, community land and water resources, 17. Quantity of ash generation and action plan for disposal as per MoEF&CC Notification may be submitted. 18. Hydro geological study carried may be furnished. 19. Rainwater harvesting plan may be furnished elaborately. How much area of the rooftop is planned and quantity of the water collected and its recharge/use may be clearly indicated. 20. Water balance diagram may be furnished along with ash pond water and action taken for zero discharge. 21. Water samples have taken only at 5 locations (3 for surface water and 2 for ground water) for the study area of 10km radius. AAQ monitoring was conducted only at 4 locations within 10 km radius. Noise monitoring conducted at 8 locations. The AAQ and Water samples collected are not representative of 10km radius. Detail scientific methodology and identification of monitoring/sampling locations may be furnished. 22. Protected forests are adjacent to plant site in the South, West, South East, North. Action plan for control of pollution and vis-à-vis impact on forest habitat and wildlife may be furnished. 23. All the baseline results may be clearly compared against relevant standards with comparative diagrams. 24. Iron in the both the ground water samples is 2.4 mg/l and 2.2 mg/l which is high against the Standard of 0.3 mg/l. Action plan and commitment as part of CSR to supply clean and safe drinking water to nearby villages may be submitted. Source of drinking water in the villages may be furnished. 25. Baseline of soil quality may be furnished which also specifically includes ash pond area. 26. Prediction of air quality modeling and incremental concentrations may be clearly explained. Hourly and daily incremental concentrations may be computed vis-à-vis baseline data. Isopleths showing incremental concentrations within 10km radius along with sensitive receptors may be furnished. 27. Public Hearing videography is not submitted. 28. Queries

raised in the Public Hearing are benefit to the locals, medical facilities, drinking water facilities, skill development activities, direct employment, education, improvement of infrastructure, recreational activites, employment to land losers, detailed compensation scheme to land losers, distribution date of Certificates of ITI & IPJC training, plantation program, extinction of high quality species of mushrooms due to deposition of flyash etc. Response/replies given by Project Proponent are qualitative with no commitment. Action plan along with timelines and financial commitment towards addressing the queries raised in PH may be furnished. When the ITI training certificates will be given should be clearly indicated. Action plan for how the mushroom species is protected from flyash may be drawn in consultation with local forest department. Detailed Compensation Scheme for land losers should be submitted. PP should clearly indicate how many permanent and temporary jobs will be given in which area.

7. Name of the Project proponent along with contact details

a) Name of the proponent	: M/s. JSW Energy(Bengal) Limited.
b) State	: West Bengal
c) District	: Medinipur
d) Pincode	: 700091

CHAPTER 1
INTRODUCTION

1.1 BACKGROUND

JSW Energy (Bengal) Limited (JSWEBL) proposes to set up a 1x660 MW coal based Supercritical Independent Power Plant (IPP) at Salboni, Dist. West Medinipur, West Bengal.

JSWEBL has signed a Coal Supply Agreement with Equentia National Resources Pte Ltd, Singapore on 09th October, 2015. JSWEBL proposes to sell the entire power generated from the power plant to WBSEDCL at the tariff decided as per the CERC/WBERC norms.

Out of 560 acres of land available for developing the power project in phases, the first phase plant having 1 x 660 MW capacity will require 360 acres. JSWEBL is desirous for super-critical technology for the proposed power project in order to make the proposed power plant more energy efficient and eco-friendly.

1.2 NEED OF THE PROJECT

As per CEA's 18th Electric power survey report at the end of 12th plan there will be a gap of about 3000MW in power demand from the present generation capacity of 8654MW in West Bengal. This gap in demand will further increase to about 9000MW at the end of 13th plan.

Also the long term demand forecast for the state of West Bengal, the peak demand is going to increase from existing 7322 MW to 11793 MW in 2017-18 (at the end of 12th five year plan) and to 17703 MW in the year 2021-22 (at the end of 13th five year plan).

It is clear from the above statistic, while the state West Bengal is already having shortage of power, the State will face considerable shortage of power by end of 12th Plan and the situation will further aggravate by FY 2021-2022. Hence, even after completion of the proposed 1 x 660 MW power plant project by FY 2021 power shortage will continue to remain high for a considerable time period in the State of West Bengal.

In view of the above, the implementation of the proposed 1 x 660 MW power plant at Salboni is fully justified. The project, when implemented, will play a vital role as a reliable source of power to the State of West Bengal.

CHAPTER-2
THE SITE AND STUDY AREA

2.1 STUDY AREA

The study area for the purpose of this EIA study covers all areas within a radius of 10 km around the plant site. This area falls within the Paschim Medinipur District in West Bengal. The district map showing the plant site is shown in Exhibit-2.1, while the vicinity map is presented in Exhibit-2.2. There is no National Park / Wildlife Sanctuary within 10 km radius of the project site.

2.2 PLANT SITE

The proposed 1 x 660 MW Supercritical Thermal Power Project of the JSW is located at Salboni in the Paschim Medinipur District of West Bengal. The co-ordinates of the plant and ash pond are presented in a toposheet (Exhibit-2.3).

2.3 PLANT AND ASH POND CO-ORDINATES AND ELEVATION AND HIGH FLOOD LEVEL (HFL) OF NEAREST RIVER

a) Co-ordinates of the approved entire Plant Site are as follows :

Boundary wall corner co-ordinates

Sl No.	Marking	Easting	Northing	Latitude	Longitude
1	B1	256511.288	2498500.961	22° 35' 35.02349" N	87° 15' 28.26623" E
2	B4	256001.181	2497534.237	22° 35' 03.59399" N	87° 15' 10.41234" E
3	B16	256216.483	2496575.226	22° 34' 32.41839" N	87° 15' 17.95415" E
4	B21	256308.381	2495527.531	22° 33' 58.35911" N	87° 15' 21.17583" E
5	B26	258111.942	2494504.136	22° 33' 25.09348" N	87° 16' 24.30697" E
6	B30	258292.324	2493287.633	22° 32' 45.54594" N	87° 16' 30.62051" E
7	B40	259237.078	2494960.327	22° 33' 39.92296" N	87° 17' 03.68890" E
8	B47	260686.550	2494021.745	22° 33' 09.40526" N	87° 17' 54.41831" E
9	B60	260060.614	2495276.859	22° 33' 50.21078" N	87° 17' 32.51566" E
10	B69	261276.207	2494714.972	22° 33' 31.93816" N	87° 18' 15.06099" E
11	B77	262479.715	2494462.300	22° 33' 23.71484" N	87° 18' 57.18319" E
12	B84	262888.031	2494436.662	22° 33' 22.87757" N	87° 19' 11.47436" E
13	B97	262883.088	2496776.648	22° 34' 38.94859" N	87° 19' 11.32588" E
14	B107	261963.623	2497028.951	22° 34' 47.15880" N	87° 18' 39.14100" E
15	B117	260894.078	2496496.075	22° 34' 29.84259" N	87° 18' 01.69649" E
16	B133	259446.716	2498101.922	22° 35' 22.05301" N	87° 17' 11.03499" E
17	B148	257893.042	2496498.784	22° 34' 29.93770" N	87° 16' 16.64345" E
18	B153	258185.994	2498091.134	22° 35' 21.70372" N	87° 16' 26.89805" E

b) Co-ordinates of the Power Plant Site

Boundary Wall Corner Co-ordinates

Sl. No.	Marking	Easting	Northing	Latitude	Longitude
1	B62	260831.311	2495309.959	22°33'51.28331"N	87°17'59.49241"E
2	B69	261276.207	2494714.972	22°33'31.93816"N	87°18'15.06099"E
3	B84	262888.031	2494436.662	22°33'22.87757"N	87°19'11.47436"E
4	B97	262883.088	2496776.648	22°34'38.94859"N	87°19'11.32588"E
5	B107	261963.623	2497028.951	22°34'47.15880"N	87°18'39.14100"E
6	B117	260894.078	2496496.075	22°34'29.84259"N	87°18'01.69649"E

c) Co-ordinates of the Ash pond

The co-ordinates of the ash pond are :

Latitude - 22^0 33' 31.94"N to 22^0 34' 9.03"N &
Longitude - 87^0 18' 4.53"E to $87^0$18' 17.97"E

d) The elevation of the Proposed Power Plant Site

The elevation of the plant site varies from 39 m – 58 m

e) The elevation of the Ash Pond

The elevation of ash pond varies from 50.5 m – 58.5 m

f) The HFL of Parang river

The high Flood Level (HFL) of Parang river (nearest river to the site) is 12.650m (1978). The distance of the plant boundary from the HFL of this river is in excess of 500 metres

2.4 WATER BODY/NULLAH WITHIN THE SITE

A dried up water passage exists in the site. Approval of its diversion has been accorded by the I&W Directorate to JSWBSL on requisite payment (Refer Annexure-1)

Environmental Setting in 10 km Radius

Sl. No.	Particulars	Details
1	Project Area	Salika, Hatimari, Gaighata, Kulpheni, Jambedia, Asnauli,
2.	Elevation above MSL	39 – 58 m
3.	Climatic conditions (Based on IMD Medinipur)	Annual Max Temp 38.4^{o}C (Premonsoon) Annual Min Temp 12.8^{o}C (Winter) Annual Total Rainfall 1478.4 mm Predominant Wind Direction : South
4.	Present land use of project site	The plant site consists of 90% waste land and 10% agricultural land.
5.	Nearest National Highway	NH-60, 1.0 km, E (Refer Exhibit-2.4)
6.	Nearest Railway Station	Godapiasal – 4Km South (Refer Exhibit-2.4).
7.	Nearest Airport / Air Strip	Kolkata (180Km E) / Kharagpur (37Km)
8.	Nearest Town	Medinipur, 22Km S
9.	Ecologically sensitive zones like Wildlife Sanctuaries, National Parks and Biospheres Reserves	Nil in 15 km radius
10.	Archaeological monuments	Nil in 15 km radius
11.	Water bodies	Parang River – 4.6 km, SW Tamal River – 9.0 km, NE
12.	Defence Installations	None in 15 km radius
13.	Nearest Port	Haldia 120Km S
14.	Seismicity Zone	Zone - III

CHAPTER-3
ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY

3.1 BASIC APPROACH

The primary objective of an EIA Study includes determination of the present environmental status, study of the specific activities related to the project and evaluation of the probable environmental impacts due to these specific activities, thus, leading to the recommendations of necessary environmental control measures. An EIA Study, thus, necessarily includes collecting detailed information on the existing environmental scenario or 'baseline data' and establishing related data of the proposed activity i.e. 'project data' or 'plant data' in case of a Thermal Power Project. The project data, relevant to environmental aspects, is then superimposed on the baseline data and the resultant environmental conditions predicted with the help of effective predictive tools. The EIA is, thus, a comprehensive study on environmental impacts due to a project and also a tool to assess and mitigate the detrimental impacts on the environment due to construction and operation of the project (Refer Exhibit-3.1).

The project, in case, is the proposed Thermal Power Project of capacity 1 x 660 MW, located at Salboni, Paschim Medinipur District of West Bengal State.

The EIA is aimed at determining the environmental impacts on the study area of the project, which encompasses all areas falling within a radius of 10 km around the project site, due to the construction and operation of the power project.

The major environmental disciplines studied include geology, surface and ground water hydrology, meteorology, landuse, surface and ground water quality, air quality, terrestrial and aquatic ecology, demography and socioeconomics and noise. The Report consists of field data generated over a 3 month period (Dec, 2013 to March, 2014) along with relevant data collected from various agencies on the above disciplines. The report also consists of an Environmental Mitigation Plan (EMP) including proposed pollution control measures, solid waste management, green belt and afforestation plan, other recommended mitigatory measures, a disaster management plan and a post study monitoring programme.

3.2 ESTABLISHING BASELINE STATUS

3.2.1 Geology

The geology of the study area together with stratigraphic formations were derived from the records of the Geological Survey of India.

3.2.2 Hydrology

The hydrogeological description of the study area has been based on information derived from records of the Central Ground Water Board.

3.2.3 Meteorology

Meteorological data for such parameters as temperature, relative humidity, rainfall, wind speed and direction, which directly affect air quality, spanning 1993-2002 were collected from the IMD Station at Medinipur.

An onsite meteorological observatory was set up near the project site which was operated for three months during December, 2013 to March, 2014, representing winter scenario to supplement the above data. The parameters monitored on a daily/hourly basis at this observatory include temperature, relative humidity, wind speed and wind direction.

3.2.4 Landuse

Landuse patterns (forests, agricultural land, cultivable wasteland and land not available for cultivation) have been established from topographical sheets. Field investigations for ground truth verification were also carried out. The landuse map was prepared through interpretation of the topographical sheet and the results of the ground truth survey, corroborated through satellite imageries

3.2.5 Water Quality

A total of five stations (Exhibit-3.2), three stations for determination of surface water quality and two stations represented by tubewells for determination of ground water quality were set up within the study area. As such, Station SW1 was located on a pond within the project site, SW2 on Tamal River and SW3 was located on the Parang river. Ground water quality station GW1 was located at a tubewell near the ash disposal site at Chandan Kath, as the groundwater of this area may be affected due to leachate from the ash pond. GW2 was located at a tubewell near Balibhasha village.

Samples were collected on a monthly basis and this report covers data for a three month period from all the stations from December, 2013 – March, 2014, analysed for physical, chemical and bacteriological parameters as well as trace inorganics, heavy metals and toxic constituents. Analyses of water samples were conducted as per IS:3025, IS:2296 and IS:10500 and Standard Methods for Examination of Water and Wastewater (APHA, AWWA, WEF). Parameters such as pH, temperature, DO and turbidity were measured at site while the other parameters were analysed at the laboratory at Kolkata.

3.2.6 Air Quality

Ambient air quality monitoring was conducted at four appropriate locations within the study area (Exhibit-3.2). Four stations were located as close as possible to maximum deposition areas of pollutants from the plant determined through a preliminary air quality modelling exercise to establish the worst case resultant air quality due to the power plant emissions. One station was maintained in the upward direction. As such, Station AQ1 was located at Dhansol village, AQ2 was located at Bursha village, Station AQ3 at Kashijora and Station AQ4 at Tangrasole village. The monitoring was conducted at a frequency of twice a week for a three month period December, 2013 – March, 2014 to establish the background data on air quality in accordance with the National Ambient Air Quality Standards of 16th November, 2009. Twenty-four hour monitoring was conducted at each station using Respirable Dust Samplers. The parameters monitored include $PM_{2.5}$, PM_{10}, SO_2, NO_x and O_3 in accordance with the National Ambient Air Quality Standards, coupled with the pollutant emissions from power plants. For sampling and analyses of the above parameters IS:5182 and USEPA was followed.

3.2.7 Terrestrial Ecology

The baseline data on terrestrial ecology, covering both flora and fauna have been derived from existing literature and research conducted by various organisations, corroborated through field studies during the premonsoon season. The survey was adopted to determine the floral and faunal pattern within the study area.

3.2.8 Aquatic Ecology

The data on the aquatic life of the rivers Parang and Tamal was derived from past studies conducted by various organizations. Spawning and breeding habitat of fishes were also delineated.

3.2.9 Demography and Socioeconomics

Relevant data have been compiled from the District Census Handbooks of Paschim Medinipur District of the State of West Bengal for 2011 for obtaining the demographic and socioeconomic features and trends prevalent in the district Paschim Medinipur. The features which were analysed include population, household, population density, family size, sex ratio, SC-ST population, literacy rate, work participation rate and its distribution, work participation rate among females, industrial scenario etc.

3.2.10 Noise

The ambient noise scenario within the study area was monitored at 8 stations during premonsoon season (Exhibit-3.2) covering applicable landuse zones in the area as industrial, commercial, residential and silence areas in accordance with the ambient noise standards of the Ministry of Environment and Forests, Government of India. The monitoring has been conducted through a twenty-four hour period. Day time and Night time Leq values have been established.

3.3 ESTABLISHING PROJECT DATA

The project data consisting of the general layout and process description of the plant; its capacity and commissioning schedule; process flow paths; source, requirement and characteristics of fuels; storage details of raw materials and other chemicals; material handling systems; quantity, nature and disposal of solid wastes; plant water use and water balance diagram; details of liquid wastes and its treatment facilities; particulars of atmospheric emissions, sources of noise and their levels; etc are established in consultation with the officials of the Project Authority.

3.4 ASSESSMENT OF ENVIRONMENTAL IMPACTS

The impacts on soils and ground water regime of the area which would primarily result due to the solid waste disposal are studied through the data generated on soil characteristics.

The changes in landuse due to setting up of the proposed plant and ancillary facilities have been established from the long term data collected from various sources with particular emphasis on diversion of productive land and afforestation programme.

The impact on hydrology has been estimated through comparison between the total water available and the total water to be abstracted.

The impact on the water quality of the river Parang river has been studied. Secondary data has been used to estimate construction stage impact.

The impact on air quality during the construction stage due to fugitive dust emissions has been discussed. The long and short term (24-hourly) impact on the ambient air quality of the area due to the project which would mainly arise due to the stack emissions has been carefully quantified through mathematical modelling. The Industrial Source Complex (ISC3) dispersion model coupled with Pasquill stability classes and dispersion co-efficients (σ_y and σ_z) for the rural mode has been used for the purpose to estimate the incremental pollutant levels. The plume rise has been computed using the Briggs'

formulae. The impacts have been evaluated on a cumulative basis, taking into account other existing and future scenarios.

The impacts on terrestrial ecology due to changes in air quality and the impacts on aquatic ecology of the river as a result of the changes in water quality, were arrived at with reference to data on authentic research and literature. The impact on terrestrial ecology during construction has been predicted using secondary data.

The impact on ambient noise within the study area due to generation of loud noise levels from various sources during operation of the plant were predicted. The major noise sources of the proposed units were used for the simulation. Construction phase impacts due to noise generating equipments and machineries were estimated based on primary data generated at similar project sites.

3.5 ENVIRONMENTAL MANAGEMENT PLAN

An Environmental Management Plan (EMP) has been prepared which covers sources of pollution, proposed pollution control system/measures, solid waste management, green belt and afforestation programme, recommendation for additional mitigatory/remedial and control/safety measures and cost of pollution control systems.

3.6 ENVIRONMENTAL MONITORING PLAN

A post study monitoring programme including parameters, locations, frequency of monitoring and their implementation programme has been recommended. It also includes infrastructural facilities required for conducting the monitoring programme.

3.7 SCOPE OF THE REPORT

In order to obtain the required clearance from the Ministry of Environment and Forests (MOEF & CC), Govt of India, an Environmental Impact Assessment (EIA) Report is a statutory prerequisite. Thus, the EIA study is aimed at predicting the possible environmental impacts due to construction and operation of the project, suggesting environmental remedies/safeguards and formulating an effective Environmental Management Plan (EMP) to ensure an environmentally sustainable development.

This report is prepared based on the available/published data along with three months (December, 2013 – March, 2014) data generated through on-site monitoring of relevant environmental components and parameters, such as meteorology, air quality, water quality and noise during the winter season.

3.8 UNDERTAKING BY PROJECT PROPONENT

In accordance with the relevant office Memorandums of MoEF & CC, GoI, M/S JSW Energy (Bengal) limited (JSWEBL) is pleased to pledge its ownership and the correctness of the contents (factual information and data) contained in the EIA Report, to the best of our knowledge . It also states that M/S Ghosh, Bose & Associates (P) Ltd (GBPL), a duly accredited consultant of QCI/NABET were contracted to undertake the EIA study. There valid accreditation Certificate is enclosed vide Appendix-1

3.9 CERTIFICATION BY EIA CONSULTANTS

In accordance with the relevant office Memorandums of MoEF & CC, GoI, M/S Ghosh, Bose & Associates (P) Ltd (GBPL) duly accredited consultants of QCI/NABET are pleased to state that, to the best of their knowledge the information and data submitted is factually correct and the compliance of all the points of the prescribed TOR of MoEF & CC vide letter no. J-13012/18/2013-IA. II(T) dated 07.01.2014 has been presented in tabular form vide Annexure-2A, additional details sought by concerned Member Secretary after consideration of proposal in EAC meeting on 17th December, 2016 by MoEF&CC, vide file No. J-13012/128/2013-IA.I(T) has been presented in Annexure-2B & compliance against each point raised by Member Secretary, MoEF&CC by e-mail of December 17, 2016 is presented in Annexure-2C. As per Ministry's OM dated 05-10-2011, undertaking from project proponent for owing the contents is submitted in Annexure-2D. And as per Ministry's OM dated 04-08-2009, the document in support of claim of being authorized signatory for the proposed project is furnished in Annexure-2E.

GBPL are also pleased to state that the primary data generation has conducted through M/S Envirocheck, a NABL Accredited laboratory and that all relevant approved Functional Area Experts were involved in the study under the approved EIA Coordinator.

GBPL confirms that all the data and documents related directly to the project itself have been provided by M/s. JSWEBL.

CHAPTER-4
PROJECT DESCRIPTION

4.1 PROJECT VISION

A $11 billion conglomerate, the JSW Group is a part of the O.P. Jindal Group. JSW Group has grown and diversified by setting up businesses in various core economic sectors of the country and by having global footprints as well and has business verticals in Steel, Energy, Cement, Mining, Infrastructure and Information Technology.

The flagship company, JSW steel is India's leading integrated steel producer with a capacity of 14.3 MTPA and has a vision of achieving 40MTPA capacity by 2025.

JSW Energy, the energy vertical, aims to achieve a 6320 MW Power plant capacity.

Towards this end, the Group has planned to build a 3MTPA Integrated steel plant with an associated 300 MW Power plant at Salboni, West Bengal.

The Group has also envisaged setting up a 2.4 MTPA Cement Plant at Salboni.

Given the fact that the company is in possession of necessary land, water allocation and an agreement to import required Thermal Coal, it has decided, in consultation with Govt. of West Bengal, to pursue development of 1 x 660 MW power project as an IPP.

4.2 SELECTION CRITERIA OF TECHNOLOGY AND UNIT SIZE

The committee appointed by CEA to recommend the next higher unit rating in India, has recommended to adopt units of 660-1000 MW size in the country in its report of November, 2003. While arriving at the recommendation, the Committee has examined among other factors, the important aspects of grid reliability to withstand outage of unit of large capacity, future grid interconnection, increase in plant efficiency and reduction in the installation cost of large size power plants, reduction in consumption of coal, reduction in effluents and emissions, established reliability of large size units world-wide and environment benefits.

For the proposed plant, the unit would be of supercritical type. Supercritical pressure (throttle pressure above 221 bar (a)) steam cycle primarily would enhance power generation efficiency of the unit, compared to a subcritical steam parameters. Supercritical technology is a recent introduction in the country, and have been performing satisfactorily. The supercritical units have been found to be cost effective in terms of life cycle cost and reliability.

The generally adopted supercritical pressure (turbine throttle pressure) is 242.2 bar(a). For the purposes of the present report, following proven options of throttle steam and reheat steam parameters for the 1x660 MW units have been considered to prepare heat balances and to compute turbine cycle heat rates.

Main Steam pressure	242.2 bar(a)
Main steam temperature	565^{o}C
Reheat temperature	593^{o}C
Computed turbine cycle heat rate based on the above parameters	1850 kCAl/kWh

4.3 SALIENT FEATURES OF MAJOR PLANT EQUIPMENT

The basis of selection of plant and equipment is as follows :

1.	Turbine Cycle Heat Rate	1850 Kcal/Kwh
2.	Cycle of Concentration (COC) :	4
3.	Design Wet Bulb Temp	28^{o}C
4.	Cooling Tower Approach	5^{o}
5.	Temperature rise across Condenser	10^{o}C
6.	GCV of coal	5030 Kcal/Kg (Design)
7.	Coal storage in Yard	30 days
8.	Raw water storage	15 days
9.	Coal Bunkers in storage capacity	12 hours at BMCR
10.	ESP outlet emission level	100 mg/Cu. Nm at TMCR with one field out of operation and worst coal firing.

4.3.1 Based on above, following salient features of major equipment are envisaged :

- Pulverized coal fired, once through, balanced draft super critical boilers with BMCR around 2100 Tons per hour, regenerative type air pre-heater, Bowl/Tube type mills with one spare under worst coal firing, 2 x 60% duty ID, FD & PA fans etc.
- Tandem, compound, double flow, reheat regenerative & condensing steam Turbine having HP, IP & LP cylinders with TMCR around 1970 Tons per hour, with 3 Nos HP Heaters and 4 nos LP Heaters.
- HP&LP Turbine Bypass with capacity 60% TMCR.
- Horizontal, double pass, surface type, integral air cooling zone condenser with temperature rise of cooling water by 9 degrees at inlet temp. 33 degrees C with hot well storage 3 minutes at Turbine V.W.O condition.
- 3 x 50% duty Condensate Extraction pumps
- 3 x 50% duty Boiler Feed Pumps (2 nos steam Turbine driven & 1 no. motor driven).
- Spray cum Tray type Deaerator with 10 minutes storage at V.W.O condition
- Condensate polishing plant of full flow, 3 x 50% duty with mixed bed trains
- Circulating Water Pumps of 3 x 50% duty.
- Auxiliary Cooling Water pumps of duty, 2 x 100%
- DM Plant of total 2x70 m^3/hr capacity to ensure make-up requirement of heat cycle at the rate of 3% of the BMCR steam flow.
- Coal Handling Plant of 1450 TPH belts.

- Induced Draft Cooling Tower

- Control and Instrumentation system with major components : Distributed Control System (DCS) with Plant wide Data High way, Steam Generator Control and Protection System as per manufacturer's standard design with interfacing with the Plant DCS, Turbine Generator Control and Protection System as per TG manufacturer's standard design interfacing with the Plant DCS, Turbine Supervisory Instrumentation system for TG, Vibration monitoring system for major plant auxiliaries including BFP, Master and Slave Clock System, Central Control Room, Measuring instruments, Stack Emission Monitoring System etc.

4.4 LAND

Total land available for the overall power project is about 560 acres. For the 1st Phase of 1 x 660 MW, with its associated facilities including Main Plant, Coal Handling Plant, Water System, Switch Yard, BOP facilities, Water Reservoir & Green Belt, the land requirement is about 170 acres.

About 190 acres of land is required for Ash Disposal, Township and Corridors for Ash Slurry line, Raw Water Pipeline and In-plant Railway Facilities etc. Remaining land of 560 acres shall be reserved for future expansion of the power project.

Outline alignment of the plot and Plant Layout is shown in Plot Plan which is enclosed under Exhibit-4.1. The plant would be accommodated in the total land area of 4335 acres acquired for Integrated Steel Plant Associated Power & Cement Projects. The Composite Plot Plan is thus presented in Exhibit-4.2.

BREAK-UP OF THE PROJECT PLAN

SL. NO	PARAMETER	AREA (in acres)
Land inside power plant area: (acres)		
1	Main Plant	18
2	Coal handling plant	16
3	Water system	16
4	Switch yard	18
5	Miscellaneous BOP Facilities	32
6	Water reservoir	28
7	Land for green belt (33% of the main plant area)	42
A	**Total area inside plant including green belt**	**170**
Land outside power plant		
8	Land for ash disposal	85
9	Land for Township	30
10	Land for corridor for ash slurry, raw water pipeline, and Railway	75
B	**Total area outside plant including green belt**	**190**
C	**Total power plant land (A+B)**	**360**
D	**Future Expansion**	**200**
E	**Total Power Plant Land + Future Expansion**	**560**

4.5 FUEL

Imported coal is considered as main fuel from principally Indonesia and if the need arises, from Australia or South Africa. The coal grade from the prospective mines is expected to have calorific value of approximately 5030 Kcal/kg (Design coal). The Annual Coal requirement for the proposed 660 MW power plant at 85% PLF based on the Gross Plant Heat rate of 2265 kcal/kwh (as per CERC norms of design turbine Heat rate of 1850 Kcal/KwH and boiler efficiency of 87%) considering the imported coal of GCV, 5030 Kcal/kg would be 2.20 million TPA.

The secondary fuel would be HFO as per IS:1593 and LDO conforming to IS:1460. LDO would be used for light up and initial warm up of units, and heavy fuel oil (HFO) during start-up and flame stabilization at low loads. During normal operation, the fuel oil requirement is expected to be about 13.46 m^3/day and annual requirement is estimated to be about 4914 m^3 at 85% PLF, considering CERC norms of 1 ml/kWhr. Fuel oil for the power plant would be made available from any of the public sector oil companies nearest to the plant location.

4.5.1 Coal Transportation

The imported coal would arrive at Haldia Port through the sea route. The Haldia Dock Complex is adequately equipped to handle this quantity of imported coal as would be evinced from the concurrent letter issued by the Deputy Chairman, Kolkata Port Trust (Refer Annexure 3). The coal would then be transported to the Salboni site through the Indian Railway System.

4.5.2 Coal Characteristics

The Coal Analysis is presented bellow (Refer Annexure-4A) :

Parameters		**Results**	
Total Moisture (As Received Basis)	:	27.85	Pct
Inherent Moisture (Air Dried Basis)	:	14.35	Pct
Ash (Air Dried Basis)	:	5.14	Pct (Max 12.0%)
Volatile Matter (Air Dried Basis)	:	40.75	Pct
Fixed Carbon (Air Dried Basis)	:	39.76	Pct By Difference
Total Sulphur (Air Dried Basis)	:	0.20	Pct (Max 0.8 %)
Gross Calorific Value (As Received Basis)	:	5030	Kcal/kg
Hard Grove Index	:	55	
Size Crushed (0 x 50 mm)	:	91.02	% wt
Size above 75 mm	:	0.00	% wt
Size less than 2 mm	:	10.22	% wt

The heavy metal analysis of coal is presented below (Refer Annexure-4B) :

Parameters	Unit	Protocol	Sample (A)	Sample (B)
Arsenic	mg/kg	USEPA METHOD 200.7	0.27	0.05
Mercury (as Hg)	mg/kg	USEPA METHOD 200.7	BDL	BDL
Cadmium (as Cd)	mg/kg	USEPA METHOD 200.7	0.01	BDL
Cobalt (as Co)	mg/kg	USEPA METHOD 200.7	0.51	0.42
Chromium (as Cr)	mg/kg	USEPA METHOD 200.7	0.59	0.39
Zinc (as Zn)	mg/kg	USEPA METHOD 200.7	40.52	44.46
Nickel (as Ni)	mg/kg	USEPA METHOD 200.7	0.24	0.21
Lead (as Pb)	mg/kg	USEPA METHOD 200.7	1.12	0.62

Note : BDL of Hg <0.01; Cd <0.05 mg/l

Radio Activity analysis of fuel is enclosed as Annexure-4.

4.5.3 Analysis of Fuel Oil

The analysis results of HFO and LDO are depicted below :

Heavy Furnace Oil (HFO) Analysis as per IS 1593, 1982 (Drade – HV)

SL NO	Particulars	Unit	Details
1	Flash Point, min	Deg. C	66
2	Viscosity@15^{0}C, max	Cst	370
3	Pour point, max	^{0}C	20
4	Ash Content by Weight, max	%	0.1
5	Free Water content by Volume, max	%	1.0
6	Sediments by weight, max	%	0.25
7	Total sulphur by weight, max	%	4.5
8	Calcium	PPM	30.5
9	Sodium	PPM	10
10	Lead content	PPM	0.2
11	Vanadium	PPM	40.50
12	Carbon Residence (Rams Bottom)	%wt	7.74
13	Approximate Gross Calorific value	Kcal/kg	10,000
14	SP gravity at 15^{0}C max		0.89-0.95

Light Diesel Oil (LDO) Analysis as per IS 1460, 1995.

SL NO	Particulars	Unit	Details
1	Flash Point	Deg. C, min	66
2	Pour Point	Deg. C, min	12 for Winter, 21 for Summer
3	Density at 15^{0}C	Kg/m^3	850-870
4	Viscosity	Cst	2.5 – 15.7 at 40^{0}C
5	Ash Content by weight	% max	0.02
6	Water content by Volume	% max	0.25

SL NO	Particulars	Unit	Details
7	Sediments by weight	% max	0.1
8	Total sulphur by weight	% max	1.8
9	Approximate Gross Calorific Value	Kcal/kg	10,000

The Coal Supply agreement of JSW with Equentia National Resources Pte Ltd of Singapore is enclosed as Annexure-5.

4.5.4 Coal Handling System

The coal for the power plants will be received by train rakes at the Power Plant complex. The coal will be unloaded by wagon tippler and then conveyed and stored in the covered silos using circular stackers. The coal for the power plant will be reclaimed from this coal storage and conveyed to the bunkers at the Boiler. There shall be direct arrangement to feed coal to the boiler coal bunkers from the wagon tipplers.

4.5.4.1 Design Criteria

The design criteria for coal conveying, is based on the following functional requirements and assumptions :

a) Coal required at maximum continuous rating (BMCR) condition based on coal having a gross calorific value of 5030 kCal/kg is 250 TPH. Crushed coal of (-) 25 mm would be available at the power plant.

b) The coal handling system would normally operate for 16 hours per day towards coal supply for proposed unit. However the system would be designed for 24 hours continuous operation.

4.5.4.2 System Capacity

For 1 x 660 MW TPP maximum daily coal requirement would be 6027 tons. The annual coal requirement is about 2.20 MTPA. Coal handling system capacity would be 1440 TPH.

4.5.4.3 System Description

Coal received from the mines will be unloaded using wagon tipplers. The coal unloaded will be collected in the hopper and will be conveyed to the coal storage silo.

The stacking and reclaiming in the coal silo will be done using circular stacker reclaimer. There shall be facility for the manual feeding in case of the main equipment unavailability. Suitable junction tower will be set up as per the conveyor routing.

All conveyors would be provided with Nylon-Nylon belting with fire retardant (FR) grade covers of 5 mm thickness at top and 4 mm thickness at bottom. The belt width would be

minimum 1200 mm with a troughing angle of 35^{o}. The belt speed would be 3.55 m/sec, maximum.

Coal would be fed to the bunkers from conveyors through motorized traveling trippers. The openings on the top of bunkers would be covered with bunker sealing belt to avoid dust nuisance. The bunkers would be adequately ventilated so as to keep the bunkers free from accumulation of volatile gases, thereby eliminating fire hazard and also avoiding dust nuisance in the tripper floor. The ventilated air would be passed through cyclones and bag filters before being let out into the atmosphere.

Adequate number of electronic belt scales would be provided on conveyors at appropriate places to monitor the inflow of coal quantity to the bunkers.

Tramp iron and other magnetic materials would be removed by means of in-line magnetic separators provided on the head pulleys of conveyors feeding the tripper conveyors. Metal detectors would be provided on other conveyors at appropriate locations to detect non-magnetic metal pieces and heavy iron pieces that may be present in the coal being conveyed.

Dry fog type dust suppression system would be provided at all transfer points in the junction towers. The bunker ventilation system would be provided with dry type bag filters with cyclone to trap the dust generated while loading coal into the bunkers and to vent out dust free gases/air.

Fire hydrants would be provided at all junction towers, bunker gallery and along the conveyors.

Operation of the complete coal handling system, except traveling trippers on bunkers, would be monitored from the coal handling control room. Travelling trippers would be controlled locally. The control and protection system would be microprocessor based with redundant CPU and colour monitor. Telemetered integrated readings would be provided for accounting of coal consumed by the SG unit. Also, annunciation would be provided in the unit control room to indicate low level of each bunker.

4.6 STACKS AND EMISSIONS

4.6.1 Stacks

The combustion gases from the unit would be dedusted through an ESP and then discharged through one single flue stack of height 275 m. The flue top diameter would be 7.50 metres.

4.6.2 Electrostatic Precipitator (ESP)

It is proposed to install high efficiency electrostatic precipitators with an efficiency of 99.98% that would limit the outlet particulate emission to 100 mg/Nm^3.

4.6.3 Emission Parameters

The operation of the power plant results in stack emissions into the atmosphere consisting of particulate and gases like sulphur dioxide and oxides of nitrogen, which is likely to affect the background air quality of the area.

The coal to be used for power generation has a maximum ash content of 12%. Electrostatic precipitators of 99.98% efficiency would be installed which would limit the PM emission through the stacks to 100 mg/Nm^3. SO_2 and NO_x emissions would be released through the 275 m tall stack to effect wide dispersal of pollutants. SO_2 emissions would be 40.18 kg/hr based on maximum sulphur content of 0.8% and NO_x emissions would be lower than 1050 mg/Nm^3 or 550 ppm. The flue gases would be released at an exit velocity of 20 m/sec and at a temperature of 145^oC.

4.7 ASH GENERATION

Considering ash content of 12% in the coal, approximately 30 t/hr ash is likely to be generated and in total 0.264 Million tonne of ash per year is likely to be generated from 1 x 660 MW.

4.8 ASH HANDLING AND DISPOSAL

- Collection of Bottom ash in wet form (collection in dry form will be considered during BTG design stage);
- Collection of fly ash in dry form to facilitate utilization for cement plants.
- Disposal of un-utilized ash in conditioned form combined with bottom ash to the ash pond.
- Dust collection hoppers at all strategic locations will have a minimum storage capacity of eight (8) hours.
- Dewatering bin will have 24 hours storage capacity and be of RCC construction with erosion resistant stainless steel internal lining.
- Pneumatic conveying system (either vacuum system or pressurized system) will be employed for extraction of fly ash from the electrostatic precipitator hoppers in dry form.
- During emergency, when ash utilization is not possible, fly ash will be transported from fly ash silo to ash mound area located inside the plant boundary by closed trucks with conditioned ash.

4.8.1 Ash Handling System

The following would be the design criteria for the proposed ash handling system :

Hourly coal firing rate at BMCR condition per unit	250 TPH
Ash content in coal considered for the design of ash handling system	12%
Distribution of total ash produced as	
Bottom ash	20%
Fly ash	80%
Volume occupied by one tonne of ash in storage area	1 m^3
PLF	100%

Wet/Dry type bottom ash removal system is proposed for bottom ash removal. The bottom ash shall be cooled and conveyed using special conveyor system. Large size clinkers will be crushed and stored in the silo. This ash would be disposed off by trucks.

Fly ash removal system would be either vacuum-cum-pressure type or pressure type pneumatic system with dry disposal by closed trucks for utilization with provision for disposal to ash disposal area in high concentrate slurry form in emergency.

The water required for slurry formation and ash conditioners would be met from CW blow down. However, service water would be used for jacket cooling of air compressors, silo /ESP aeration blowers etc.

4.8.2 Bottom Ash Handling System

A maximum of 20% of the total ash produced by steam generator would be collected as bottom ash in dry form. The bottom ash hopper would have a capacity to store about eight (8) hours collection of bottom ash.

4.8.3 Fly ash handling system

The fly ash handling system would be dense phase pressure pneumatic type. The fly ash collected in the ESP hoppers, air pre-heater hoppers, economizer hoppers and stack hoppers would be evacuated pneumatically. Air compressors of suitable capacity would be installed for conveying fly ash from ash hoppers to fly ash silos. Clearance of ash from hoppers connected to common fly ash header would be done one after another. Shifting of ash clearance cycle from one hopper to the next will be automatic. The ash collected in each fly ash hopper would be conveyed to ash silo.

4.8.4 Fly Ash Storage Silo and Disposal of Fly Ash from Silo

There would be two (2) fly ash storage silos having a holding capacity of 2000 tonnes. Each silo would be provided with 5 outlets. Two outlets would cater to unloading into road

trucks / tankers through paddle type dust conditioners or unloading spout. One outlet would be left blank. Two outlets to cater to HCSD system during emergency would be provided.

4.8.5 Fly Ash Disposal System (Emergency)

The high concentrate slurry disposal system would be provided for ash disposal during emergency conditions. The concentration of ash in the high concentrate slurry would be about 65-70 % by weight. This slurry would be pumped by HCSD pumps to ash disposal area.

4.8.6 Ash Disposal Area Development

The ash disposal area is provided with LDPE / HDPE membrane so as to prevent contamination of ground water.

4.8.7 Control System

To automatically control all the compressors, pumps, valves, etc, in the fly ash handling system, a centralized control panel with micro processor based PLC would be provided in the control room for the ash handling system.

The PLC system would provide for continuous cyclic operation of fly ash evacuation system. The opening and closing of the valves below fly ash hoppers would be controlled with the help of level switches provided on the transmitter vessel / fly ash hoppers in various streams. The hopper from which fly ash is being removed would be indicated on the monitor or mimic panel. The equipment and valves in the bottom ash handling system would be controlled automatically through a separate PLC system provided in the boiler area. The status of operation of bottom ash handling system would be available on the monitor or mimic panel in ash handling system control room.

Silo unloading system would be controlled from the local control panel located at silo unloading floor.

4.9 WATER

The plant water requirement for condenser cooling, cycle make up and other consumptive requirements after pre treatment will be met from Rupnarayan River which is about 80 kms from the proposed project site. Estimated total consumptive raw water requirement for the proposed 1 x 660 MW plant is about 1980 m^3/hr considering recirculating closed cooling water system with cooling towers. The clarified water will be used for condenser cooling. The major quantity of clarified water will essentially be the makeup water for the

cooling towers to compensate the loss on account of evaporation, drift and blow down. Closed cooling water system with Induced Draft cooling tower is used for cooling of the condenser cooling water.

The river water will be drawn from the intake site using intake water pumps and supplied to the raw water reservoir. The reservoir will have storage capacity sufficient to cater for 15 days requirement of the power plant. The raw water will be clarified at the Pre Treatment Plant. Water Balance Diagram I & II for the Plant is enclosed as Exhibits-4.3 & 4.4.

Water allocation letter for 45 MGD water of River Rupnarayan from Irrigation & Waterways Department, GoWB is enclosed as Annexure-6.

4.9.1 Water System

The water would be used for condenser cooling, cooling of SG and TG auxiliaries and various other requirements like SG makeup, service and fire protection system etc. Various sub-systems of the water system are indicated below :

1. Raw Water system
2. Clarified Water system
3. DM Water system
4. Condenser Auxiliary cooling Water (ACW) system
5. Water treatment (WT) system
6. Service water system

4.9.1.1 Raw Water Supply System

The daily requirement of raw water for the proposed plant is expected to be about 47,520 m^3/day. Raw water will be received at approximately 2 kg/cm^2 near the plant boundary.

4.9.1.2 Clarified Water System

The raw water will be clarified in clarifiers. Clarified water will be sourced from clarified water tank. The clarified water will be directly used for the CW makeup, plant service & fire water system without any further treatment. The clarified water will be stored in tank sized for adequate storage.

4.9.1.3 DM Water System

The DM water storage tank will be sized to cater to one day requirement. The DM water will be used for condenser cooling system, cooling of SG and TG auxiliaries and plant service.

4.9.1.4 Clarified Water Treatment

Chlorination system will be provided at the inlet of clarified water storage tank. Electro chlorination skid will be used.

Break up of plant water requirement for various utilities are given below:

Plant Water Requirement (1 x 660 MW)

Sl. No.	Purpose	Estimated Quantity		Quality
		M^3/hr	M^3/day	
1.0	CW Make up for Evaporation & drift	1368	32832	Clarified water
2.0	CW make up for blow down from CW system	442	10608	Clarified water
3.0	Service Water, HVAC make up, Misc requirement	150	3600	Clarified water
4.0	Clarifier sludge	60	1440	Clarified water
5.0	To produce DM water for SG makeup, ACW makeup and potable water	43	1032	Clarified water
6.0	Ash water makeup	0	0	Raw water provision only
7.0	Total raw water requirement	2058	49392	River water + Recycled water
8.0	Evaporation loss	52	1248	
9.0	Recycle from Effluent Treatment Plant	310	7440	
10.0	Actual Raw water requirement considering evaporation and margin and recycled water	1800	43200	River water
11.0	Total Raw Water requirement considering 10% margin	1980	47520	River water
12.0	Ash handling system	200	4800	Recycled water
13.0	Coal handling plant	50	1200	Recycled water

4.9.1.5 Condenser Cooling Water (CW) System

Cooling Tower

Re-circulation type cooling system with Induced Draught Cooling Tower (IDCT) is proposed for CW system. The condenser circulating cooling water flow is estimated to be 85000 m^3/hr.

The cooling tower will be designed to cool the water from 43^oC to 32^oC at a design atmospheric wet bulb temperature at 28^oC (tentative).

4.9.1.6 Cooling Water (CW) Pumps

Three Nos 3 x 33.3% capacity each CW pumps each of 28,500 cu. m/hr. Capacity each are proposed for the cooling water system of 1x660 MW unit. Three pumps would be working continuously.

4.9.1.7 CW Blow Down and Make-up Water Requirements

Make-up water requirement of CW system is obtained as the sum of drift and evaporation losses from the cooling towers and blow down from the CW system. In order to conserve water, the blow down would be utilized to meet the water requirement of the coal and ash handling system. Blow down is taken from CW condenser outlet and from the ACW pump discharge.

4.9.1.8 Optimization of COC

Based on the evaporation loss and blow down quantity the cycle of concentration ratio (COC) (ratio of solids concentration in circulating water to that in make-up water) is about 4.0. Chemical dosing is required to prevent scaling and corrosion due to the operation of the CW system at this COC.

4.9.1.9 Make-up System

Make up water to CW system shall be supplied by CW makeup pump. 3 x 50% CW makeup pump will supply the clarified water from clarified water storage tank.

4.9.1.10 CW Chemical Dosing System

Based on the evaporation loss and blow down quantity indicated earlier, the cycle of concentration ratio (COC) (ratio of solids concentration in circulating water to that in make-up water) is about 4.0. Chemical dosing is required to prevent scaling and corrosion due to the operation of the CW system at this COC.

To prevent / control algae growth in the CW system, chlorine dosing will be provided. Continuous dosing will be done at the rate of 1 ppm and shock dosing will be done at a rate of 3 ppm. Chlorine leak detection and absorption system will be provided to trap chlorine leakage from chlorine tonners.

4.9.1.11 Side Stream Filtration

Condenser cooling water will be treated further in side stream filtration (SSF) plant which shall be provided near the CW forebay to restrict the total suspended solids (TSS) and turbidity level in CW conduit. Side stream filtration plant will be designed for a capacity of 1.5% of CW and ACW flow rate.

4.9.1.12 Auxiliary Cooling Water (ACW) System

The ACW system meets the cooling water requirements of all the auxiliary equipment of the TG and SG units such as turbine lube oil coolers, seal oil coolers, stator water coolers, BFP auxiliaries such as lube and working oil coolers, seal water coolers, drive motors and sample coolers etc.

A closed loop system using passivated DM water is proposed for ACW system. The hot water from these auxiliaries is cooled in the plate type ACW heat exchangers by the circulating water tapped from the main CW circuit and boosted by secondary cooling water pumps.

4.9.2 Water Treatment Plant

The water treatment plant broadly consists of filtration followed by a DM (Demineralisation) plant which will provide DM water to meet steam generator make up and ACW system make-up.

4.9.2.1 Filtration Plant for DM Plant

The filtration plant consists of 2 x 50% vertical pressure sand filters of dual media type, capacity of 27 m^3/hr each, to remove turbidity and suspended solids.

Activated carbon filter (ACF) will be used for dechlorination purpose. Two (2) Nos ACF of capacity 27 cum/hr will be provided for this purpose. This filter will remove traces of organics also in addition to dechlorination. The filter will be of mild steel construction with bituminous painted, internally. Filter media will be essentially activated carbon.

4.9.2.2 De-Mineralising (DM) Plant

The quality of SG make up water required is as follows :

Total Silica as SiO_2	:	Not greater than 0.02 ppm
Conductivity	:	$\leq$ 0.1 µmho/cm at 25^oC
pH	:	6.8-7.2

It is proposed to provide two (2) x 50% streams DM plant, each stream designed for a net output of 1000 m^3/day. Each stream of the DM plant will consist of the following:

a) Cation Unit
b) Degasser System
c) Arion Units
d) Mixed Bed (MB) unit
e) Regeneration system
f) Neutralising system

4.9.2.3 Service & Potable Water Systems

The service water system supplies water required for HVAC system and miscellaneous requirements of station building.

Potable water system will be derived from the clarified water after required chlorine dosing.

4.9.2.4 Fire Protection System

An elaborate fire hydrant system covering all the buildings of the proposed power plant including coal stockyard would be provided. The water would be drawn from the raw water storage tank and reserve capacity of 2000 m^3 earmarked for the system.

The following fire protection systems are proposed :

a) Automatic High Velocity Water Spray (HVWS) system for the protection of transformers and manual HVWS system for the protection of turbine oil tanks.

b) Automatic deluge (Medium velocity water spray) system for the protection of cable vaults.

c) Heavy-duty portable or trolley mounted fire extinguishers for the protection of control rooms.

d) Portable fire extinguishers for different areas.

The system would be designed to conform generally to the rules and regulations of fire safety standards as per NFPA.

4.10 EFFLUENT TREATMENT SYSTEM

Waste water from various systems like blow down water from the boiler, drains from various plant drains, after oil separation, cooling tower blow down etc, would be collected in the guard pond. The water from guard pond will be treated in effluent treatment plant.

Waste water from colony will also be treated in the effluent treatment plant. The waste water from DM plant regeneration and filter backwash would be first neutralized in the neutralizing pit and then transferred to Guard Pond.

Wash water from Air Pre-heater would be first collected in a settling basin for the collection of ash particles and then pumped to the Guard Pond. Sewage from various buildings in the power plant would be conveyed to sewage treatment plant.

Water from the guard pond will be ultilised for Ash handling system, Coal Handling dust suppression and the remaining water will be treated in effluent treatment plant. The effluent plant will use reverse osmosis (RO) process to reclaim as much water as possible to minimize the consumption of water and the sludge from effluent treatment plant will be disposed to ash pond, thus ensuring zero discharge of liquid effluents from the power plant. Details are provided in the water balance diagram. (Refer Exhibit 4.3)

4.10.1 Re-Use and Recirculation of Effluents

The effluents from DM plant neutralizing pit, plant drains, oil separator, back wash form side stream filter, CW Blow down water, Boiler blow down water etc. will be

collected in a Guard pond for further reuse. From the guard pond part of water would be re-used for coal handling system, ash handling system, plant washing and the remaining water would be supplied to effluent treatment plant and consequently reclaimed water will be recycled to the raw water reservoir .

4.11 POWER EVACUATION

Evacuation of power from the proposed power plant will be done at 400 kV level through 400 kV transmission lines connected to Kharagpur S/S & Chanditala S/S of WBSEDCL

The full net power (ex-bus) will be 620 MW with estimated auxiliary power consumption of 6% of unit rating. The net generation will be 4619.5 GWh per annum with Plant Load Factor of 85%.

CHAPTER-5
BASELINE ENVIRONMENTAL SCENARIO

5.1 GEOLOGY AND HYDROGEOLOGY

5.1.1 Introduction to Geology

The plateau area is generally devoid of rock exposures, being widely covered by laterite and soil/murrum capping. The western part of the study area consists of a hard laterite formation and eastern part has been formed out of the alluvial deposits borne down by the Hooghly and its tributaries from the great gangetic system.

The generalized geological succession of the area may be summarized as below :

Quaternary	Recent to Sub-Recent	Soil Laterite Bauxite Litho marge
	Pleistocene	Sand, clay, silt, kankar and gravel
	Upper Cretaceous to Eocone	Weathered Granite Gneiss
----------Unconformity ----------		

Both the Recent and Pleistocene sediments have been deposited successively by the river and Ganga as flood-plain deposits. In lithological characters, both the group of sediments are remarkably similar. Pleistocene and Recent sediments do not differ in maximum grain size, but an excess of very fine grained material is found in the Pleistocene deposits. Recent sediments are loosely compacted and have water content and variable and appreciable quantities of organic material. Pleistocene sediments occurring on the surface are reddish brown or motted and have undergone a great degree of oxidation. Occurrence of gravel and calcareous concretions are more common in the sediments, which are believed to represent Pleistocene series.

Recent sediments are represented by sand, silt and clay. On the basis of the depositional history the alluvial plain can be divided into three environments of depositions. These are (1) the ancient braided stream bars and channels, (2) the floored plain or back swamp environment and (3) the meander belt.

The lithological Map depicting occurrence/deposits of minerals is presented in Exhibit-5.1.

5.1.2 Geology and Hydrogeology

Geomorphologically, the area falls in laterite covered platform sedimentary area underlain by the deposits of the Older alluvium bearing rolling plains. The area presents a gradual sloping topography.The main geological formations of the area represent the Quaternary

unconsolidated formation consisting of laterite, yellow to reddish clay with kankar, ferruginous gravel and fine to medium yellow sand. The Quaternary sediments are underlain by the tertiary sediments of Mio-Pliocene age. The tertiary sediments comprise of alternation of graded sand, silt and clay. The maximum thickness of older alluvium is within 50m which is capped by laterite. Laterite is having a typical reddish brown colour. A zone of lithomergic clay marks the contact between the top laterite and the underlying Quaternary sediments.

The geological sequence of the area as revealed from the study represent occurrence of laterite and lateritic soil at the top underlain by thick sequence of clay, silt, sand and gravel down to 200 m.

Hydrogeological study reveals the presence of several granular zones in the areas within a depth of 90m. Below this, two or three ground water zones are generally found up to a depth of 180m. Ground water condition in the upper aquifer up to 20m bgl is under unconfined condition. Depth of water level in monsoon period for shallow aquifer ranges from 4m-10m bgl and for deeper aquifer from 5-12m bgl. Due to confining nature of the deeper aquifer, at places, we get artesian condition of ground water such as valley portion in a rolling topography. Due to the presence of laterite, yield in the tube wells is relatively low. A medium duty tube well tapping granular zone of 15-25m up to 170m depth can yield 30-50m^3/hour with 6-10m draw down.

5.1.2.1 Methodology

Schlumberger sounding array was used in the area to know the vertical variation of resistivity along depth and to locate the aquifer zone and proper bore well sites. In this method, all four electrodes are kept in one line. Current is sent into the ground through two outer current electrodes and the resulting potential difference is measured between two inner electrodes comprising carbon pots. The current electrode spacing is gradually increased. Resistance of the ground is measured for different sets of electrode spacing. As the separation between the current electrodes is increased, current penetrates deeper and the observed resistance pertains to resistivity of the deeper bodies. Depth of investigation depends on the resistivity structure in the subsurface; the higher the resistivity, the more is the depth of investigation. Maximum current electrode spread of 600m was used in the investigation. Depth of probe was in the range 180m-200m

Corresponding to each spacing of electrodes, apparent resistivity is calculated at the centre of the spread using the following formula**.**

$\rho_{a=} \Pi n(n+1)a. (\Delta V/I)$,

where,

a = distance between two potential electrodes in m

na = distance between the centre of the electrodes and one extreme current electrode in m.

Resistance ($\Delta V/I$) has been measured by the resistivity meter. DC resistivity meter manufactured by M/s IGIS was deployed to measure the resistance of the ground. Five battery packs (450 volts) were used for sending current into the ground.

Thus, data for a sounding curve is generated for each sounding point (location).These data (apparent resistivity vs. half the current electrode separation) have been plotted on a Log-Log scale. These curves are interpreted by curve matching technique with a set of master curves of Orellena and Mooney. The interpreted parameters, thus obtained are the resistivity and thickness of each subsurface layer up to the depth of investigation. Finally, these resistivity values of the layers are interpreted in terms of geological formations and aquifer zone.

Interpreted parameters viz. resistivity and thickness of different subsurface layers are given in Table-5.1.

Data Analysis and Interpretation

Based on the known geology of the area, our past experience and present VES investigation, correlation has been made between the various litho logical units including ground water zone and the true resistivity values interpreted in the area. These are generally as follows:

Lithology		**Resistivity**
Saturated sand with pebbles/gravel (Good aquifer zone)	:	80 Ohm.m - 150 Ohm.m
Saturated sand (Good aquifer zone)	:	30 Ohm.m-80 Ohm.m.
Clay, Sandy clay, Clayey sand, Silt, very fine sand	:	Less than 25 Ohm.m

The above resistivity values are considered as general guide line only.

Details of Interpreted Vertical Electrical Soundings are given below:

VES-1 (Ankur Area, N 22^0 34′ 43.1″, E 87^0 18′ 34.0″)

The top hard laterite layer is 3m thick followed by a predominantly sand rich zone with some clay intercalations up to a depth of 46.5m. Below this, ground water bearing sand zone mixed with pebbles is interpreted up to 100.5m. Further down, another good aquifer zone is inferred continuing at least up to 165m.

VES-2 (Ankur Area, N 22^0 34′ 42.1″, E 87^0 18′ 32.6″)

Aquifer zones comprising mainly sand with some probable pebbles are interpreted below 48.3 m and continuing up to 110 m below ground level (b.g.l.). The second aquifer zone comprising mostly sand occurs below this, continuing at least up to 165 m.

VES-3 (Ankur Area,N 22^0 34′ 41.7″, E 87^0 18′ 30.0″)

Aquifer zones comprising mostly sand occur below 45.8 m and continue up to 165 m. However, within the broad sand zone, some clay layers are likely**.**

VES-4 (Ankur Area,N 22^0 34′ 39.2″, E 87^0 18′ 25.2″):

The top layer is 2.8 m thick followed by a predominantly saturated sandy horizon at depth. A very good aquifer zone is interpreted below 113 m continuing at least up to 180 m. Some intermittent clay intercalations are likely within this broad zone.

VES-5 (Ankur Area,N 22^0 34′ 39.2″, E 87^0 16′ 23.6″):

A predominantly ground water bearing zone comprising mostly sand is interpreted below 3.1 m continuing at least up to 165 m. Some clay intercalations are likely within this broad zone.

VES-6 (Ankur Area, N 22^0 34′ 44.6″, E 87^0 18′ 30.3″)

The top compact laterite is 4m thick followed by a predominantly sand layer at least up to 180 m. This is a very good zone for sinking a deep tube well up to 165 m depth.

VES-7 (Ankur Area, N 22^0 34′ 45.2″, E 87^0 18′ 24.4″)

A very good aquifer zone is interpreted below 46.8 m continuing up to 180 m or more.

VES-8 (Ankur Area, N 22^0 34′ 44.5″, E 87^0 18′ 27.1″)

A very good aquifer zone occurs from 48.8 m to 180 m. This is mainly a saturated sand zone with occasional pebbles and clay layers.

VES-9 (Natundih, N 22^0 35′ 20.0″, E 87^0 17′ 08.3″)

This location is at a lower level compared to the surroundings. A good aquifer zone comprising mostly sand is obtained from 40m to 198.9 m bgl. Some clay intercalations are likely within this broad sand zone.

VES-10 (Natundih, N 22^0 35′ 17.0″, E 87^0 17′ 05.1″)

Aquifer zone comprising sand occurs between 44.2 m and 99.4 m and again below 132.1 m up to about 165 m. This is a moderately good zone for ground water.

VES-11 (Natundih, N 22^0 35′ 13.9″, E 87^0 17′ 06.1″)

Aquifer zone occurs from 40.9 m to 103.1 m and from 129.5 m to 173 m.

VES-12 (Natundih, N 22^0 35′ 10.0″, E 87^0 17′ 7.2″)

No good aquifer zone occurs hetre.

VES-13 (Natundih N 22^0 35′ 16.8″, E 87^0 17′ 02.2″)

This is located on road at a lower level as compared to the surroundings. Good aquifer zone is inferred below 40m depth continuing up to 165m and beyond.

VES-14 (Kulpheni, N 22^0 34′ 38.8″, E 87^0 19′ 04.8″)

A very good aquifer zone is inferred between 12.2 m and 165.4 m. This zone comprises mainly of sand with a few clay intercalations.

VES-15 (Banskopa, N 22^0 34′ 41.4″, E 87^0 16′ 41.5″)

A moderately good aquifer zone is interpreted between 125.4 m and 180 m.

VES-16 (Banskopa, N 22^0 34′ 39.3″, E 87^0 16′ 43.3″)

This is not an encouraging zone for ground water.

VES-17 (Banskopa, N 22^0 34′ 43.9″, E 87^0 16′ 45.7″)

A moderately good aquifer zone is interpreted between 42.8 m and 101 m and from 131.8 m to 158 m.

VES-18 (Banskopa, N 22^0 34′ 49.3″, E 87^0 16′ 51.9″)

This is located at a lower level. A very good aquifer zone is interpreted between 44.2 m and 99.4m and also between 132.1 m and 165 m.

VES-19 (Banskopa,N 22^0 34′ 55.3″, E 87^0 16′ 58.1″)

The location is at a lower level. A very good aquifer zone occurs below 35.3 m continuing up to 165 m. However, this broad saturated sand zone will contain some clay intercalations.

VES-20 (Ghagrasol,N 22^0 34′ 31.1″, E 87^0 15′ 22.2″)

A good aquifer zone is inferred below 11.5 m continuing up to 165 m. However, within this broad zone, there would be some clay intercalations.

VES-21 (Ghagrasol, N 22^0 34′ 32.4″, E 87^0 15′ 25.0″)

A good aquifer zone occurs below 21.6m and continues at least up to 165 m. Needless to say, that this broad zone contains some clay intercalations.

VES-22 (Ghagrasol, N 22^0 34′ 34.6″, E 87^0 15′ 29.6″)

Moderately good ground water zones have been delineated below 12.6m continuing up to 165m bgl.

VES-23 (Ghagrasol-Shimulpur, N 22^0 34′ 55.4″, E 87^0 16′ 07.9″)

Moderately good ground water zones could be delineated here between 46.3m and 101m; and between 134.5m to 162m.

VES-24 (Ghagrasol-Shimulpur, N 22^0 34′ 57.2″, E 87^0 16′ 03.1″)

No encouraging ground water zone was found here.

VES-25 (Ghagrasol, N 22^0 34′ 47″, E 87^0 16′ 9.1″)

Moderately good aquifer zone occurs from 95.6 m to 165 m or more.

VES26 (Borju, Opposite Football Ground, Near Forest, Proposed Reservoir Area, N 22^0 33′ 06.1″, E 87^0 16′ 26.0″)

A good aquifer zone has been identified from 20.5 m to 180 m or more.

VES-27 (Borju, Near Forest, Proposed Reservoir Area, N 22^0 33′ 08.7″, E 87^0 16′ 28.2″)

A good ground water zone is interpreted between 42.5 m and 101.5 m and also from 132 m to 164 m.

VES-28 (Borju, Near Forest, Proposed Reservoir Area, N 22^0 33′ 11.9″, E 87^0 16′ 30.1″)

Good ground water zone is interpreted from 44.8 m to 165 m bgl.

VES-29 (Borju, On Road Side, N 22^0 33′ 15.1″, E 87^0 16′ 32.0″)

This is located at a lower level. A very good zone is inferred between 19.6 m and 165 m.

VES-30 (Borju, On Paddy Field, N 22^0 33′ 18.5″, E 87^0 16′ 30.3″)

This is located at a low level. A very good aquifer zone has been identified from 20.3 m to 162.3 m depth. The zone comprises mainly of sand with some clay intercalations.

VES-31 (Kulpheni, N 22^0 34′ 30.5″, E 87^0 19′ 04.6″)

Two very good aquifer zones have been identified in the depth range 11.6 m - 68.8 m and 96.8 m-162.8 m.

VES-32 (Kulpheni-Balibasa, N 22^0 34′ 26.7″, E 87^0 19′ 04.8″)

One very good aquifer zone has been delineated in the depth range 12.5 m-70.6 m and 93.6 m-165 m.

VES-33 (Kulpheni-Balibasa, N 22^0 34′ 23.8″, E 87^0 18′ 45.2″, West Side On Higher Ground)

Moderately good aquifer zone has been identified between 94.7 m and 180 m bgl.

VES-34 (Balibasa Ground, South of Southern Goal Post, N 22^0 34′ 21.6″, E 87^0 19′ 05.4″)

Very good aquifer zone is interpreted in the depth range 12.1 m - 69.7 m and 94.5 m-164.5 m.

VES-35 (West of Balibasa, On Higher Ground, N 22^0 34′ 17.1″, E 87^0 18′ 33.7″)

Aquifer zone has been delineated between 46.7m & 100.3m and 130.4 m & 165 m.

VES-36 (Near Thatched House, On Thatched House, Near Balibasa, N 22^0 34′ 11.2″, E 87^0 19′ 04.3″):

Moderate aquifer zone has been identified in the depth range 8.4 m-50.4 m.

VES-37 (Lalbandh, Near Railway Line, N 22^0 34′ 01.7″, E 87^0 19′ 09.4″)

A very good aquifer zone has been delineated from 11.5 m to 173 m and beyond. The zone mainly comprises of sand with some clay intercalations.

VES-38 (Between Balibasa and Lallbandh, N 22^0 34′ 07.6″, E 87^0 19′ 07.4″)

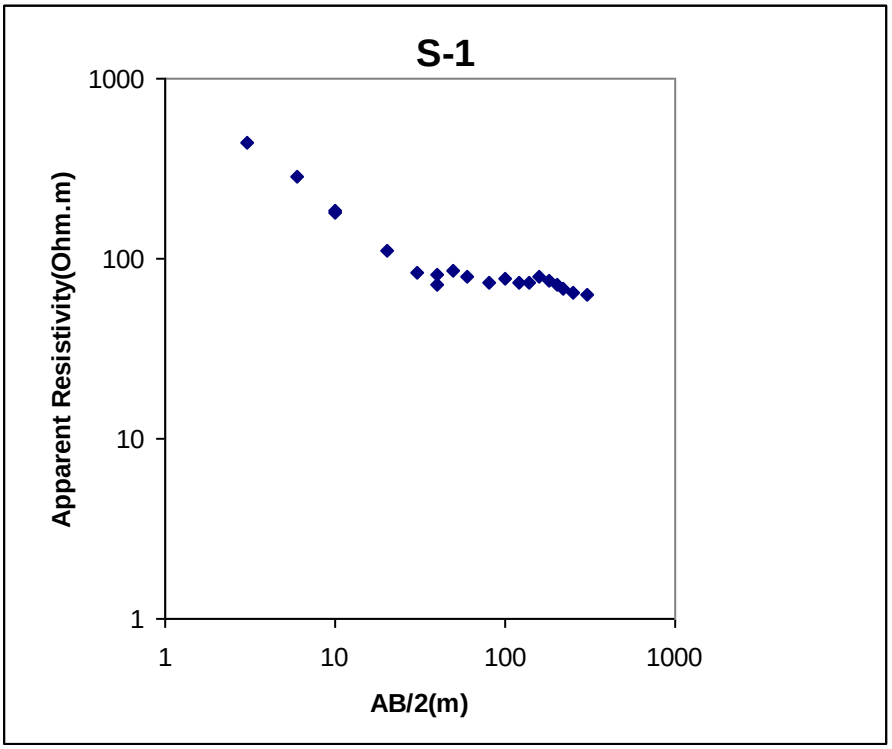
Very good aquifer zones have been identified in the depth range 3.1 m - 49.5 m and 116 m – 165 m.

VES-39 (About 250m South of Southern Boundary Wall of Ankur, N 22^0 34′ 29.2″, E 87^0 18′ 24.8″)

One very good aquifer zone has been identified below 4.2 m continuing up to 165 m.

VES-40 (About 250m South of South-Western Point of Ankur, N 22^0 34′ 32.7″, E 87^0 18′ 18.7″)

One very good aquifer zone comprising mostly saturated sand has been identified from 21.5m to 164.5m depth.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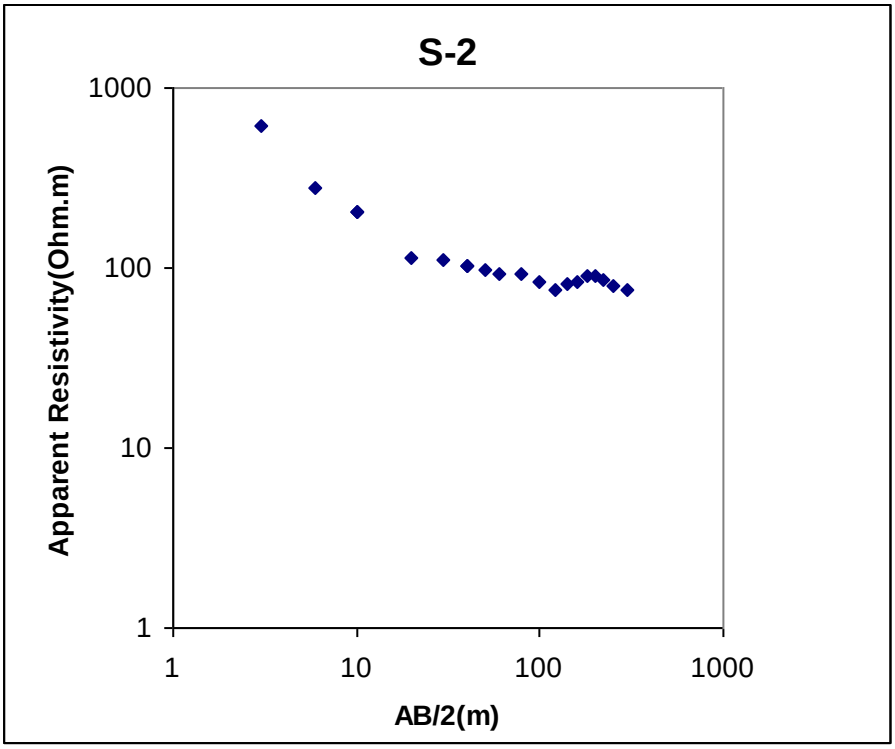
AB/2(m)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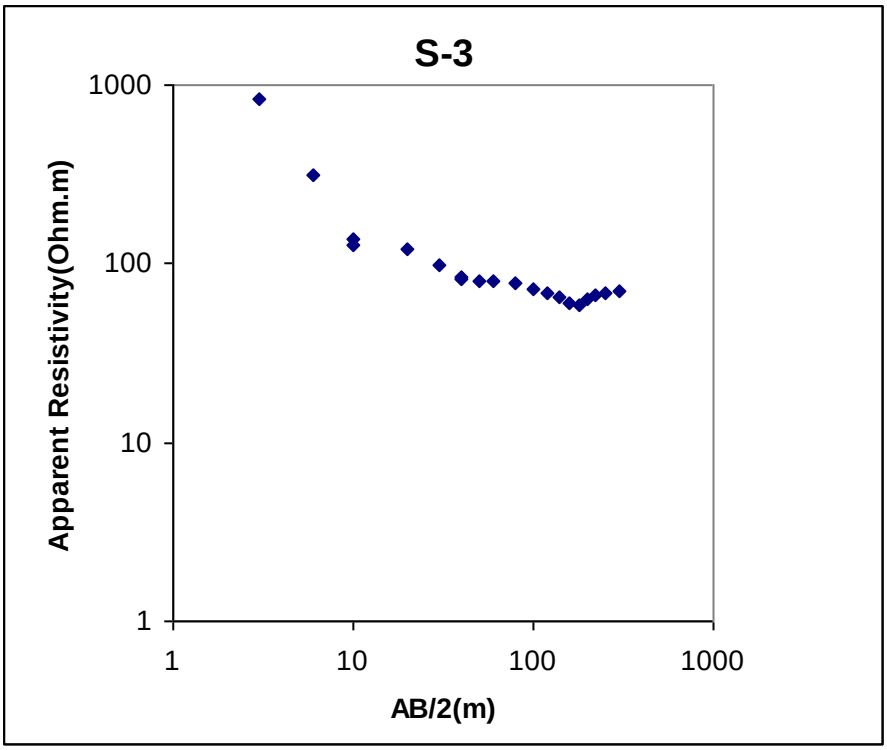
AB/2(m)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100
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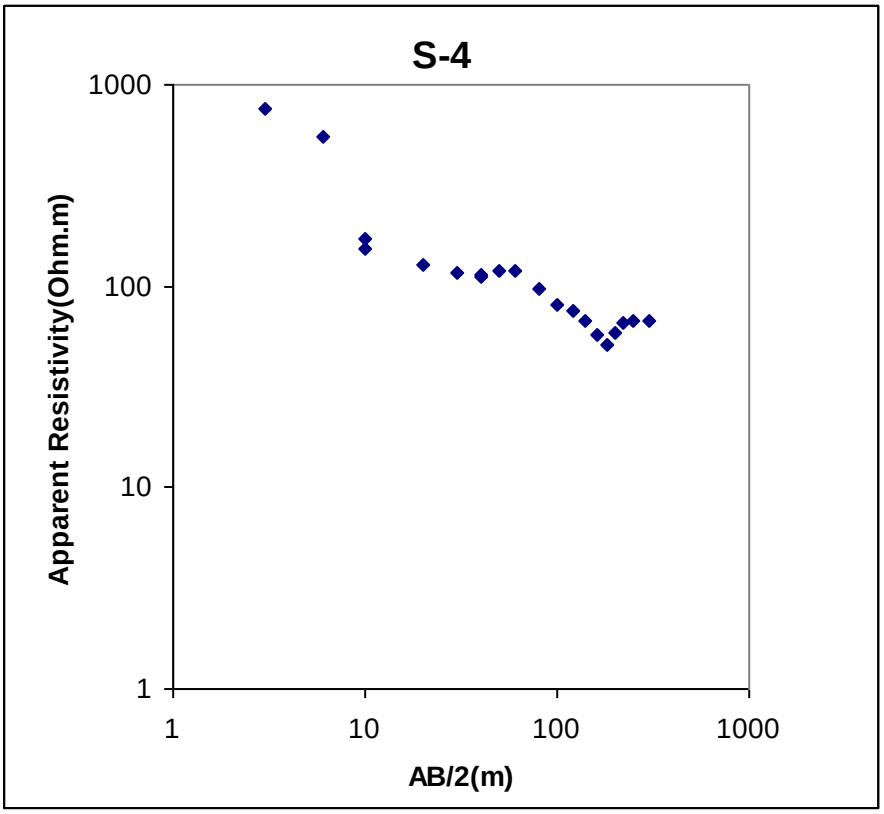
AB/2(m)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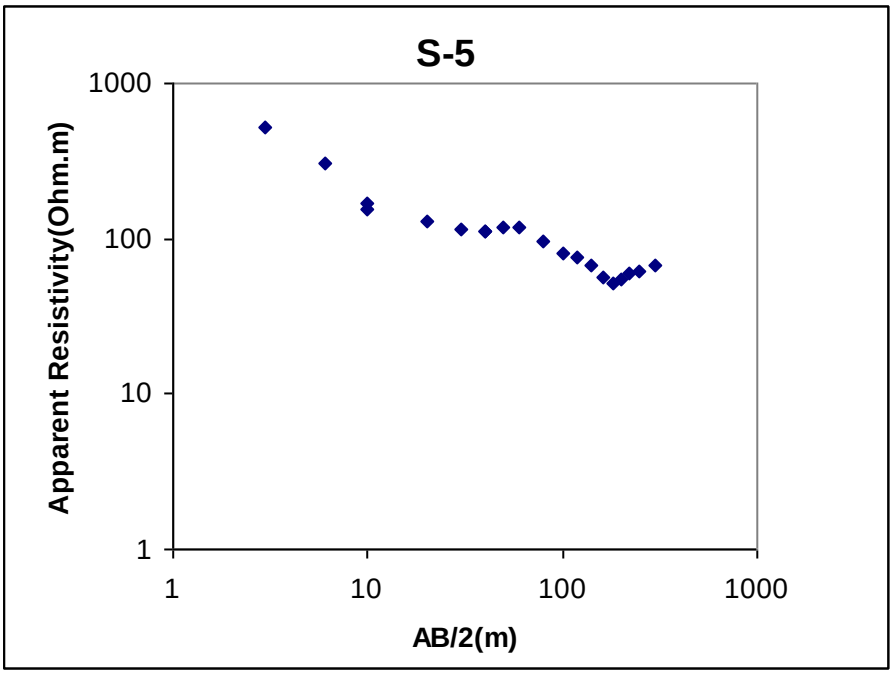
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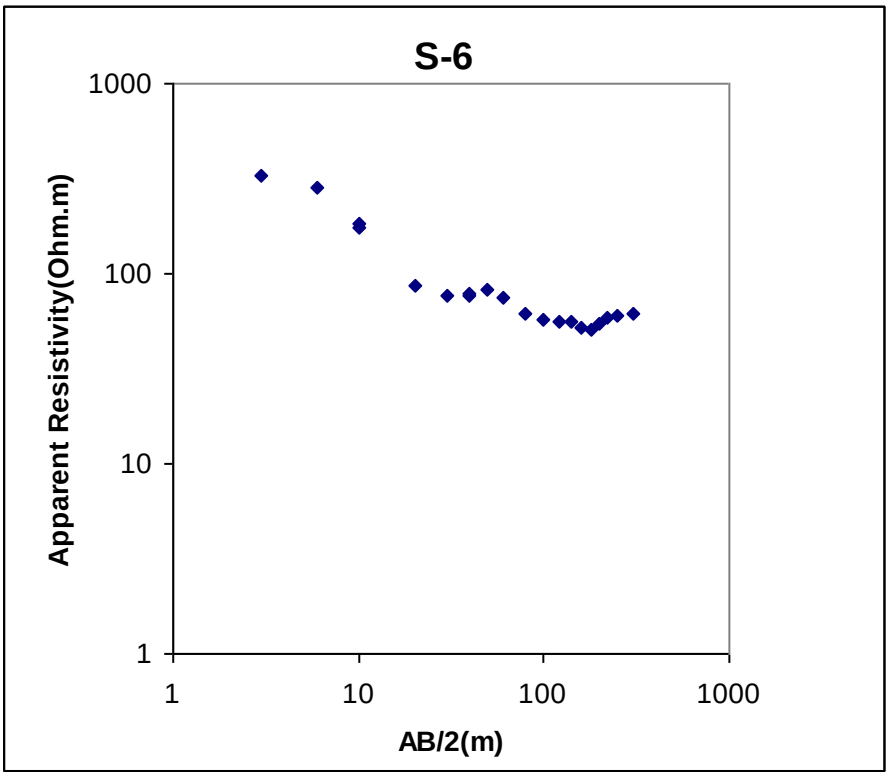
AB/2(m)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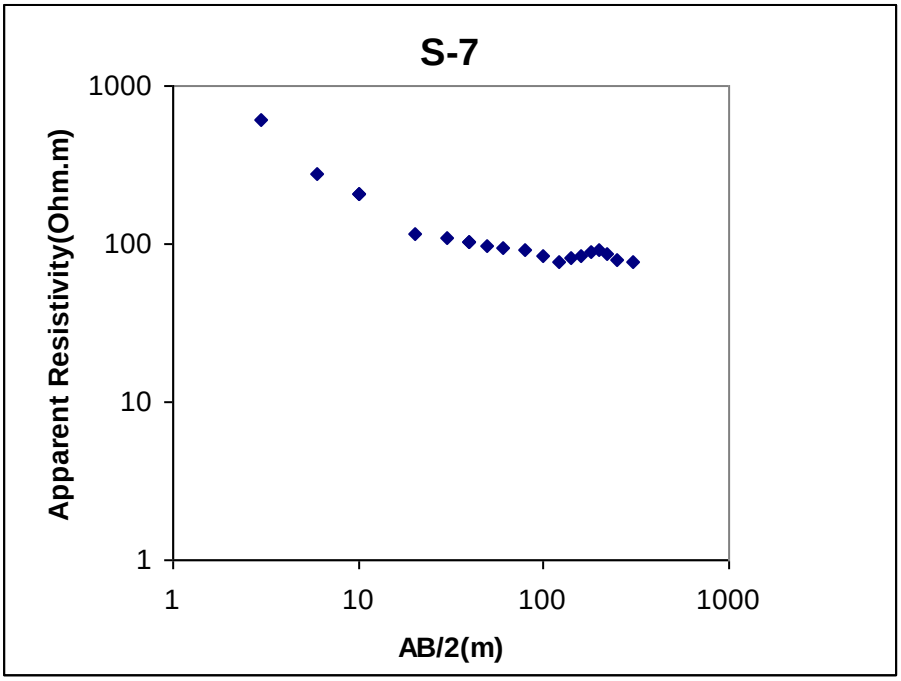
AB/2(m)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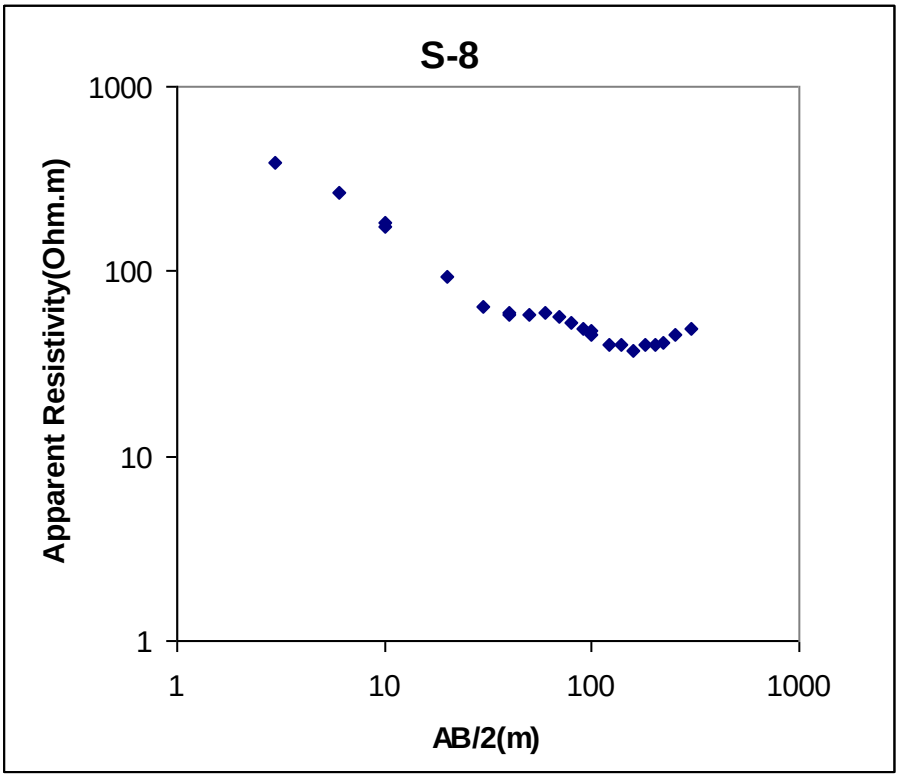
1000
AB/2(m)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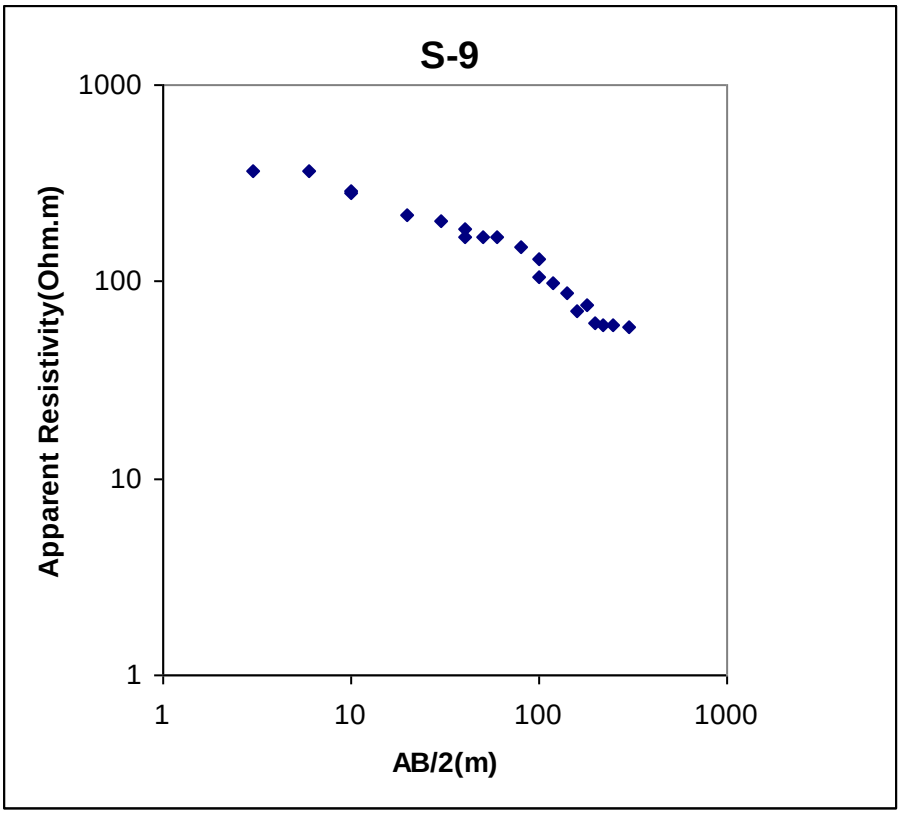
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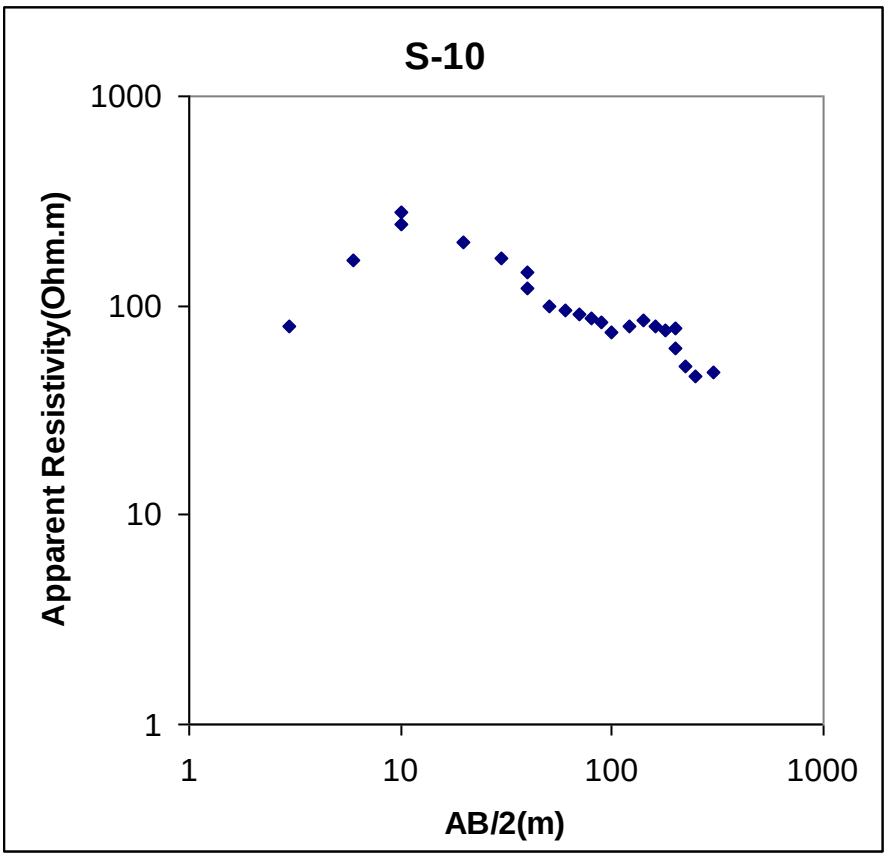
AB/2(m)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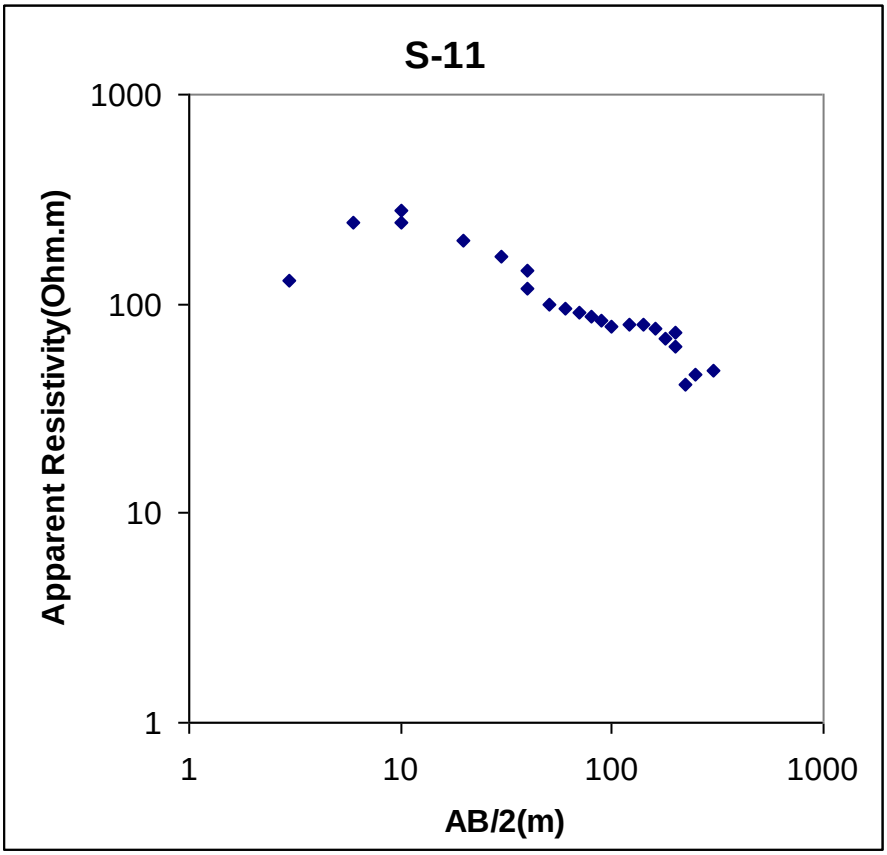
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1000
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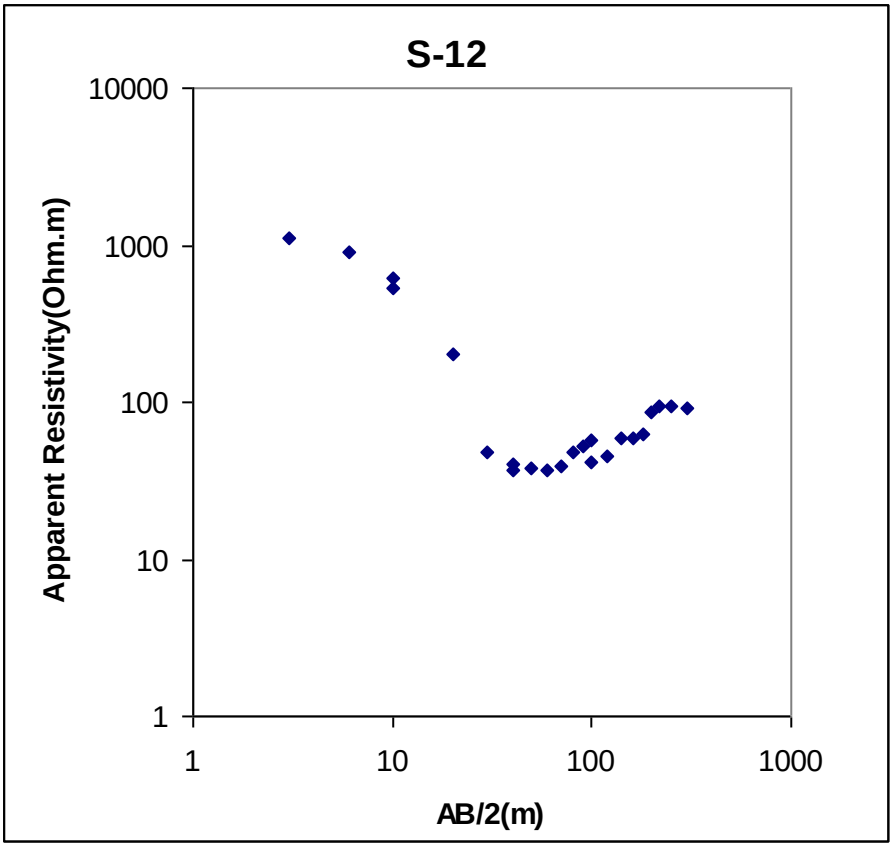
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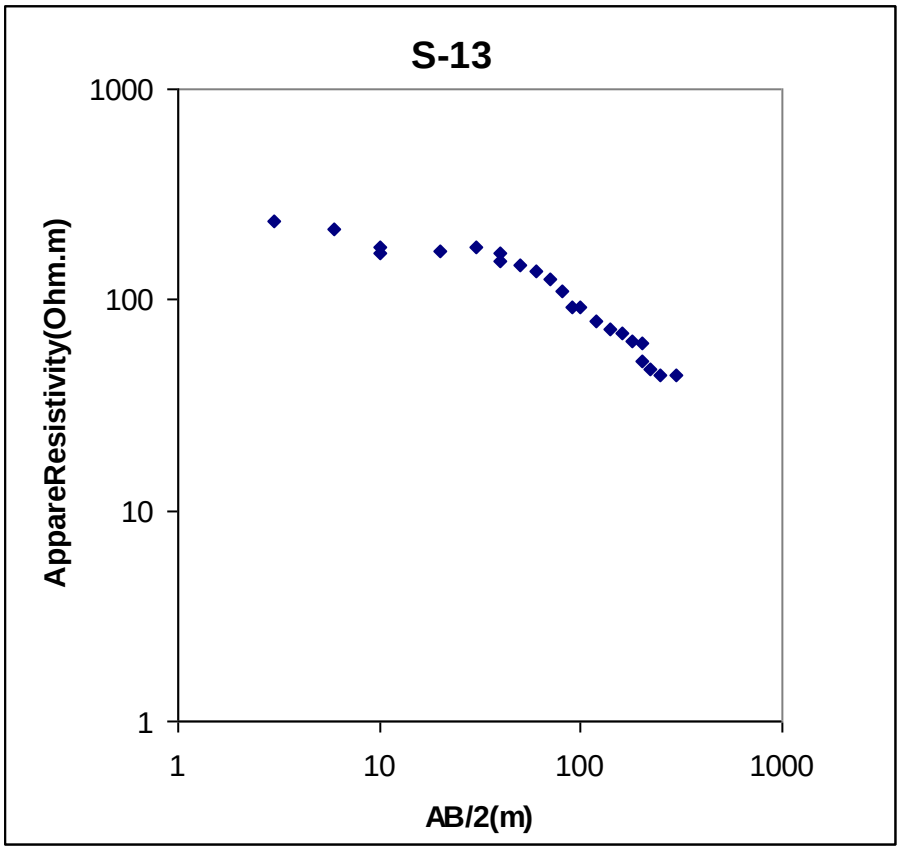
AB/2(m)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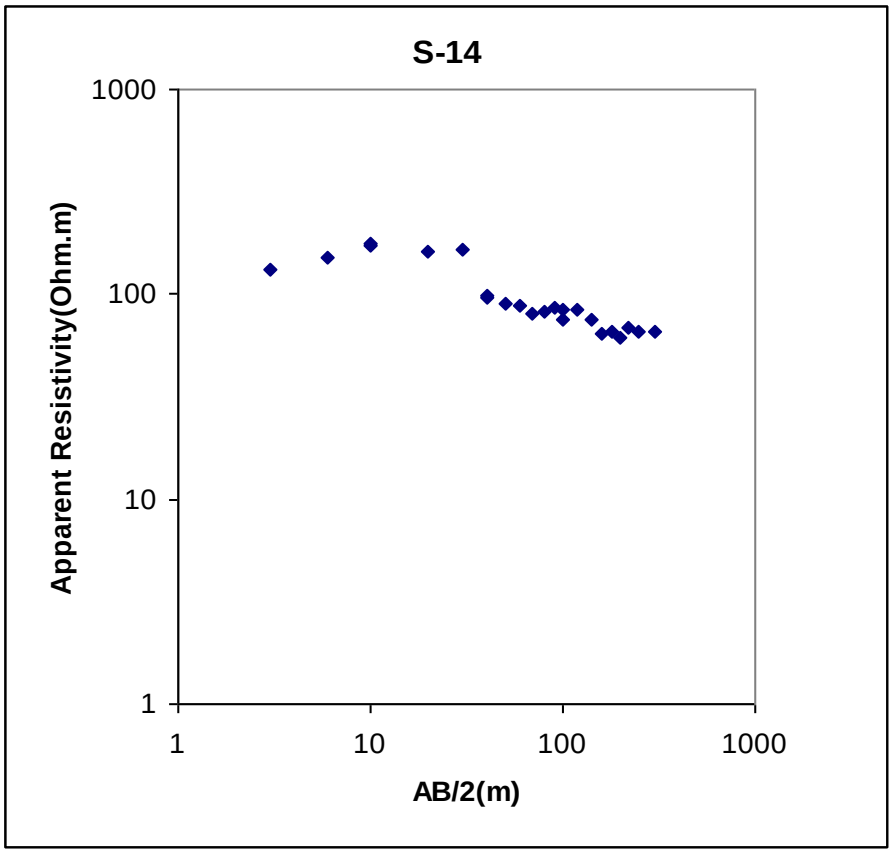
100
1000
AB/2(m)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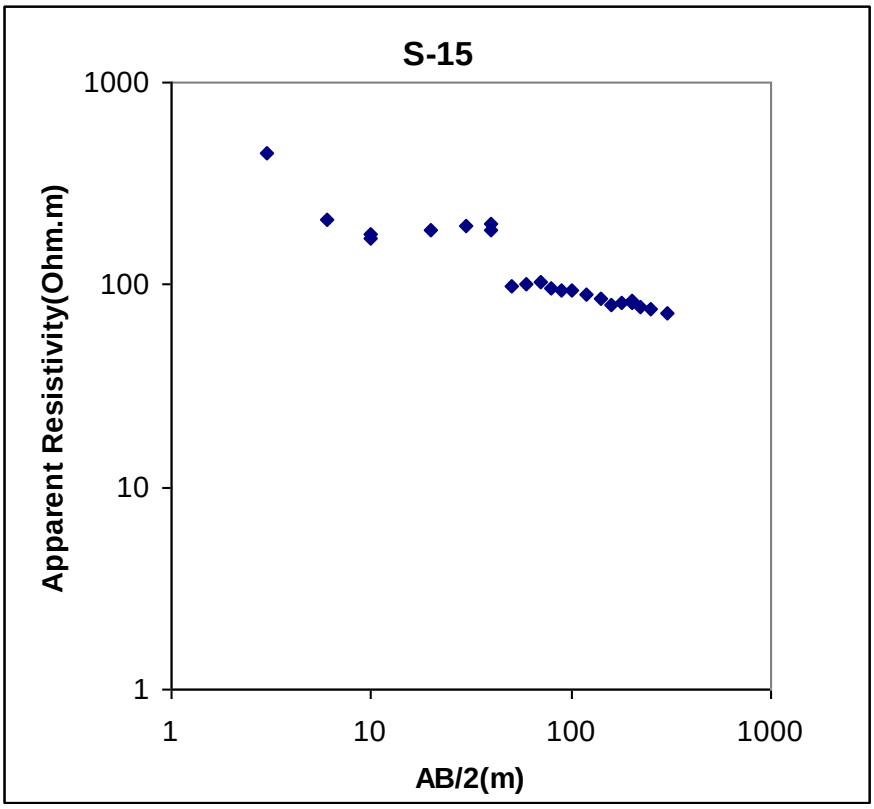
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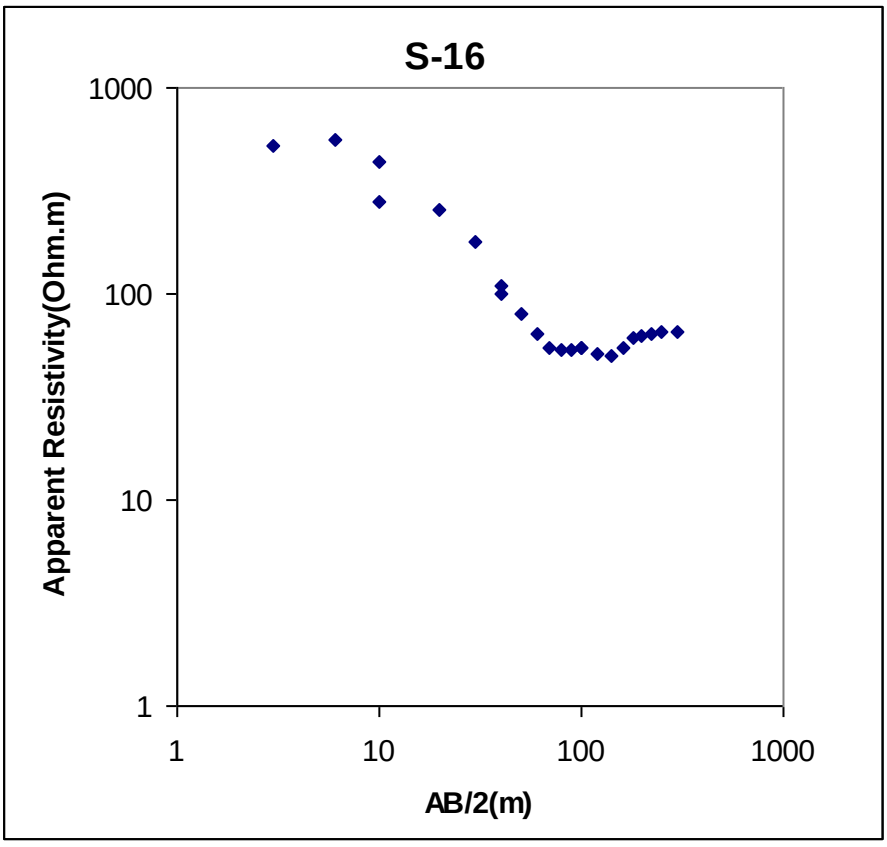
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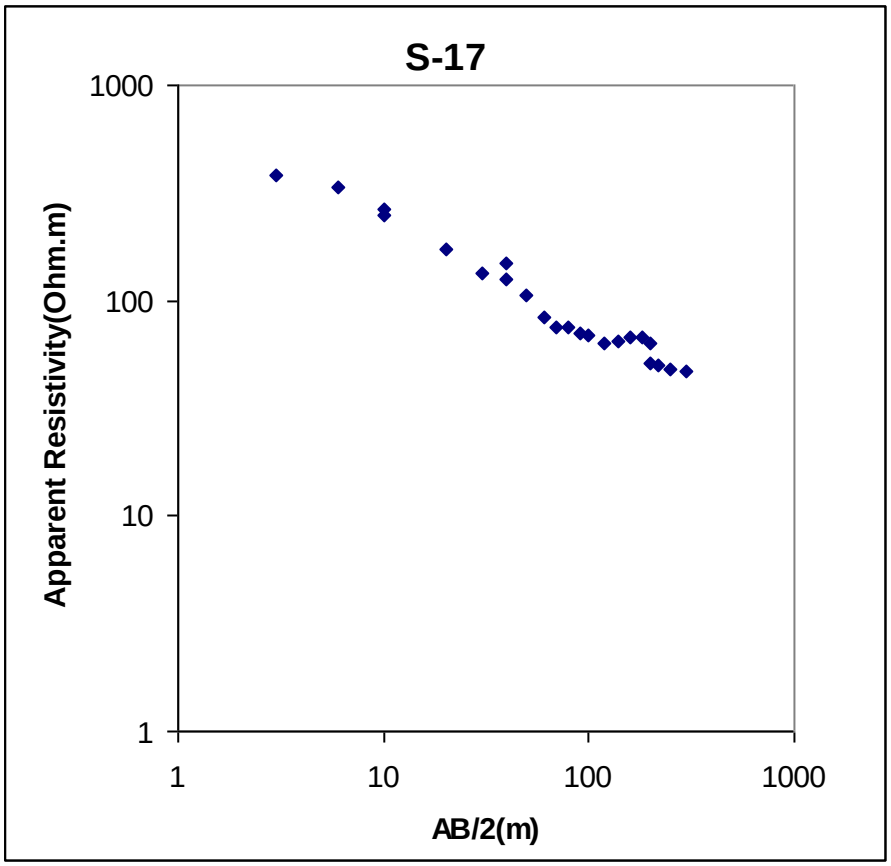
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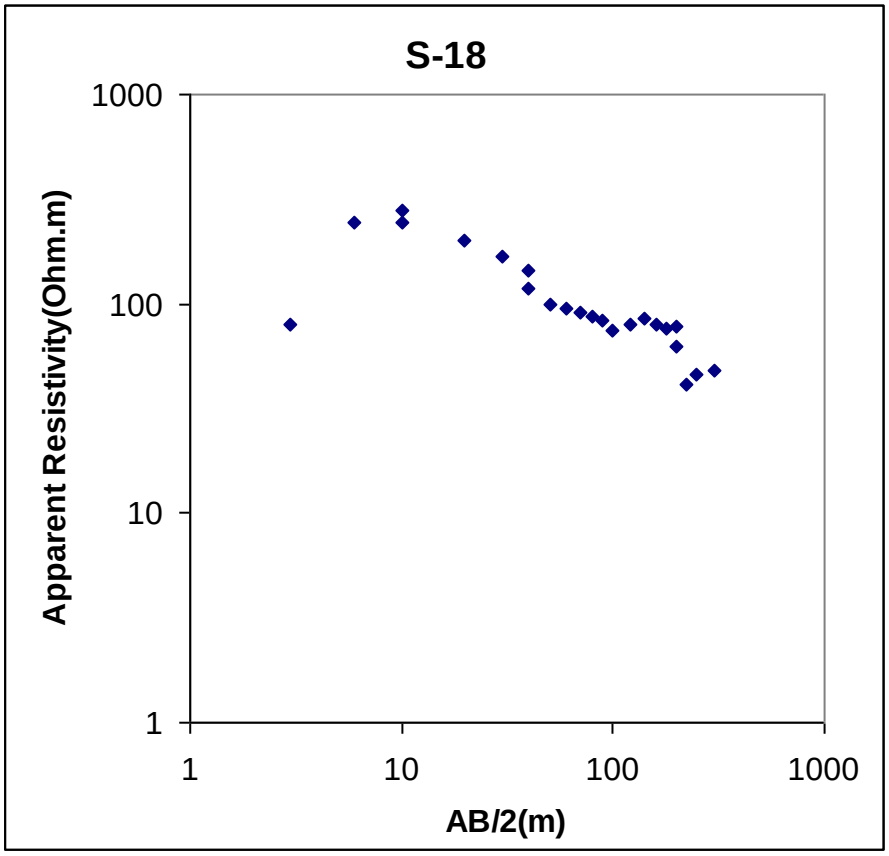
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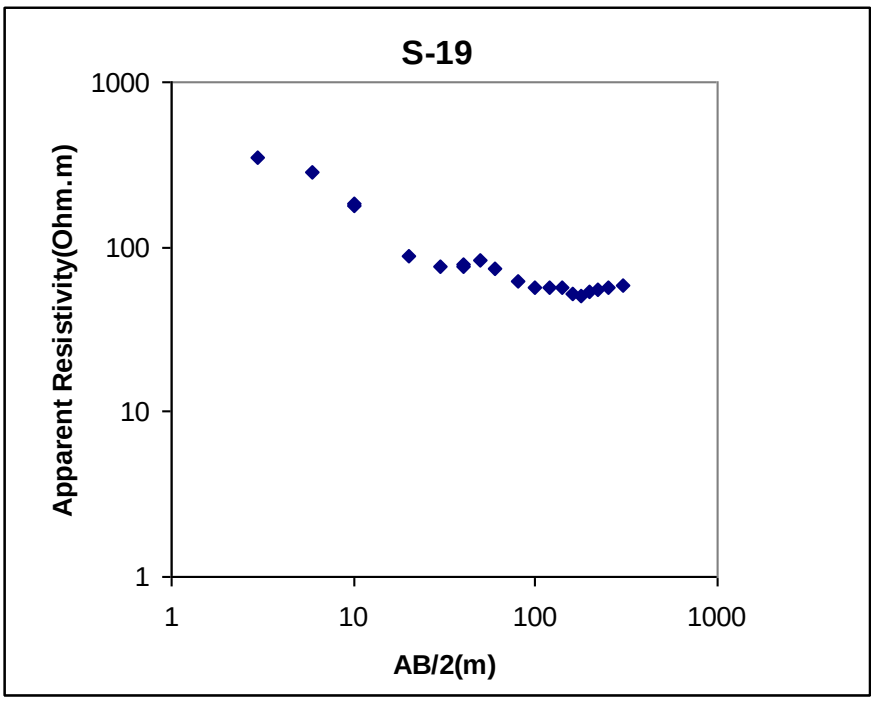
AB/2(m)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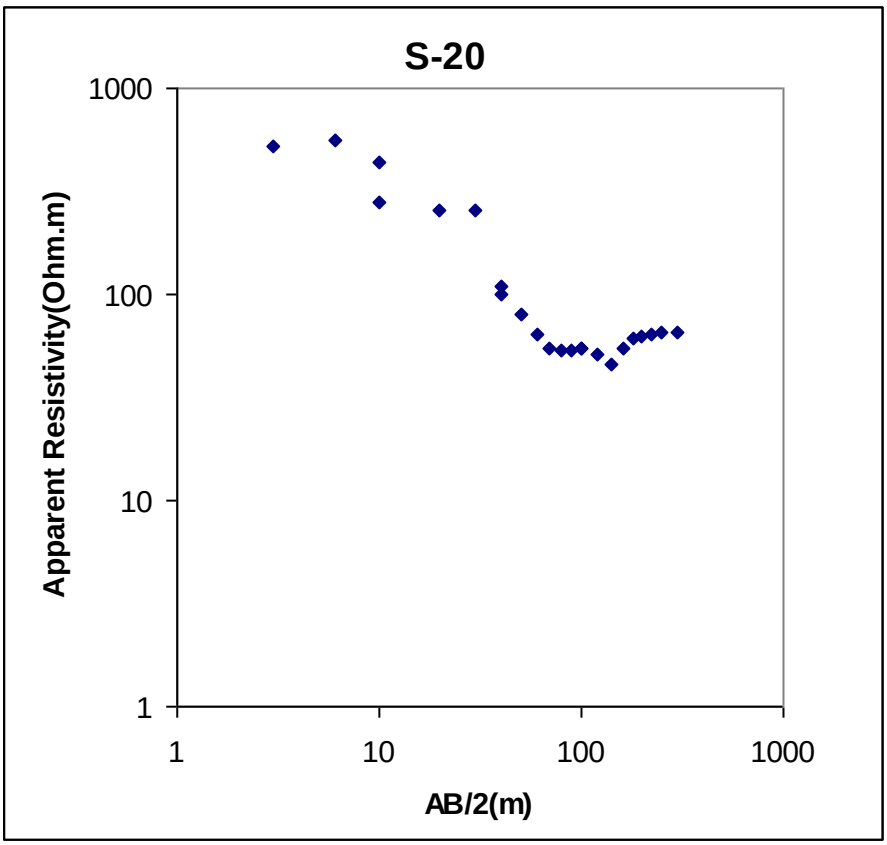
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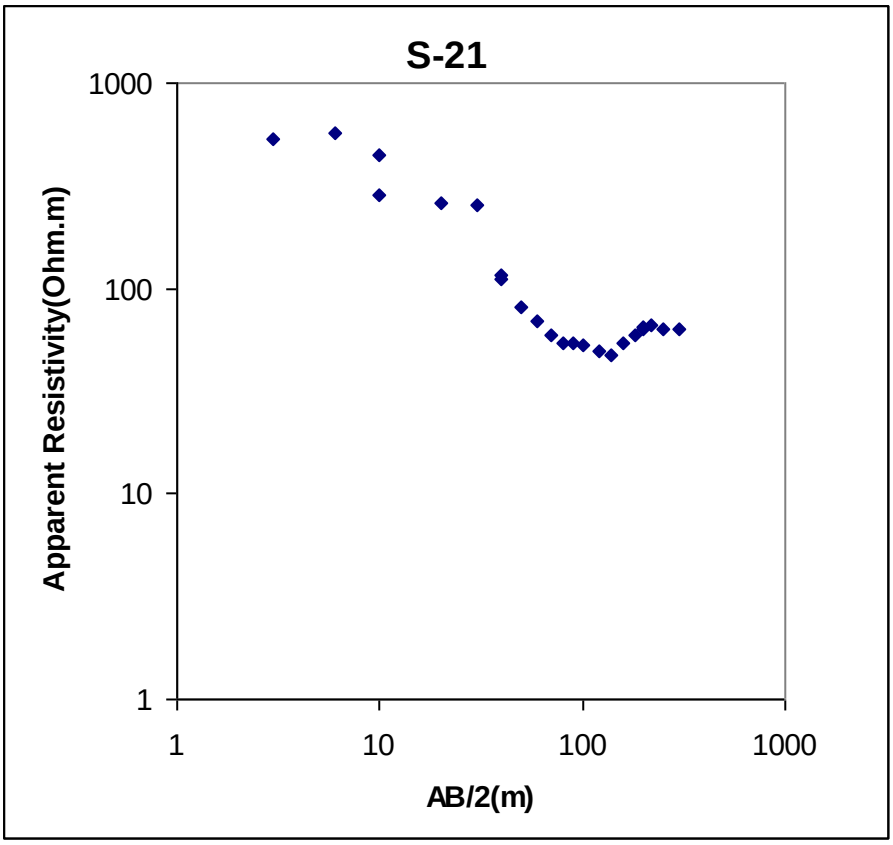
AB/2(m)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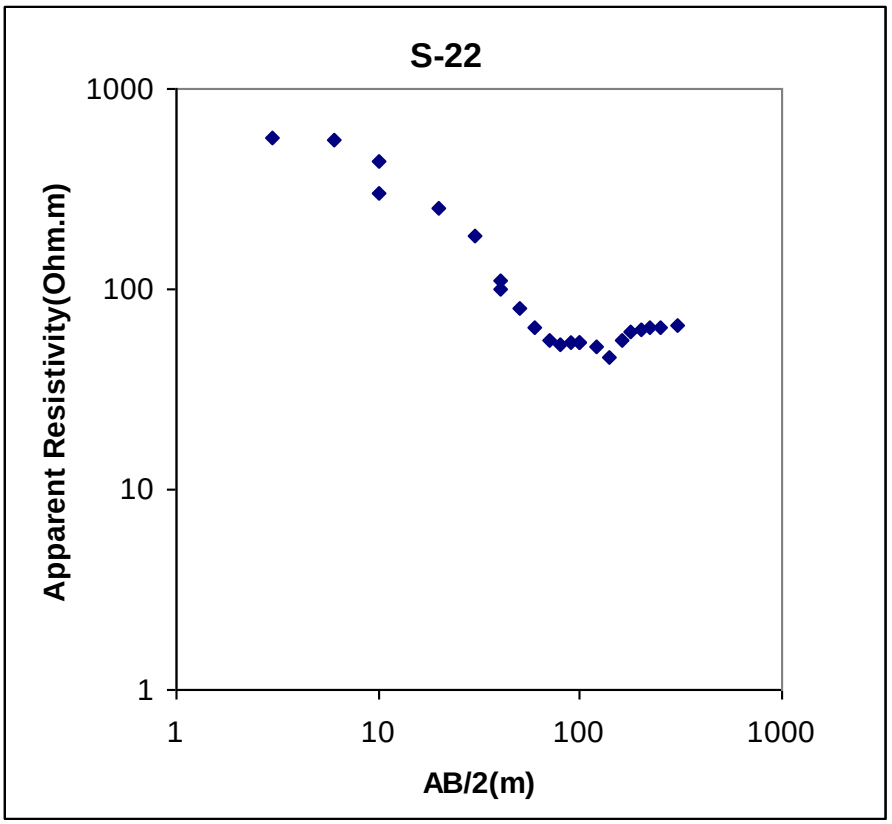
AB/2(m)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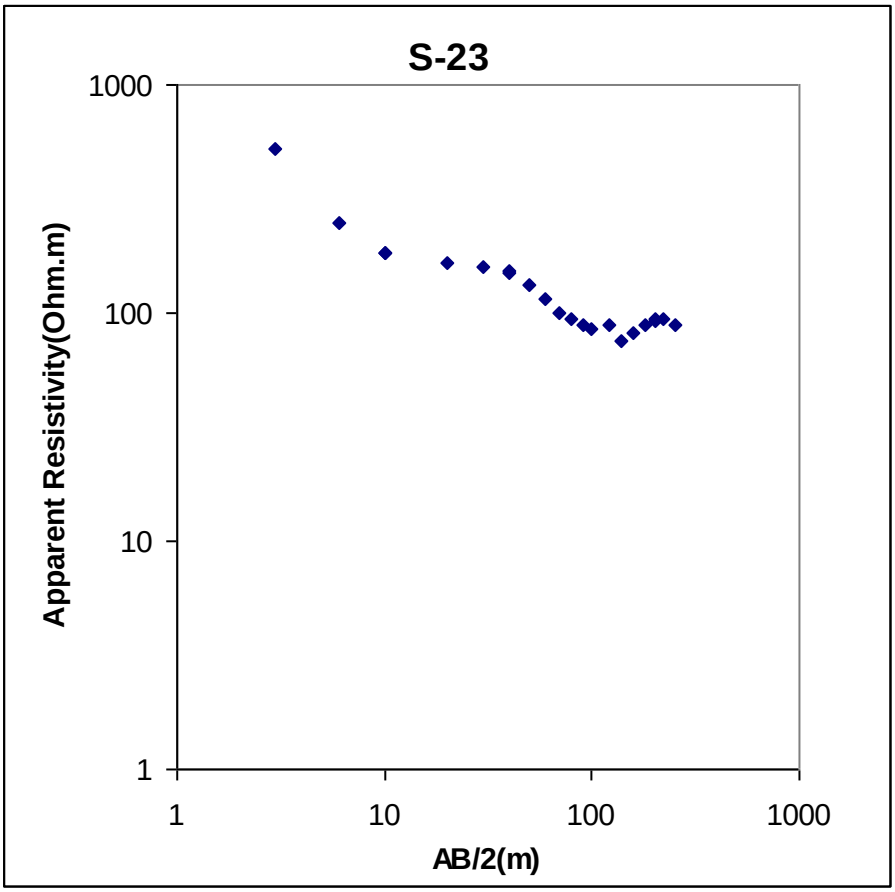
AB/2(m)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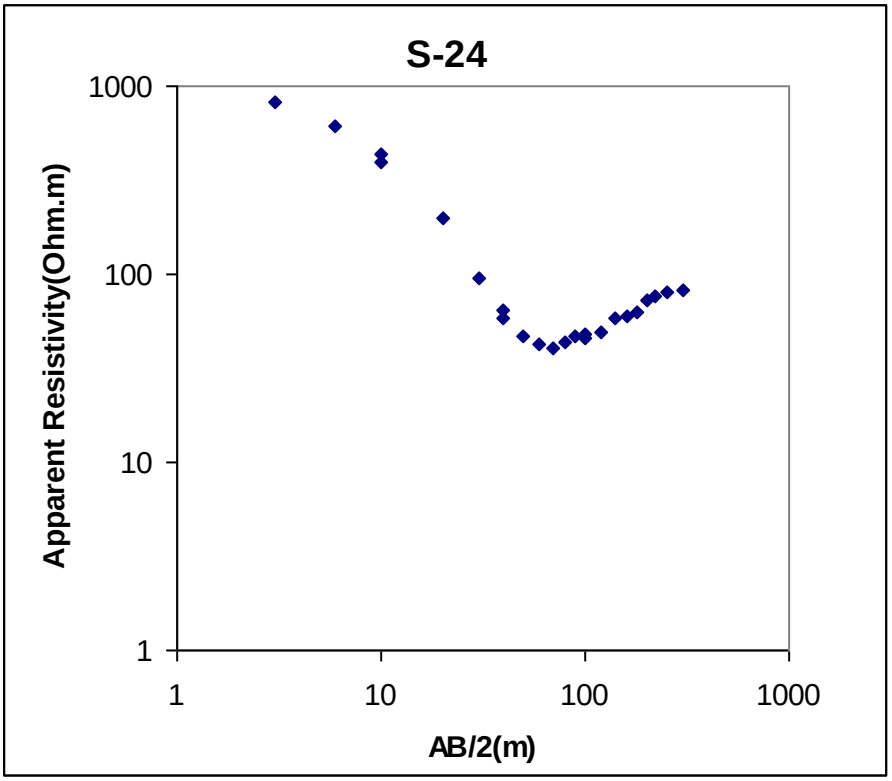
AB/2(m)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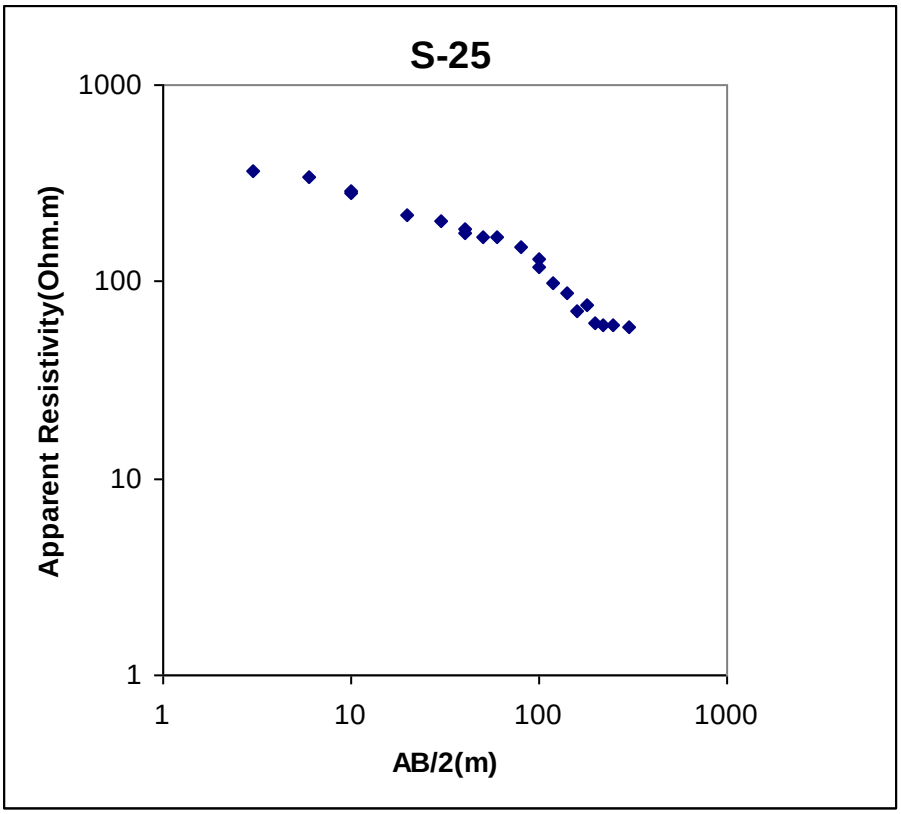
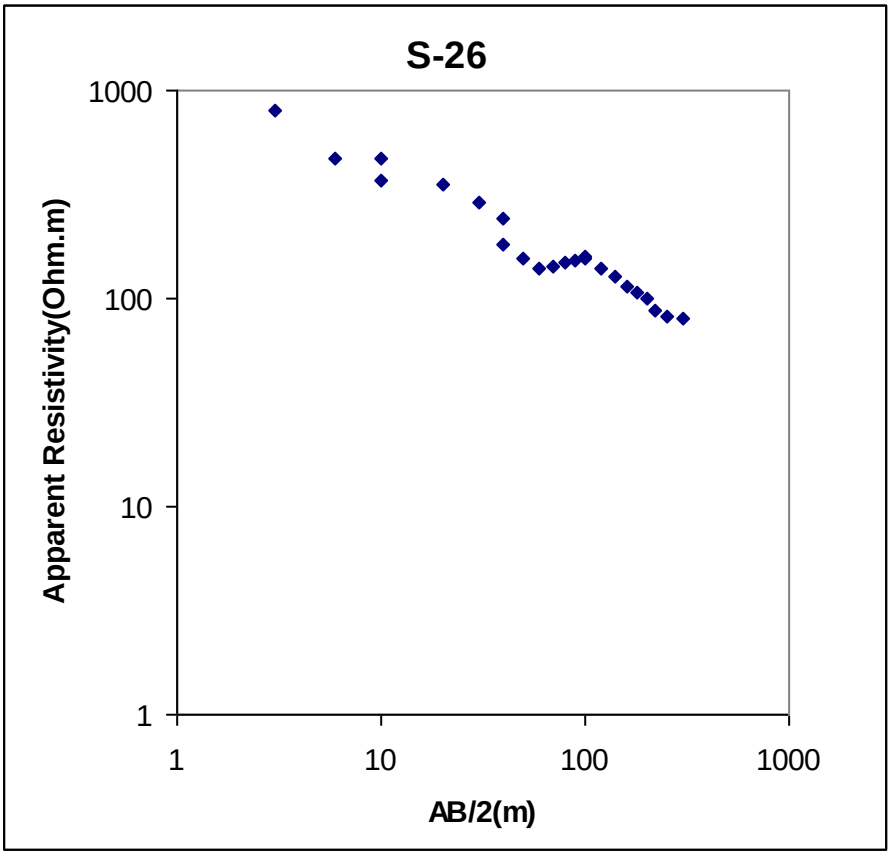
1000
AB/2(m)


S-25
1000
100
10
1
Apparent Resistivity(Ohm.m)
1
10
100
1000
AB/2(m)


S-26
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100
10
1
Apparent Resistivity(Ohm.m)
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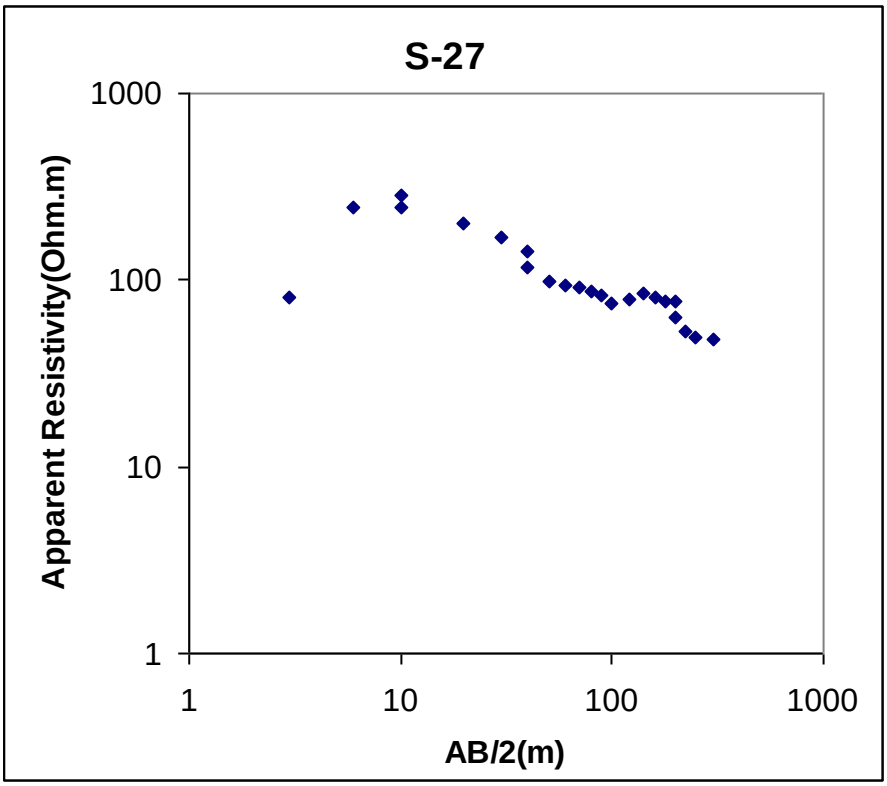
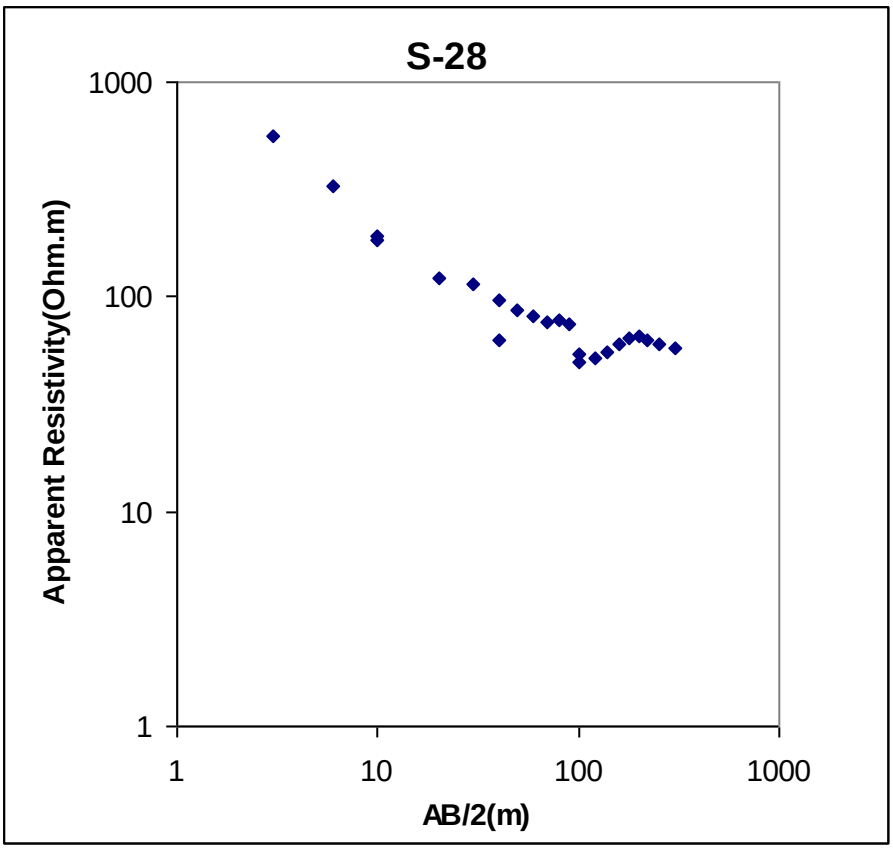
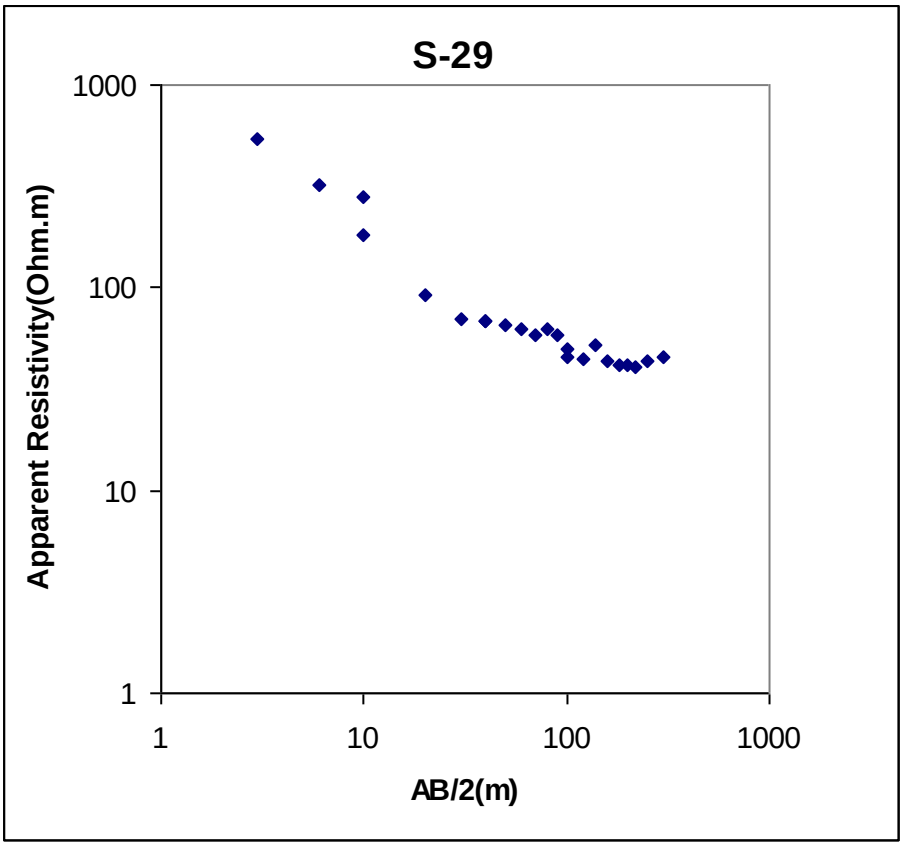
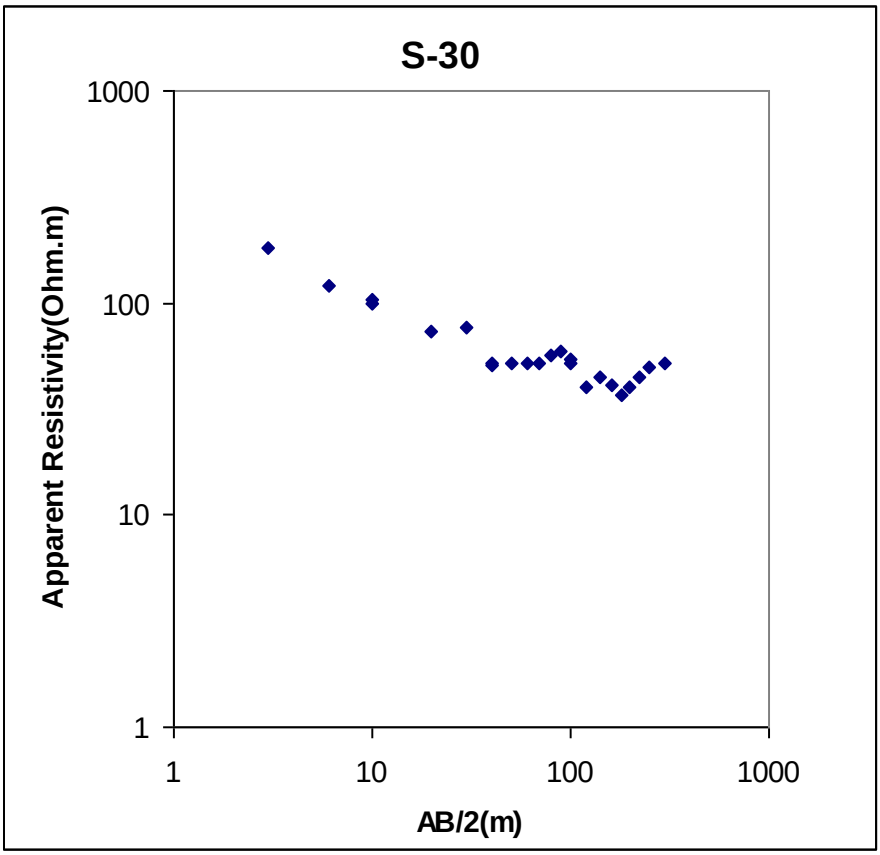
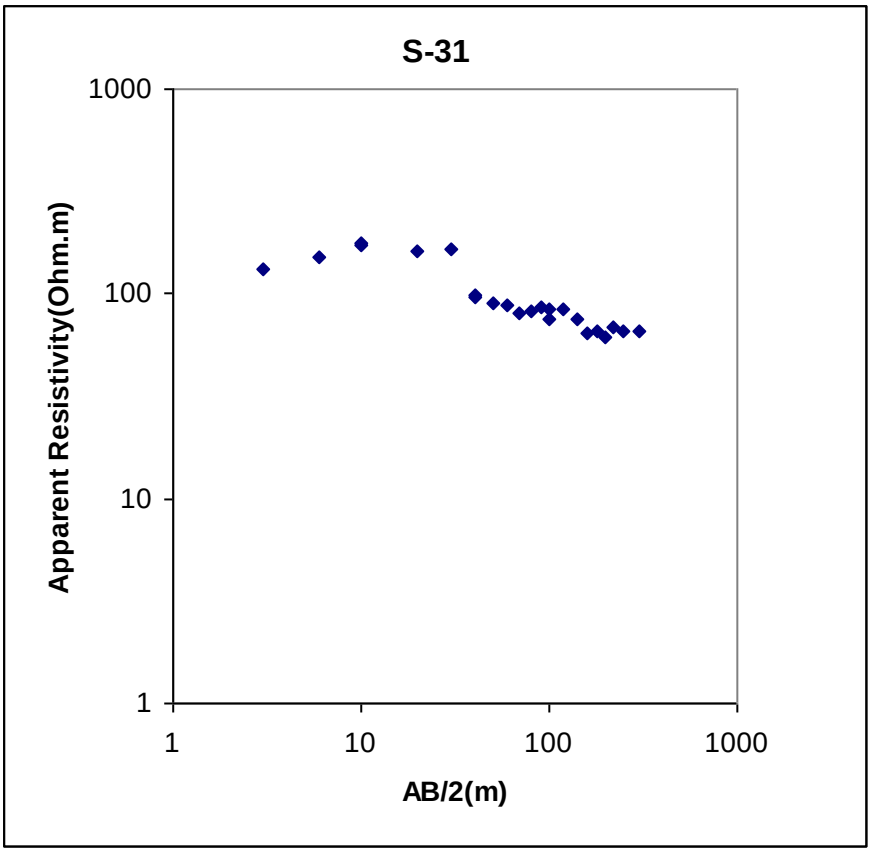
10
100
1000
AB/2(m)

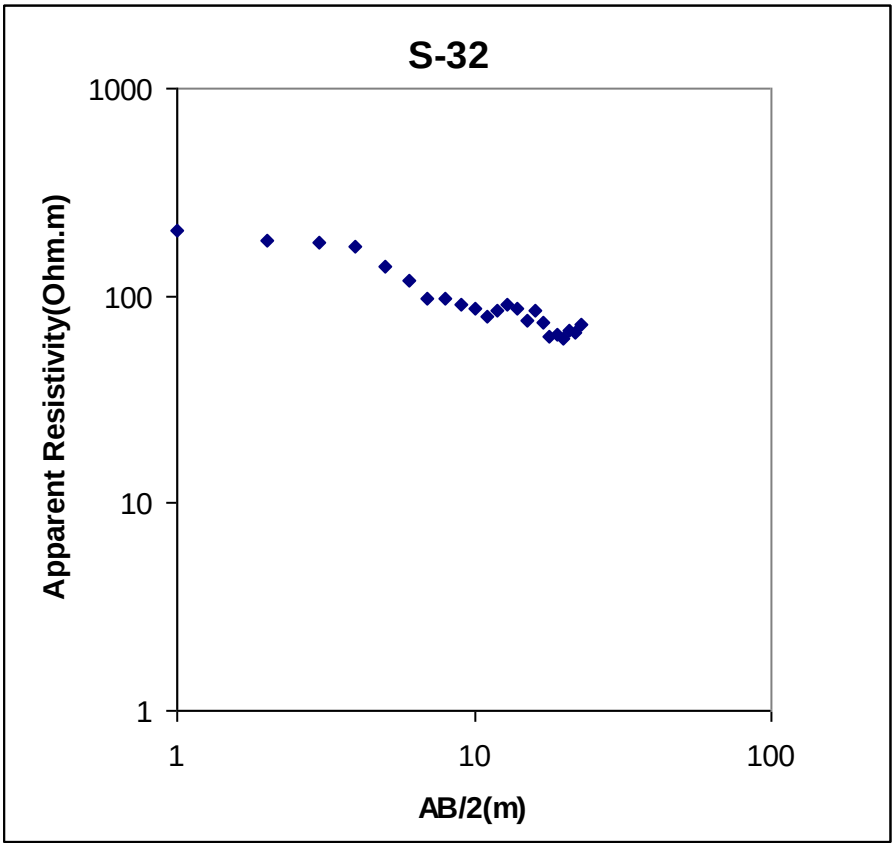

S-27
1000
100
10
1
Apparent Resistivity(Ohm.m)
1
10
100
1000
AB/2(m)

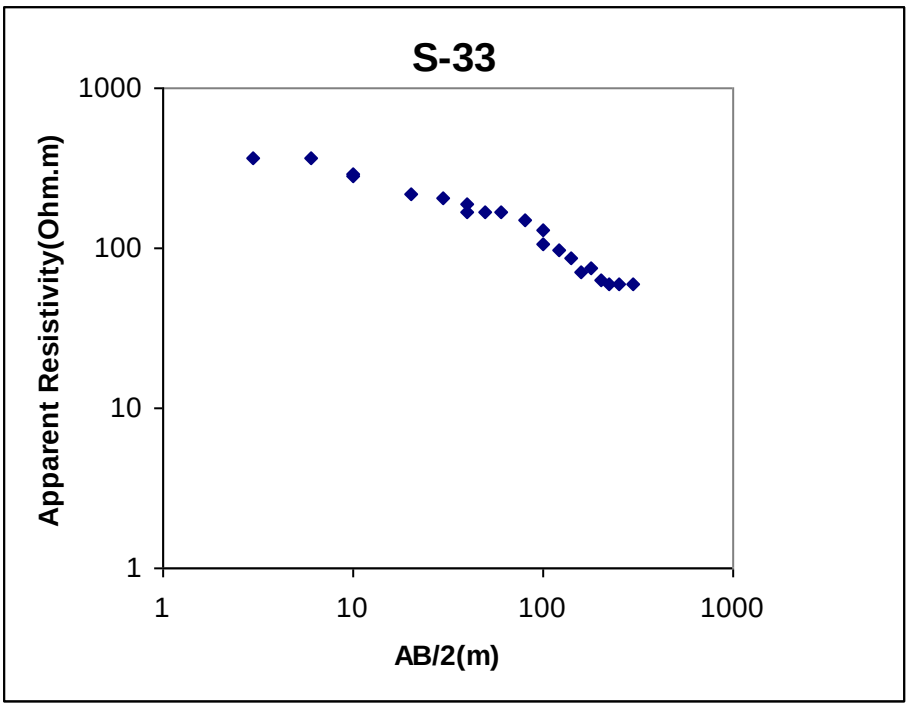

S-28
1000
100
10
1
Apparent Resistivity(Ohm.m)
1
10
100
1000
AB/2(m)

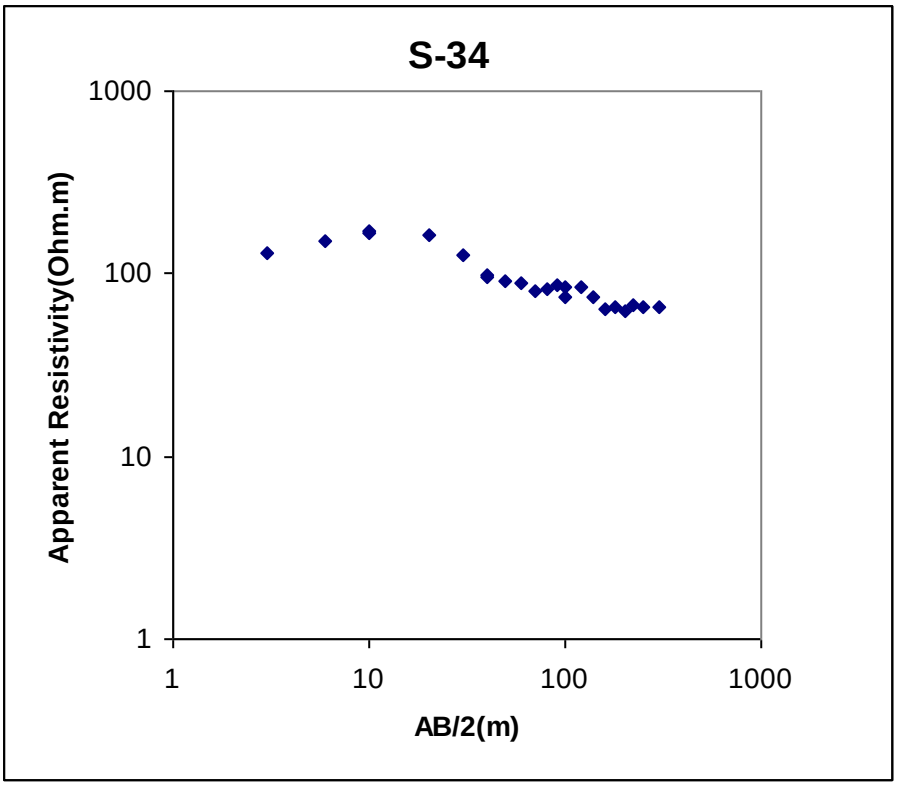

S-29
1000
100
10
1
Apparent Resistivity(Ohm.m)
1
10
100
1000
AB/2(m)

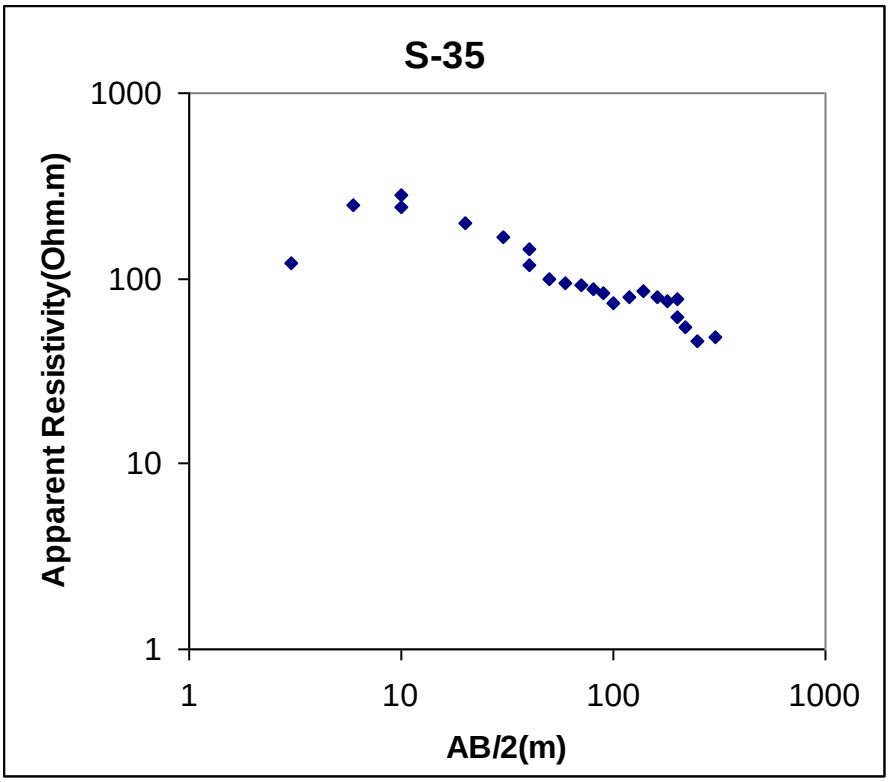

S-30
1000
100
10
1
Apparent Resistivity(Ohm.m)
1
10
100
1000
AB/2(m)

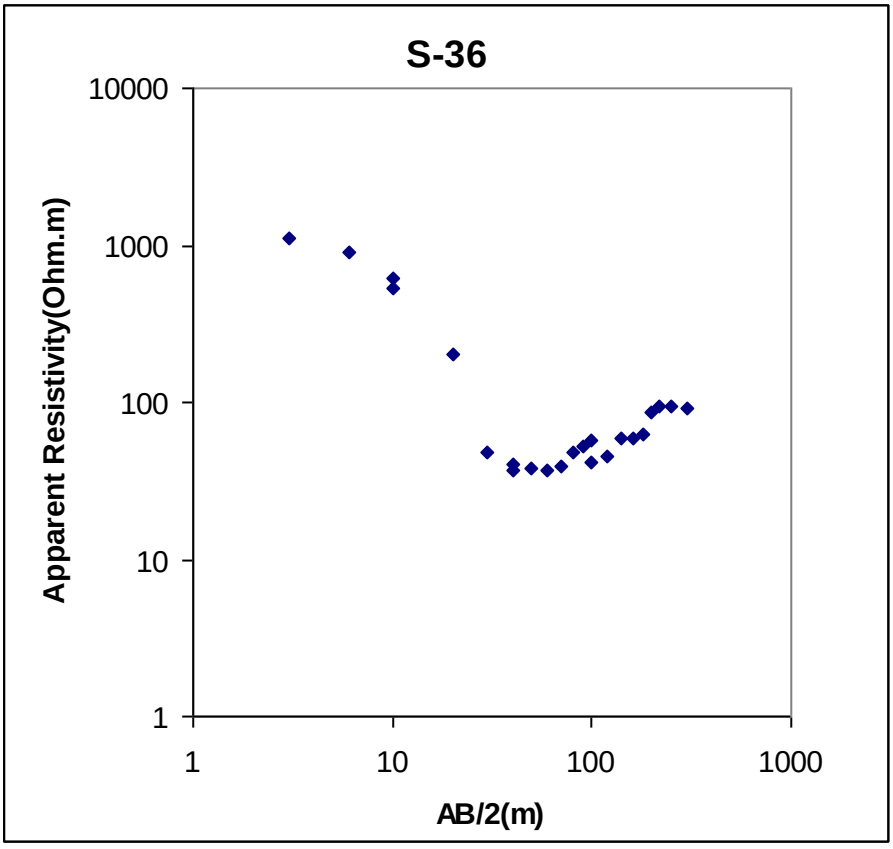

S-31
1000
100
10
1
Apparent Resistivity(Ohm.m)
1
10
100
1000
AB/2(m)

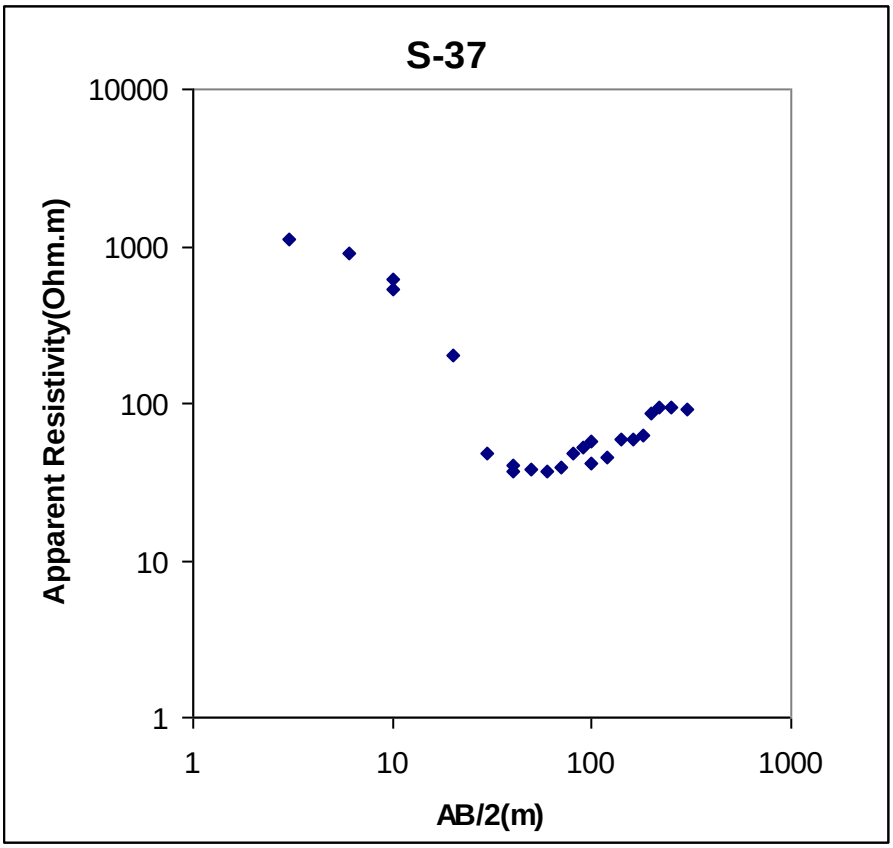

S-32
1000
100
10
1
Apparent Resistivity(Ohm.m)
1
10
100
AB/2(m)

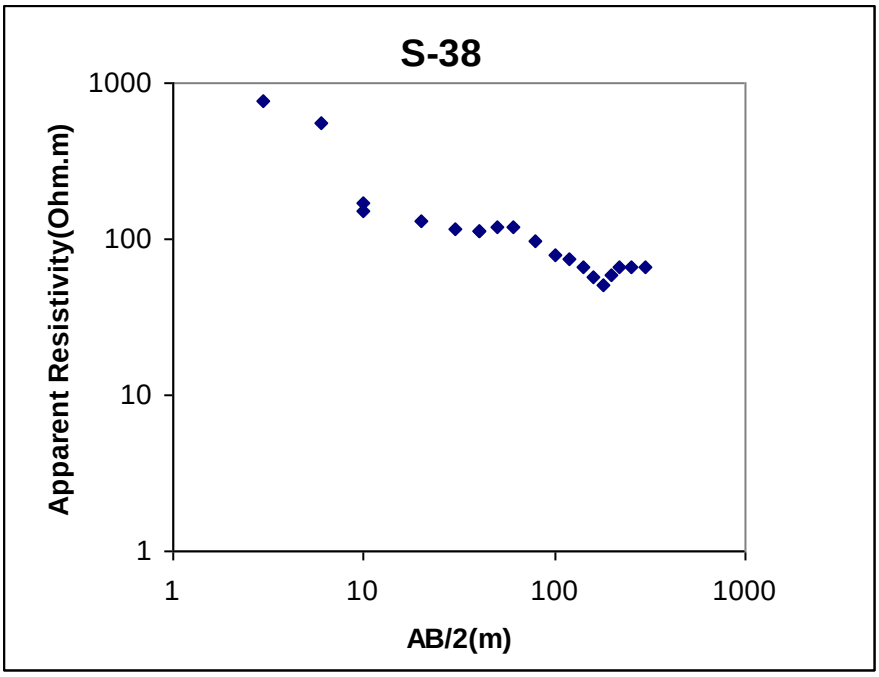

S-33
Apparent Resistivity(Ohm.m)
1000
100
10
1
1
10
100
1000
AB/2(m)

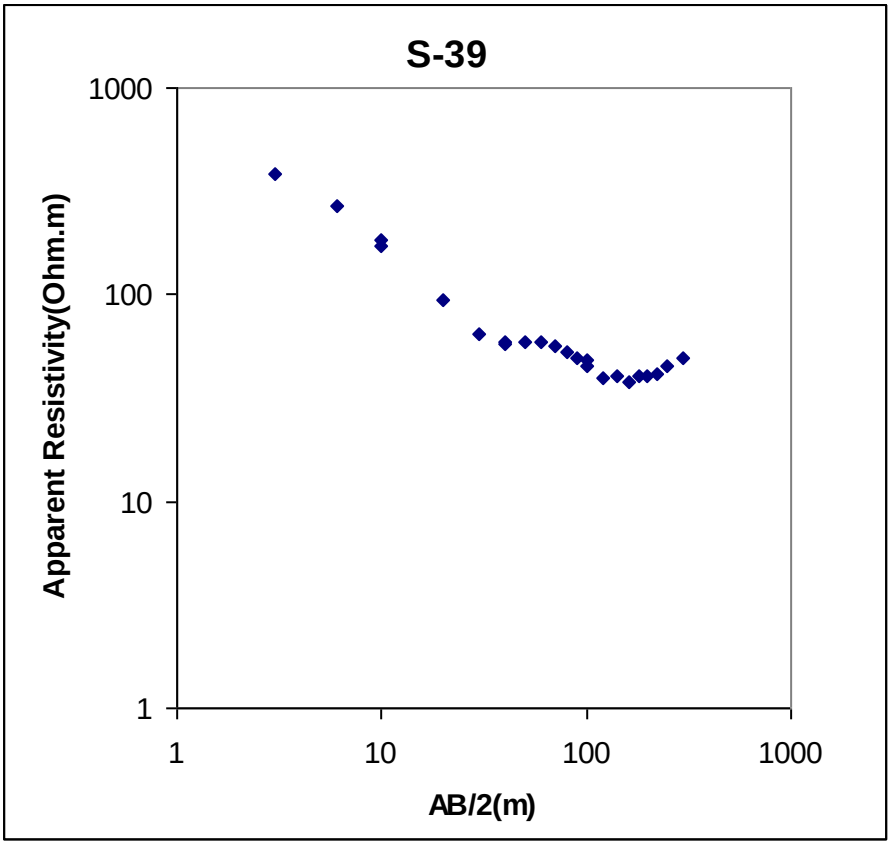

S-34
Apparent Resistivity(Ohm.m)
1000
100
10
1
1
10
100
1000
AB/2(m)

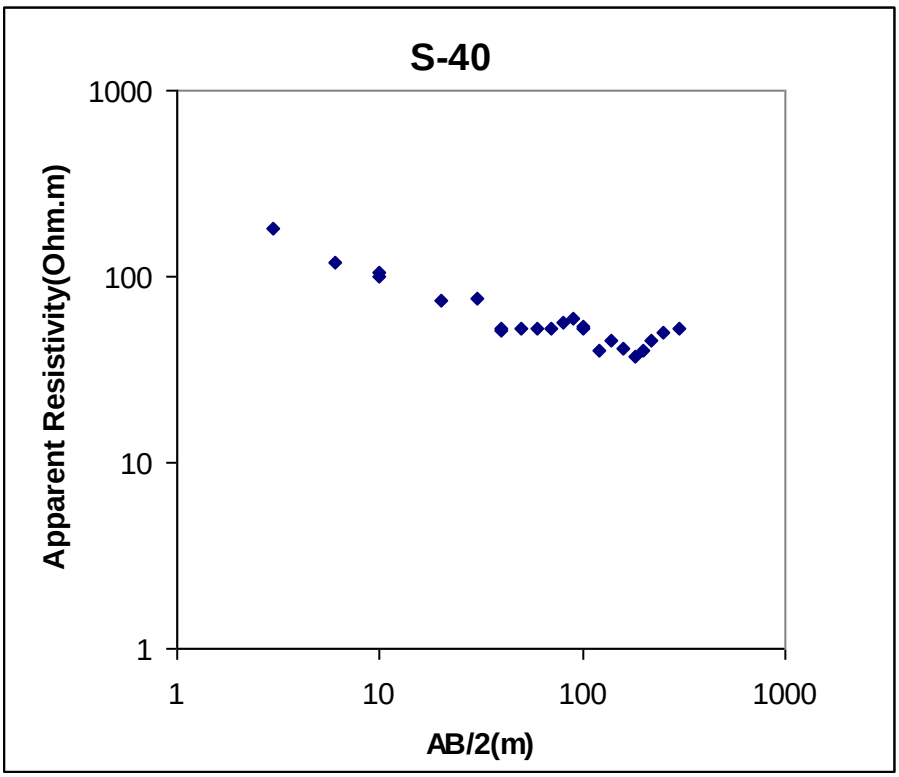

S-35
1000
100
10
1
Apparent Resistivity(Ohm.m)
1
10
100
1000
AB/2(m)


S-36
10000
1000
100
10
1
Apparent Resistivity(Ohm.m)
1
10
100
1000
AB/2(m)


S-37
10000
1000
100
10
1
Apparent Resistivity(Ohm.m)
1
10
100
1000
AB/2(m)


S-38
1000
100
10
1
Apparent Resistivity(Ohm.m)
1
10
100
1000
AB/2(m)





CONCLUSIONS AND RECOMMENDATIONS

The investigated area comprises of laterite underlain by different grades of clay, silt, sand and gravel. Ground water occurs within sand formation gravels. The aquifer occurs at different depths, the prominent ones are around 90m and 120m-165m depths.

It is observed that the resistivity sounding locations falling in a lower elevation viz. close to the railway line, near paddy fields, nala etc show higher prospect for ground water as compared to elevated areas, which often includes forest/jungle areas, where more compact laterite generally occurs.

The areas in and around Ankur, Kulpheni, Balibasa, Lalbandh, the whole of eastern low lying areas near the Railway line, the areas near paddy fields in Borju(proposed reservoir area) and the lower areas of Natundih and Banskopa appear to be more promising. However, since there is a laterite capping over a large area around the site, ground water yield potential will be less through out the investigated area. Minimum distance between two consecutive tube wells should be around 200m-250m for the sake of less interference. 8inch by 6inch pipes may be used for lifting ground water from the subsurface. Pumping may be carried out for about 10 hours a day for sustained yield and longer life of tube wells. Placement of filters at the appropriate positions may be decided after boring. Important locations, recommended depth of boring, and an idea about approximate yield potential are given below. The actual yield may vary to some extent. Yield prediction is based on the present VES surveys, hydrogeological studies and our past experience even though it is not customary to predict yield without pump test.

Based on VES investigations it is concluded that the investigated area has saturated sand layer (aquifer zone) at depths in most of the places. It may be noted that within a broad sand zone, some clay intercalations are likely.

Locations	**Depth of Boring**	**Approximate Yield (Litres per hour (lph)**
VES-1 to VES-8(Ankur), VES-39, 40	160m	30,000 lph
VES-14, 31(Kulpheni)	165m	30,000 lph
VES-32, 34, 37, 38 (Kulpheni-Balibasa-Lalbandh Near Railway Line)	165m	30,000 lph
VES-18, 19(Banskopa)	165m	30,000 lph
VES-17 (Banskopa)	165m	23,000 lph
VES-9, 13(Natundih)	165m	30,000 lph
VES-20, 21,22 (Ghagrasol)	165m	30,000 lph
VES-23 (Ghagrasol)	165m	22,000 lph
VES-26, 27(Borju)	165m	27,000 lph
VES-29, 30 (Borju)	165m	30,000 lph

Considering the vast area within the site, it is likely that 0.5 mgd of ground water would be available on a sustainable basis.

Table-5.1
Interpreted Ves Parameters : JSW Site

Sounding No.	ρ_1	d_1	ρ_2	d_2	ρ_3	d_3	ρ_4	d_4	ρ_5	d_5	ρ_6	d_6
VES-1	495	3	82	46.5	115	100.5	83	-	-	-	-	
VES-2	480	3.1	85	48.3	118	110	76	-	-	-	-	
VES-3	510	8.5	65	45.8	122	105.5	61.5	-	-	-	-	
VES-4	440	2.8	132	50.4	325	113	80	-	-	-	-	
VES-5	425	3.1	128	48.7	304	110	75	-	-	-	-	
VES-6	360	4	72	36	46	154	98	-	-	-	-	
VES-7	486	2.9	81	46.8	114	103.5	72	-	-	-	-	
VES-8	448	3.0	85	48.8	118	102.6	68	-	-	-	-	
VES-9	380	4.7	190	40	130	93.3	58	198.9	164	-	-	
VES-10	210	3.8	525	7.2	155	44.2	80	99.4	275	132.1	52	162
VES-11	220	4.2	510	7.8	142	40.9	76	103.1	240	129.5	100	173
VES-12	196	7.8	32	51.3	218	169.7	84	-	-	-	-	-
VES-13	362	5.1	178	38.5	122	94.7	61	193.8	172	-	-	-
VES-14	32	2.9	186	12.2	72.5	71.0	189	98.4	42	165.4	320	-
VES-15	476	3.2	105.5	312	80	98.7	220	125.4	82	-	-	-
VES-16	580	3.6	452	12.8	98	122.4	202	-	-	-	-	-
VES-17	322	4.1	485	7.0	141	42.8	76	101.0	244	131.8	58	164
VES-18	210	3.8	525	7.2	155	44.2	80	99.4	275	132.1	52	165
VES-19	347	5.6	69	35.3	51	155	101	-	-	-	-	-
VES-20	580	3.2	464	11.5	92	119.52	120	-	-	-	-	-
VES-21	668	2.8	298	21.6	46	146	78	180	-	-	-	-
VES-22	592	3.6	438	12.6	86	120.8	122	-	-	-	-	-
VES-23	215	4.1	518	7.0	149	46.3	82	101	246	134.5	58	164
VES-24	192	7.9	33	52.5	218	169.8	88	-	-	-	-	-
VES-25	372	4.5	181	38.4	133	95.6	68	196.5	158	-	-	-
VES-26	660	2.5	330	20.5	48	152	81	-	-	-	-	-
VES-27	215	3.8	502	7.2	149	42.5	78	101.5	200	132	55	164
VES-28	425	2.9	79	44.8	110	100.5	72	-	-	-	-	-
VES-29	172	3.1	68	19.6	109	64.7	43	165	560	-	-	-
VES-30	180	2.3	72	20.3	114	66.3	40	162.3	570	-	-	-
VES-31	30	2.9	195	11.6	68	68.8	195	96.8	39	162.8	448	-
VES-32	27	3.1	202	12.5	71	70.6	182	93.6	41	165	426	-
VES-33	368	4.5	178	38.2	125	94.7	61	-	-	-	-	-
VES-34	28	3.2	186	12.1	66	69.7	189	94.5	41	164.5	455	-
VES-35	218	4.2	505	7.4	142	46.7	78	100.3	266	130.4	55	-
VES-36	190	8.4	31	50.4	205	172.6	75	-	-	-	-	-

Table-5.1 (contd)

Sounding No.	ρ_1	d_1	ρ_2	d_2	ρ_3	d_3	ρ_4	d_4	ρ_5	d_5	ρ_6	d_6
VES-37	750	11.5	53	92	100	173	27	-	-	-	-	-
VES-38	432	3.1	128	49.5	315	116	76	-	-	-	-	-
VES-39	415	4.2	54	36	40	122	88	-	-	-	-	-
VES-40	192	3.1	75	21.5	108	68.2	42	164.5	428	-	-	-

The symbols above have the following meanings.

p_1 = Resistivity of first layer

p_2 = Resistivity of second layer

p_3 = Resistivity of third layer

p_4 = Resistivity of fourth layer

P_5 = Resistivity of fifth layer and so on.

d_1 = Depth of first layer

d_2 = Depth of second layer

d_3 = Depth of third layer

d_4 = Depth of fourth layer

5.2 METEOROLOGY

The meteorological data recorded during the study period is very useful for proper interpretation of the baseline information regarding the project and surrounding area for air quality dispersion. Historical data on meteorological parameters will also play an important role in identifying the general meteorological regime of the region.

The year may broadly be divided into four seasons :

- Winter season : December to February
- Pre-monsoon season : March to May
- Monsoon season : June to September
- Post-monsoon season : October to November

5.2.1 Methodology of Data Generation

The methodology adopted for monitoring surface observations is as per the standard norms given by Bureau of Indian Standards (IS:8829) and Indian Meteorological Dept (IMD). On site data was collected every hour for three month period (Dec'13-March'14)

The Central Monitoring Station (CMS) equipped with continuous monitoring equipment was installed on top of a house in Ashnasuli village near the proposed plant site at a height of 10 m above ground level to record wind speed, direction, relative humidity and temperature. The meteorological monitoring station was located in such a way that it is free from any obstructions and as per the guidelines specified under IS:8829. Cloud cover was recorded by visual observation. Rainfall was monitored by rain gauge.

The continuous recording meteorological instrument by Dynalab, Pune (Model NO. WDL1002) was used for recording the meteorological data. The sensitivity of the equipment is as given below :

Sensitivity of Meteorology Monitoring Equipment

Sl. No.	Sensor	Sensitivity
1	Wind speed Sensor	$\pm$ 0.02 m/s
2	Wind direction Sensor	$\pm$ 3 degrees
3	Temperature Sensor	$\pm$ 0.2^{o}C

5.2.2 Source of Information

Secondary information on meteorological conditions has been collected from the nearest IMD Station at Medinipur, located about 18 km from the plant site in the south direction.

The available meteorological data of IMD, Medinipur station has been collected for the period 1993-2002 and analyzed and summarized as follows :

5.2.2.1 Analysis of the Data Recorded at IMD – Medinipur

1. Temperature

The winter season starts from December and continues till end of February. December is the coolest month with the mean daily maximum temperature at 29.7^{o}C and the mean daily minimum temperature at 12.8^{o}C. Both the night and day temperatures increase rapidly during the onset of the pre-monsoon season from March to May. During pre-monsoon season, the mean maximum temperature (May) was observed to be 38.4^{o}C with the mean minimum temperature at 20.6^{o}C. The mean maximum temperature in the monsoon season was observed to be 35.2^{o}C in the month of June whereas the mean minimum temperature was observed to be 25.3^{o}C in the month of September. By the end of August, the day temperatures increase slightly, with the mean maximum temperature at 31.9^{o}C in the month of October and the night temperature decreases with the mean minimum temperature at 17.3^{o}C in the month of November. The monthly variations of temperature are presented below and Exhibit-5.2.1.

2. Relative Humidity

The air is generally humid in this region during the monsoon season when the relative humidity at 0830 hours was observed to be around 84%. Similarly, at 1730 hours, the relative humidity was observed to be in the range of 81%. Generally, the weather during other seasons was observed to be dry. The monthly variations in relative humidity are presented below and Exhibit-5.2.1.

3. Atmospheric Pressure

The maximum pressure observed was 1012.3 mb at 0830 hours and 1008.3 mb at 1730 hours, with the maximum pressure occurring during the winter season, in the month of December. The minimum pressure observed was 995.2 mb at 0830 and 992.1 mb at 1730 hours, with the minimum pressure occurring during the month of June and July in the monsoon season. The average pressure level in all other months was found to be in the range of 1003.9 mb at 0830 hours and 1000.2 mb at 1730 hours. It can be seen from the data that not much variations are observed in the average atmospheric pressure levels. The pressure levels are found to be fairly consistent over the region. The monthly variations in the pressure levels are presented below and Exihibit-5.2.2.

4. Rainfall

The average annual rainfall based on the 10 year IMD data, was observed to be 1465 mm. The monsoon sets in the month of June and continues till September and sometime extends upto mid October. The maximum amount of rainfall (312.1 mm) occurs in the month of July. The maximum number of rainy days was also observed in the month of July. Monthly variations in the rainfall are given below and Exhibit-5.2.2.

Climatological Data
Station : IMD, Medinipur (1993-2002)

Month	Atmospheric Pressure (mb)		Temperature (^{o}C)		Relative Humidity (%)		Rainfall (mm)
	0830	1730	Mean Max	Mean Min	0830	1730	
January	1012.2	1008.1	26.3	12.8	59	45	12.4
February	1009.8	1005.7	29.7	15.9	56	38	19.7
March	1006.8	1002.4	34.8	20.6	56	34	32.5
April	1003.3	998.7	38.4	24.3	60	43	49.5
May	999.0	995.0	38.4	25.9	66	54	80.9
June	995.3	992.1	35.2	25.9	76	70	219.6
July	995.2	992.6	32.0	25.3	83	81	312.1
August	996.4	993.5	31.8	25.3	84	81	310.1
September	1000.2	997.0	31.9	24.9	83	81	290.4
October	1006.0	1002.6	31.3	22.8	77	73	120.0
November	1010.1	1006.4	29.0	17.3	66	60	13.7
December	1012.3	1008.3	26.4	13.0	59	50	4.1
						Total Rainfall	1465.0

5. Cloud Cover

During the winter and the pre-monsoon seasons, it was observed that the skies were generally very clear. In the post-monsoon season, generally light clouds were observed in the evenings, with clear mornings. During the monsoon season, both in the mornings and evenings, the skies were found to be generally cloudy.

6. Wind Speed / Direction

Generally, light to moderate winds prevail throughout the year. Winds were light and moderate particularly during the morning hours, while during the afternoon hours the winds were stronger. The season wise discussion of the respective wind pattern is given below :

A) Wind Pattern during Pre-Monsoon Season

0830 Hours

A review of the wind rose diagram shows that predominant winds are mostly from S and SW direction followed by NE direction (Figure – 5.2.3)

1730 Hours

A review of the wind rose diagram shows that predominant winds are mostly from S direction followed by SW, N and NE direction (Figure – 5.2.3)

B) Wind Pattern during Monsoon Season

0830 Hours

The predominant winds are mostly from S and SW direction followed by NE and E (Figure-5.2.3)

1730 Hours

A review of the wind rose diagram shows that predominant winds are mostly from S direction followed by SW direction (Figure-5.2.3).

C) Wind Pattern during Post-Monsoon Season

0830 Hours

The predominant winds are mostly from N and NE directions followed by E direction (Figure-5.2.4).

1730 Hours

A review of the wind rose diagram shows that predominant winds are mostly from NE direction followed by N and S directions (Figure – 5.2.4).

D) Wind Pattern during Winter Season

0830 Hours

A review of the wind rose diagram shows that predominant winds are mostly from N and NE directions followed by E direction (Figure – 5.2.4)

1730 Hours

The predominant winds are mostly from N and NE directions (Figure-5.2.4).

E) Annual Wind Pattern

0830 Hours

A review of the wind rose diagram shows that predominant winds are mostly from S, N and NE directions followed by SW direction (Figure – 5.2.5).

1730 Hours

A review of the wind rose diagram shows that predominant winds are mostly from S direction followed by SW, N and NE directions (Figure – 5.2.5).

5.2.3 On-Site Meteorological Observation

5.2.3.1 Wind Speed and Direction

Wind rose diagram for the period December, 2013 – March, 2014, have been prepared based on hourly reading of wind speed and direction (Refer Exhibit-5.2.6). The wind rose diagram shows predominant direction of wind from the N-E arc with the lowest frequencies from the western side.

The average wind speed during the monitoring period was 1.73 m/sec (6.23 km/hr) (Refer Exhibit-5.2.6)

5.2.3.2 Temperature

Analysis of the climatological data at on-site meteorological observatory shows that the mean maximum temperature during the period is 28.56^{o}C, recorded during the month of March, 2014 and the mean minimum temperature is 18.66^{o}C, recorded during the month of January, 2014. Monthly variation of temperature is shown in Exhibit-5.2.7 (Refer Tables-5.2.1 – 5.2.5).

5.2.3.3 Relative Humidity and Rainfall

Onsite meteorological observations during the period show that the mean maximum Relative Humidity is 88.12%, recorded during March, 2014 and the mean minimum Relative Humidity is 60.14%, recorded in the month of January, 2014 (Exhibit-5.2.7 and Tables 5.2.1 – 5.2.5).

Rainfall recorded during the period is nil.

Table-5.2.1
Daily Onsite Meteorological Observation
For the Month of December, 2013
(Temperature, Relative Humidity and Rainfall)

Date	Temperature (^{o}C)		Relative Humidity (%)		Rainfall (mm)
	Min	Max	Min	Max	
09	15.0	27.0	56	90	0
10	14.0	27.0	62	89	0
11	14.0	26.0	54	90	0
12	14.0	26.0	47	90	0
13	14.0	26.0	61	89	0
14	13.0	25.0	53	88	0
15	13.0	25.0	65	88	0
16	13.0	26.0	54	89	0
17	14.0	26.0	61	89	0
18	14.0	26.0	55	86	0
19	14.0	25.5	68	89	0
20	15.0	27.0	68	90	0
21	15.0	27.0	68	90	0
22	15.5	27.5	63	90	0
23	18.0	28.5	90	56	0
24	15.0	25.5	79	90	0
25	13.0	24.5	59	89	30
26	11.5	24.5	59	88	0
27	11.5	25.0	57	88	0
28	13.5	26.5	52	89	0
29	14.5	25.0	64	89	0
30	13.5	23.5	67	89	0
31	14.5	24.5	67	90	0
Avg	14.02	26.91	59.17	87.60	-

Table-5.2.2
Daily Onsite Meteorological Observation
For the Month of January, 2014
(Temperature, Relative Humidity and Rainfall)

Date	Temperature (^{o}C)		Relative Humidity (%)		Rainfall (mm)
	Min	Max	Min	Max	
01	14.5	25.5	65	94	0
02	14.5	26.5	67	90	0
03	12.5	23.5	69	90	0
04	12.5	23.0	62	88	0
05	14.0	25.0	59	89	0
06	14.0	22.0	14	22	0
07	12.5	24.0	68	89	0
08	11.5	23.0	62	88	0
09	11.5	23.5	62	88	0
10	12.0	24.0	60	88	0
11	12.0	24.5	67	89	0
12	12.5	24.5	66	82	0
13	14.0	24.5	74	94	0
14	11.5	22.5	66	89	0
15	12.0	19.5	73	94	0
16	12.5	22.5	73	94	0
17	13.5	24.5	73	94	0
18	15.5	26.0	71	91	0
19	13.5	25.0	67	90	0
20	14.5	24.0	64	89	0
21	13.0	24.5	67	89	0
22	13.0	27.0	60	89	0
23	14.0	26.5	62	90	0
24	14.0	26.5	71	90	0
25	15.0	27.0	63	90	0
26	14.0	26.0	66	89	0
27	12.5	24.5	64	88	0
28	12.0	23.0	72	90	0
29	13.5	25.0	64	84	0
30	13.5	26.0	65	88	0
31	13.5	26.0	61	96	0
Avg	12.82	24.5	60.19	87.26	-

Table-5.2.3
Daily Onsite Meteorological Observation
For the Month of February, 2014
(Temperature, Relative Humidity and Rainfall)

Date	Temperature (°C)		Relative Humidity (%)		Rainfall (mm)
	Min	Max	Min	Max	
01	14.0	27.0	55	89	0
02	13.5	27.5	56	90	0
03	13.0	28.5	53	84	0
04	15.5	28.5	54	89	0
05	17.0	29.5	55	85	0
06	16.5	30.0	59	90	0
07	19.0	31.5	62	90	0
08	19.5	31.5	60	83	0
09	19.0	31.0	60	86	0
10	17.0	27.0	62	86	0
11	16.0	26.5	64	86	0
12	16.5	27.5	59	85	0
13	16.5	27.0	58	86	0
14	17.0	28.0	68	85	0
15	17.0	23.5	74	100	0
16	17.0	20.0	76	92	0
17	12.0	24.5	57	89	0
18	13.0	25.0	53	84	0
19	13.5	26.5	59	89	0
20	14.5	27.0	60	85	0
21	17.0	29.0	61	86	0
22	19.0	29.5	64	87	0
23	20.0	30.5	62	83	0
24	21.0	32.0	64	87	0
25	19.5	29.5	70	87	0
26	20.0	30.5	65	91	0
27	19.5	29.0	68	91	0
28	19.0	26.5	75	91	0
Avg	15.45	28.0	57.39	87.68	-

Table-5.2.4
Daily Onsite Meteorological Observation
For the Month of March, 2014
(Temperature, Relative Humidity and Rainfall)

Date	Temperature (°C)		Relative Humidity (%)		Rainfall (mm)
	Min	Max	Min	Max	
01	19.5	29.0	67	91	0
02	17.5	26.5	73	91	0
03	19.0	28.0	71	87	0
04	17.0	28.0	64	90	0
05	19.0	28.5	64	90	0
06	19.5	28.5	71	86	0
07	19.5	29.5	64	87	0
08	20.0	30.5	62	83	0
Avg	18.87	28.56	67	88.12	-

Table-5.2.5
On-site Meteorological Observation
(December, 2013 – March, 2014)
(Temperature, Relative Humidity and Rainfall)

Month	Temperature			Relative Humidity			Total Rainfall (mm)
	Mean Max	Mean Min	Avg	Mean Max	Mean Min	Avg	
December	26.91	14.02	20.47	87.60	39.17	73.38	0
January	24.50	12.82	18.66	87.26	60.19	73.72	0
February	28.00	15.45	21.13	87.68	57.39	72.53	0
March	28.56	18.87	23.72	88.12	67.00	77.56	0

5.3 LANDUSE

Present Landuse of the proposed site is 90% Barren land and 10% agricultural land. The land to be used for laying of railway line for the transportation of coal near the plant site is agricultural land.

The land to be used for laying the water pipeline is agricultural land but the pipe shall be buried atleast 1.0m below the ground and covered. This land shall then be returned to the owner for farming.

The coal will be transported by rail wagons. Wagon loading at pitched will be from silos.

5.3.1 Jurisdiction of the Study Area

As outlined earlier, the study area of this project encompasses areas falling within a 10 km radius of the plant site. The study area is distributed over Paschim Medinipur District of the state of West Bengal.

5.3.2 Basis of Landuse Classification

The landuse classification used in this report for the study area has been adopted from the District Planning Map of the National Atlas and Thematic Mapping Organisation (NATMO), duly complemented by ground truth surveys. The breakup of landuse has been presented in the following four categories.

1.	Forest Area	:	19.47	%
2.	Residential	:	1.23	%
3.	Scrub land	:	1.95	%
4.	Cultivated/barren land	:	77.35	%

The landuse as per revenue record is presented in Exhibit-5.3.1. The landuse map is presented vide Exhibit-5.3.2. The pattern of landuse is presented in Exhibit-5.3.3.

The classification / land use pattern of the concerned plots of land within the proposed thermal power plant has been noted as per available records and are furnished here under for taking necessary action

P.S. - Salboni, Dist - Paschim Medinipur

SL No	Name of the mouza with JL No	Plot No within the Project	Classification / land use as per present Land records	Remarks
1	Gaighata JL 455	321	Dahi puratan patit	Fallow non-agri land
		322	Dahi puratan patit	Fallow non-agri land
		1	Dahi puratan patit	Fallow non-agri land
		355	Dahi puratan patit	Fallow non-agri land

SL No	Name of the mouza with JL No	Plot No within the Project	Classification / land use as per present Land records	Remarks
2	Hatimari JN 454	1	Dahi puratan patit	Fallow non-agri land
		2	Dhani chaharam	Low quality agri land
		3	Danga puratan patit	Fallow non-agri land
		4	Dhani chaharam	Low quality agri land
		6	Dahi puratan patit	Fallow non-agri land
		20	Path	Passage
		21	Dahi puratan patit	Fallow non-agri land
		327	Dahi puratan patit	Fallow non-agri land
		328	Danga puratan patit	Fallow non-agri land
		329	Danga puratan patit	Fallow non-agri land
		365	Dahi puratan patit	Fallow non-agri land
		366	Dhani chaharam	Low quality agri land
		381	Dahi puratan patit	Fallow non-agri land
3	Salika JN 453	1	Dahi puratan patit	Fallow non-agri land
		2	Path	Passage
		179	Dahi puratan patit	Fallow non-agri land
		240	Dahi puratan patit	Fallow non-agri land
		241	Dahi puratan patit	Fallow non-agri land
		242	Dahi puratan patit	Fallow non-agri land
		243	Dahi puratan patit	Fallow non-agri land
		244	Dahi puratan patit	Fallow non-agri land
		245	Dahi puratan patit	Fallow non-agri land
		246	Dahi puratan patit	Fallow non-agri land
		247	Dahi puratan patit	Fallow non-agri land
		248	Dahi puratan patit	Fallow non-agri land
		249	Dahi puratan patit	Fallow non-agri land
		250	Dahi puratan patit	Fallow non-agri land
		251	Dahi puratan patit	Fallow non-agri land
		252	Dahi puratan patit	Fallow non-agri land
		253	Dahi puratan patit	Fallow non-agri land
		254	Dahi puratan patit	Fallow non-agri land
		255	Dahi puratan patit	Fallow non-agri land
		256	Dahi puratan patit	Fallow non-agri land
		257	Dahi puratan patit	Fallow non-agri land
		258	Dahi puratan patit	Fallow non-agri land
		259	Dahi puratan patit	Fallow non-agri land
		260	Dahi puratan patit	Fallow non-agri land
		261	Dahi puratan patit	Fallow non-agri land
		262	Dahi puratan patit	Fallow non-agri land
		263	Dahi puratan patit	Fallow non-agri land
		264	Dahi puratan patit	Fallow non-agri land
		265	Dahi puratan patit	Fallow non-agri land
		266	Dahi puratan patit	Fallow non-agri land
		267	Dahi puratan patit	Fallow non-agri land

SL No	Name of the mouza with JL No	Plot No within the Project	Classification / land use as per present Land records	Remarks
		268	Dahi puratan patit	Fallow non-agri land
		269	Dahi puratan patit	Fallow non-agri land
		270	Path	Passage
		271	Path	Passage
		272	Path	Passage
		273	Path	Passage
		274	Path	Passage
4	Kharkasuli JL 312	71	Path	Passage
		72	Dahi puratan patit	Fallow non-agri land
5	Jambedia JL 445	349	Dahi puratan patit	Fallow non-agri land
6	Kulpheni JL 456	194	Dahi puratan patit	Fallow non-agri land

5.4 WATER QUALITY

Selected water quality parameters of surface and ground water resources within 10 km radius of the study area have been considered for assessment of baseline water quality characteristics. The monitoring locations were finalized based on :

- Locations of major water bodies; and
- Areas which can represent baseline conditions and likely to be impacted due to effluent discharges if any.

5.4.1 Water Quality Monitoring

Though monitoring of water quality was not specified in the prescribed ToR of MOEF&CC, the same was carried out for portrayal of the background water quality in the study area.

Overall five (5) sampling stations, three (3) for surface water and two (2) for ground water quality monitoring were selected. Samples of water were drawn from these five (5) stations during the a three month period, December, 2013 – March, 2014 and analysed for relevant parameters covering physical, chemical and bacteriological qualities including certain heavy metals, trace elements and toxic constituents. Samples were collected as grab samples and were analysed for various water quality parameters. The location of the monitoring stations are depicted in Exhibit-3.2.

The plant is designed on 'Zero discharge concept'. Since there is no recipient sink for plant discharge, the surface water quality monitoring stations were selected on open water systems (rivers / streams) and closed water systems (ponds). Thus SW1 was located on a pond near the project site and SW2 and SW3 on the Tamal river and Parang river, respectively in proximity to the plant site.

Groundwater monitoring stations GW1 and GW2 were located around ash pond and plant site as groundwater is most likely to be affected due to the ash pond leachate phenomena.

GW1 and GW2 are tubewells located at villages, Chandan Kath and Balibasha respectively.

5.4.2 Water Quality Results

The baseline surface water quality monitoring results are presented monthwise in Table-5.4.1 and the ground water quality, monitoring results are presented in Table-5.4.2.

5.4.3 Surface Water Quality

The pH of the surface waters is about 7.1, which is within the normal range of 6.5-8.5.

TDS varied between 78-283 mg/l, which is well below the permissible limit of 1500 mg/l for Class 'C' of Inland Surface Waters, as per Central Pollution Control Board. Dissolved oxygen levels are high (range:5.6-6.4 mg/l) which should be 4 mg/l, according to Class 'C' Inland Surface Water as per CPCB. BOD levels ranged between 3-12 mg/l, which should be 3 mg/l, according to Class 'C' Inland Surface Water as per CPCB.

Chloride content, sulfate content, zinc and iron all are within the permissible limit according to Class 'C; of Inland Surface Water as per CPCB.

5.4.4 Ground Water Quality

The analysis of ground water quality reveals that, among the physical parameters analyzed, colour, turbidity and pH are within the permissible limit as per Potable Water Quality Standards' for "Indian Standards : 10500 (1991)" for both GW1 and GW2.

The chemical parameters analyzed are, alkalinity, total hardness, residual chlorine, nitrate, fluoride, phenol, chloride, sulfate are within the permissible limit as per Potable Water Quality Standards for "Indian Standards : 10500 (1991)" for both GW1 and GW2.

The heavy metals analyzed at GW1 and GW2 includes parameters such as Boron, Zinc, Chromium, Copper & Lead which are well below the permissible limit as per Potable Water Quality Standards for "Indian Standards : 10500 (1991)".

Among the heavy metals analyzed, only iron content, both in GW1 & GW2 are in higher range viz. 2.44 mg/l & 2.2 mg/l respectively, that exceed the permissible limit for "Indian Standards : 10500 (1991)", which is 0.3 mg/l.

The hard copies of the data on baseline water quality duly stamped & signed by Enviocheck is presented in Annexure-7A.

As a part of CSR commitment, JSW had installed about 10 hand pumps in 10 different villages around the plant site within the study area, for collecting water from deep aquifer water samples have been collected randomly from 2 tubewells & tested for iron content. It has been found that iron content from these deep hand pumps are within range. Analysis report of the tests as enclosed in Annexure-7B. The sources of drinking water in the village is underground water through open wells, hand pumps & deep tubewells.

Table-5.4.1
Surface Water Quality Results

No.	Parameters	Sample (SW1)	Sample (SW2)	Sample (SW3)
1	Temperature (^{0}C)	18.5	18.5	16
2	pH	7.1	7.1	7.08
3	Total Dissolved Solid (mg/l)	120	78	283
4	Total Hardness (mg/l)	30	32	140
5	Dissolved Oxygen (mg/l)	6.4	6	5.6
6	BOD , 3 days at 27^{0}C (mg/l)	3	5	12
7	COD (mg./l)	9.8	19.6	39.2
8	Oil & Grease (mg/l)	<1.0	<1.0	<1.0
9	Kjeldahl Nitrogen (mg/l)	5.2	6.5	9.2
10	Chloride (mg/l)	23.41	14.41	19.81
11	Sulphates as SO4 (mg/l)	25	10.25	17.5
12	Phosphate (mg/l)	0.69	0.51	0.69
13	Calcium (mg/l)	6.01	8.02	33.67
14	Magnesium (mg/l)	3.6	2.88	13.44
15	Sodium (mg/l)	26.5	16.5	43
16	Manganese (mg/l)	<0.03	<0.03	<0.03
17	Zinc (mg/l)	0.1	0.12	0.15
18	Iron (mg/l)	9.23	1.38	2.09
19	Chromium (Total) (mg/l)	<0.2081	<0.2081	<0.2081
20	Chromium (VI) (mg/l)	<0.01	<0.01	<0.01

Table-5.4.2
Ground Water Quality Analysis Result

No.	Parameters	GW1	GW2
1	Colour (Hazen)	1	1
2	Temperature (^{0}C)	14.5	16
3	Turbidity (NTU)	5.2	5.6
4	Total Dissolved Solid (mg/l)	175	53
5	pH	5.96	5.16
6	Alkalinity (mg/l)	54.6	21
7	Total Hardness (mg/l)	48	24
8	Residual Chlorine (mg/l)	<0.01	<0.01
9	Nitrate (mg/l)	2.8	1.2
10	Fluoride (mg/l)	<0.02	<0.02
11	Phenol (mg/l)	<0.001	<0.001
12	Total Nitrogen (mg/l)	4.12	2.32
13	Boron (mg/l)	<0.1	<0.1
14	Chloride (mg/l)	37.82	9.0
15	Sulphate (mg/l)	11.25	<0.1
16	Cyanide (mg/l)	<0.05	<0.05
17	Calcium (mg/l)	11.22	6.41
18	Magnesium (mg/l)	4.8	1.92
19	Manganese (mg/l)	<0.03	<0.03
20	Zinc (mg/l)	0.15	0.29
21	Aluminium (mg/l)	<0.006	<0.006
22	Iron (mg/L)	2.44	2.2
23	Chromium (VI) (mg/l)	<0.01	<0.01
24	Copper (mg/l)	<0.05	<0.05
25	Mercury (mg/l)	<0.0001	<0.0001
26	Cadmium (mg/l)	<0.01	<0.01
27	Sodium (mg/l)	26.5	8.5
28	Arsenic (mg/l)	<0.01	<0.01
29	Lead (mg/l)	<0.03	<0.03
30	Total Coliform / 100 ml.	<1, <10,<100	<1, <10,<100
31	Fecal Coliform /100 ml.	<1, <10,<100	<1, <10,<100

5.5 AMBIENT AIR QUALITY

The objective of the ambient air quality monitoring is to establish the baseline conditions with respect to the study area of a 10 km radius around the project site. The sources of pollution are vehicular traffic, agricultural fields, unpaved roads and domestic fuel burning etc.

5.5.1 Monitoring Stations

The locations of the monitoring stations were based on the meteorology and topography of the area, representativeness of the likely impact areas as assessed through preliminary results of the air quality dispersion model in order to site the stations as close as feasible to the anticipated maximum pollutant deposition areas and one station in the upwind directions. Three stations (AQ2, AQ3 and AQ4) were selected near the maximum pollutant deposition areas and AQ1 was placed in the upwind directions. The ambient air quality monitoring stations are located at four (4) selected places at Dhansol village (AQ1), Bursha village (AQ2), Kashijora village (AQ3) and Tangrashole village (AQ4). Logistic considerations as easy accessibility, security, availability of reliable power supply etc were examined while finalising the locations. The locations of the ambient air quality monitoring stations are depicted in Exhibit-3.2.

4 air quality monitoring stations were set up for portrayal of the background ambient air quality in the vicinity of the project. 1 station AQ1 was set up north of the project site in the upwind direction as the referral station. The other 3 stations, AQ2, AQ3 and AQ4 were set up within 4-6 kms from the plant site in the west, west-south-west and south west directions, respectively in the prevalent downwind directions to represent the maximum deposition areas of air pollutants. It may be noted that the number of monitoring stations was not specified in the prescribed ToR.

5.5.2 Duration and Frequency of Monitoring

The monitoring was carried out for a three month period (December, 2013 – March, 2014) at a frequency of twice a week at each station adopting a continuous 24-hour schedule.

5.5.3 Sampling & Analytical Techniques and Results

The High Volume cum Respirable Dust Sampler APM-460 of Envirotech Instruments were placed at a height of 3 to 4.5 metres above ground level at each monitoring station, thus negating the effects of wind blown ground dust and free from vertical obstructions within a cone of 120^{o} from the actual position, to avoid any impedance to the pollutants.

The following parameters were monitored in the study area :

- Particulate Matter (PM_{10})
- Particulate Matter ($PM_{2.5}$)
- Sulphur Dioxide (SO_2)
- Oxides of Nitrogen (NO_x)
- Ozone (O_3)
- Mercury (Hg)

PM_{10} and $PM_{2.5}$ present in ambient air is sucked through the cyclone. Coarse and non-respirable dust is separated from the air stream by centrifugal forces acting on the solid particles. These separated particulates fall through the cyclone's conical hopper and collect in the sampling cap placed at the bottom. The fine dust (<10 microns) forming the respirable fraction of the Particulate Matter passes the cyclone and is retained by the filter paper.

A tapping is provided on the suction side of the blower to provide a suction for sampling air through a set of impingers. Samples of gases are drawn at a flow rate of 0.2 litres per minute (LPM). PM_{10} and $PM_{2.5}$ have been estimated by gravimetric method. Modified West and Gaeke method (IS 5182, Part II, 1969) has been adopted for estimation of SO_2. Jacobs & Hochheiser method (IS 5182, Part IV, 1975) has been adopted for estimation of NO_x. The techniques used for ambient air quality monitoring are as under :

Sl. No.	Parameters	Techniques	Technical Protocol
1	PM_{10}	Respirable Dust Sampler, APM 460 (Gravimetric Method)	IS-5182 (Part-IV)
2	$PM_{2.5}$	Respirable Dust Sampler, APM 460 (Gravimetric Method)	USEPA
3.	Sulphur Dioxide	West and Gaeke	IS-5182 (Part-II)
4.	Oxides of Nitrogen	Jacob & Hochheiser	IS-5182 (Part-IV)

The detailed monitoring results of PM_{10}, $PM_{2.5}$, SO_2, NO_x, Ozone and other pollutants are presented in Tables-5.5.1 – 5.5.4 corresponding to air quality stations AQ1, AQ2, AQ3 and AQ4 (Refer Exhibit-5.5.1).

The Minimum, Maximum, Arithmetic Mean (AM) and P98 values of 24-hourly average values for PM_{10} and $PM_{2.5}$ measured during the period are shown in Table-5.5.5. The National Ambient Air Quality Standards are presented in Table-5.5.6.

5.5.3.1 Particulate Matter (PM_{10})

The 24-hour average arithmetic mean values of PM_{10} (Table-5.5.5) varied between 55-68 $\mu g/m^3$ with overall average of 4 stations being 60 $\mu g/m^3$.

The overall 24-hour average 98-percentile values of PM_{10} were observed to be 77 $\mu g/m^3$ (max 77 $\mu g/m^3$ at Station AQ1 and min 60 $\mu g/m^3$ at Station AQ3) (Table-5.5.6) being much lower the applicable standard of 100 $\mu g/m^3$ (Refer Exhibit-5.5.1).

5.5.3.2 Particulate Matter ($PM_{2.5}$)

The 24-hour average arithmetic mean values of $PM_{2.5}$ (Table-5.5.5) varied between 24-26 $\mu g/m^3$ with overall average of 4 stations being 25 $\mu g/m^3$.

The overall 24-hour average 98-percentile values of $PM_{2.5}$ were observed to be 33 $\mu g/m^3$, which is much below the limit of 60 $\mu g/m^3$ for industrial, residential, rural and other areas (Table-5.5.5) (Refer Exhibit-5.5.1).

5.5.3.3 Sulphur Dioxide (SO_2)

All the values of SO_2 at all 4 stations were recorded below the detection limit of 6.94 $\mu g/m^3$ and as such no statistical analyses was conducted. The values are much below the threshold of 80 $\mu g/m^3$.

5.5.3.4 Oxides of Nitrogen (NO_x)

All values of NO_x at all the stations were below the detection limit of 20 $\mu g/m^3$ and as such were not subjected to statistical analyses.

This is much below the permissible limit of 80 $\mu g/m^3$.

5.5.3.5 Ozone (O_3)

Ground level concentrations of Ozone have lower than 10 $\mu g/m^3$, significantly lower than the permissible limit of 100 $\mu g/m^3$ for industrial, residential, rural and other areas (Table-5.5.6).

5.5.3.6 Others

Monitoring data of other pollutants as mercury, is given in Table-5.5.1 – 5.5.4 and their values are found to be less than 0.069 $\mu g/m^3$ for all samples monitored.

The hard copies of the data on baseline ambient air quality duly stamped & signed by Envirocheck is presented in Annexure-7C.

Table-5.5.1
Ambient Air Quality Results for Station AQ1

Date of sampling	Pollutants level in µg/m^3					
	$PM_{2.5}$	PM_{10}	SO_2	NO_x	Mercury	Ozone
10.12.13 to 11.12.13	32.5	78.2	<6.94	<20		
14.12.13 to 15.12.13	30.2	67.5	<6.94	<20		
18.12.13 to 19.12.13	26.8	58.2	<6.94	<20	<0.069	<10
22.12.13 to 23.12.13	31.5	76.5	<6.94	<20		
26.12.13 to 27.12.13	26.8	62.8	<6.94	<20		
30.12.13 to 31.12.13	23.5	63.5	<6.94	<20		
03.01.14 to 04.01.14	25.2	61.2	<6.94	<20		
07.01.14 to 08.01.14	26.8	65.2	<6.94	<20		
11.01.14 to 12.01.14	32.5	71.5	<6.94	<20	<0.069	<10
15.01.14 to 16.01.14	23.5	61.8	<6.94	<20		
19.01.14 to 20.01.14	26.8	73.2	<6.94	<20		
23.01.14 to 24.01.14	25.8	62.5	<6.94	<20		
27.01.14 to 28.01.14	23.6	61.8	<6.94	<20	<0.069	<10
31.01.14 to 01.02.14	28.5	68.2	<6.94	<20		
04.02.14 to 05.02.14	31.5	65.8	<6.94	<20		
08.02.14 to 09.02.14	28.5	61.2	<6.94	<20	<0.069	<10
12.02.14 to 13.02.14	21.8	62.8	<6.94	<20		
16.02.14 to 17.02.14	18.5	53.2	<6.94	<20		
20.02.14 to 21.02.14	25.6	63.5	<6.94	<20	<0.069	<10
24.02.14 to 25.02.14	23.8	61.2	<6.94	<20		
28.02.14 to 29.02.14	20.5	58.6	<6.94	<20		
04.03.14 to 05.03.14	26.3	65.2	<6.94	<20		
08.03.14 to 09.03.14	21.5	61.8	<6.94	<20	<0.069	<10
12.03.14 to 13.03.14	23.5	68.2	<6.94	<20		

Lower Detection Limit of Parameters as per NABL Specifications

1.	Respirable Suspended Particulate Matter (PM_{10})	-	3.5	µg/m^3
2.	Respirable Particulate Matter ($PM_{2.5}$)	-	5.0	µg/m^3
3.	Sulphur Dioxide (SO_2)	-	6.94	µg/m^3
4.	Oxides of Nitrogen (NO_x)	-	20.0	µg/m^3
5.	(O_3)	-	10.0	µg/m^3
6.	Mercury (Hg)	=	0.069	µg/m^3

Table-5.5.2
Ambient Air Quality Results for Station AQ2

Date of sampling	Pollutants level in µg/m^3					
	$PM_{2.5}$	PM_{10}	SO_2	NO_x	Mercury	Ozone
12.12.13 to 13.12.13	26.20	61.50	<6.94	<20		
16.12.13 to 17.12.13	26.50	63.20	<6.94	<20		
20.12.13 to 21.12.13	31.80	71.50	<6.94	<20	<0.069	<10
24.12.13 to 25.12.13	32.80	73.80	<6.94	<20		
28.12.13 to 29.12.13	28.60	72.50	<6.94	<20		
01.01.14 to 02.01.14	31.20	62.50	<6.94	<20		
05.01.14 to 06.01.14	25.20	58.20	<6.94	<20	<0.069	<10
09.01.14 to 10.01.14	23.60	61.78	<6.94	<20		
13.01.14 to 14.01.14	26.50	63.50	<6.94	<20		
17.01.14 to 18.01.14	21.78	56.20	<6.94	<20		
21.01.14 to 22.01.14	23.50	52.78	<6.94	<20		
25.01.14 to 26.01.14	26.50	71.50	<6.94	<20	<0.069	<10
29.01.14 to 30.01.14	23.30	62.78	<6.94	<20		
02.02.14 to 03.02.14	31.20	76.50	<6.94	<20		
06.02.14 to 07.02.14	28.60	71.26	<6.94	<20	<0.069	<10
10.02.14 to 11.02.14	23.60	61.50	<6.94	<20		
14.02.14 to 15.02.14	21.50	58.23	<6.94	<20		
18.02.14 to 19.02.14	23.60	56.20	<6.94	<20		
22.02.14 to 23.02.14	21.30	52.80	<6.94	<20		
26.02.14 to 27.02.14	24.30	58.12	<6.94	<20	<0.069	<10
02.03.14 to 03.03.14	32.50	73.50	<6.94	<20		
06.03.14 to 07.03.14	26.30	61.58	<6.94	<20		
10.03.14 to 11.03.14	23.80	58.20	<6.94	<20	<0.069	<10
14.03.14 to 15.03.14	21.50	62.18	<6.94	<20		

Lower Detection Limit of Parameters as per NABL Specifications

1.	Respirable Suspended Particulate Matter (PM_{10})	-	3.5	µg/m^3
2.	Respirable Particulate Matter ($PM_{2.5}$)	-	5.0	µg/m^3
3.	Sulphur Dioxide (SO_2)	-	6.94	µg/m^3
4.	Oxides of Nitrogen (NO_x)	-	20.0	µg/m^3
5.	(O_3)	-	10.0	µg/m^3
6.	Mercury (Hg)	=	0.069	µg/m^3

Table-5.5.3
Ambient Air Quality Results for Station AQ3

Date of sampling	Pollutants level in µg/m^3					
	$PM_{2.5}$	PM_{10}	SO_2	NOx	Mercury	Ozone
12.12.13 to 13.12.13	23.50	61.20	<6.94	<20		
16.12.13 to 17.12.13	21.38	53.20	<6.94	<20		
20.12.13 to 21.12.13	20.10	51.89	<6.94	<20	<0.069	<10
24.12.13 to 25.12.13	21.78	53.60	<6.94	<20		
28.12.13 to 29.12.13	26.50	58.12	<6.94	<20		
01.01.14 to 02.01.14	28.36	56.28	<6.94	<20		
05.01.14 to 06.01.14	23.78	51.23	<6.94	<20	<0.069	<10
09.01.14 to 10.01.14	26.50	56.80	<6.94	<20		
13.01.14 to 14.01.14	21.50	53.68	<6.94	<20		
17.01.14 to 18.01.14	25.10	56.80	<6.94	<20		
21.01.14 to 22.01.14	23.50	52.60	<6.94	<20		
25.01.14 to 26.01.14	28.23	56.78	<6.94	<20	<0.069	<10
29.01.14 to 30.01.14	23.80	53.28	<6.94	<20		
02.02.14 to 03.02.14	23.80	58.23	<6.94	<20		
06.02.14 to 07.02.14	21.80	51.20	<6.94	<20	<0.069	<10
10.02.14 to 11.02.14	23.60	52.80	<6.94	<20		
14.02.14 to 15.02.14	28.60	56.18	<6.94	<20		
18.02.14 to 19.02.14	22.80	52.12	<6.94	<20		
22.02.14 to 23.02.14	26.10	53.68	<6.94	<20		
26.02.14 to 27.02.14	22.80	52.18	<6.94	<20	<0.069	<10
02.03.14 to 03.03.14	21.50	56.12	<6.94	<20		
06.03.14 to 07.03.14	23.80	52.80	<6.94	<20		
10.03.14 to 11.03.14	21.50	51.23	<6.94	<20	<0.069	<10
14.03.14 to 15.03.14	26.50	58.23	<6.94	<20		

Lower Detection Limit of Parameters as per NABL Specifications

1. Respirable Suspended Particulate Matter (PM_{10}) - 3.5 µg/m^3
2. Respirable Particulate Matter ($PM_{2.5}$) - 5.0 µg/m^3
3. Sulphur Dioxide (SO_2) - 6.94 µg/m^3
4. Oxides of Nitrogen (NO_x) - 20.0 µg/m^3
5. (O_3) - 10.0 µg/m^3
6. Mercury (Hg) = 0.069 µg/m^3

Table-5.5.4
Ambient Air Quality Results for Station AQ4

Date of sampling	Pollutants level in µg/m^3					
	$PM_{2.5}$	PM_{10}	SO_2	NO_x	Mercury	Ozone
10.12.13 to 11.12.13	23.60	52.80	<6.94	<20		
14.12.13 to 15.12.13	28.50	56.20	<6.94	<20		
18.12.13 to 19.12.13	26.12	58.23	<6.94	<20	<0.069	<10
22.12.13 to 23.12.13	31.50	62.50	<6.94	<20		
26.12.13 to 27.12.13	32.80	61.28	<6.94	<20		
30.12.13 to 31.12.13	36.20	68.20	<6.94	<20		
03.01.14 to 04.01.14	28.50	68.20	<6.94	<20		
07.01.14 to 08.01.14	23.60	62.18	<6.94	<20		
11.01.14 to 12.01.14	22.80	63.12	<6.94	<20	<0.069	<10
15.01.14 to 16.01.14	16.50	41.20	<6.94	<20		
19.01.14 to 20.01.14	22.18	60.10	<6.94	<20		
23.01.14 to 24.01.14	21.60	56.28	<6.94	<20		
27.01.14 to 28.01.14	26.50	52.78	<6.94	<20	<0.069	<10
31.01.14 to 01.02.14	21.80	51.80	<6.94	<20		
04.02.14 to 05.02.14	26.58	56.20	<6.94	<20		
08.02.14 to 09.02.14	20.10	51.23	<6.94	<20	<0.069	<10
12.02.14 to 13.02.14	21.58	52.80	<6.94	<20		
16.02.14 to 17.02.14	23.50	53.68	<6.94	<20		
20.02.14 to 21.02.14	21.80	56.20	<6.94	<20	<0.069	<10
24.02.14 to 25.02.14	22.50	58.60	<6.94	<20		
28.02.14 to 29.02.14	21.80	53.12	<6.94	<20		
04.03.14 to 05.03.14	20.50	51.28	<6.94	<20		
08.03.14 to 09.03.14	21.80	52.78	<6.94	<20	<0.069	<10
12.03.14 to 13.03.14	26.50	58.12	<6.94	<20		

Lower Detection Limit of Parameters as per NABL Specifications

1.	Respirable Suspended Particulate Matter (PM_{10})	-	3.5	µg/m^3
2.	Respirable Particulate Matter ($PM_{2.5}$)	-	5.0	µg/m^3
3.	Sulphur Dioxide (SO_2)	-	6.94	µg/m^3
4.	Oxides of Nitrogen (NO_x)	-	20.0	µg/m^3
5.	Ozone (O_3)	-	10.0	µg/m^3
6.	Mercury (Hg)	=	0.069	µg/m^3

Table-5.5.5
Statistical Analysis of Ambient Air Quality Results

Pol	Unit	AAQMS	Location	Mes	Min	Max	AM	p98
$PM_{2.5}$	$\mu g/m^3$	AQ1	Dhansole	24	21	33	26	33
		AQ2	Bursha	24	21	33	26	33
		AQ3	Kashijora	24	20	29	24	28
		AQ4	Tangrashole	24	20	36	25	35
		All	Overall 4 locations	96	20	36	25	33
PM_{10}	$\mu g/m^3$	AQ1	Dhansole	24	58	78	66	77
		AQ2	Bursha	24	53	77	63	75
		AQ3	Kashijora	24	51	61	55	60
		AQ4	Tangrashole	24	51	68	58	68
		All	Overall 4 locations	96	51	78	60	77

Note :
Pol : Pollutant
AAQMS : Ambient Air Quality Monitoring Station
Mes : Number of Measurements
AM : Arithmetic Mean
P98 : 98 Percentile

Table-5.5.6
National Ambient Air Quality Standards

Pollutant	Time-Weighted Average	Concentration in Ambient Air	
		Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government
Sulphur Dioxide (SO_2), $\mu g/m^3$	Annual* 24-Hours**	50 80	20 80
Nitrogen Dioxide (NO_x), $\mu g/m^3$	Annual* 24-Hours**	40 80	30 80
Particulate Matter (size less than 10 μm) or PM_{10} $\mu g/m^3$	Annual* 24-Hours**	60 100	60 100
Particulate Matter (size less than 2.5 μm) or PM_{25} $\mu g/m^3$	Annual* 24-Hours**	40 60	40 60
Ozone (O_3) $\mu g/m^3$	8 hours ** 1 hour **	100 180	100 180
Lead (Pb) $\mu g/m^3$	Annual * 24-Hours**	0.50 1.0	0.50 1.0
Carbon Monoxide (CO) $\mu g/m^3$	8 hours ** 1 hour**	02 04	02 04
Ammonia (NHO) $\mu g/m^3$	Annual * 24 hours **	100 400	100 400
Benzene (C_6H_6) $\mu g/m^3$	Annual *	05	05
Benzo (a) Pyrene (BAP – particulate phase only ng/m^3	Annual *	01	01
Arsenic (As) ng/m^3	Annual *	06	06
Nickel (Ni), ng/m^3	Annual *	20	20

* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note :- Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

5.6 SOIL

Selected soil quality parameters for soil resources within 10 km radius of the study area have been considered for assessment of baseline soil quality characteristics. The monitoring locations were finalized based on, areas which represent baseline condition & areas likely to be impacted due to solid waste disposal, effluent discharge if any, or lechate from ash disposal site.

5.6.1 Soil Quality Monitoring

Three sampling stations for soil quality monitoring were selected. Samples of soil were drawn from these three stations during December, 2016, and analysed for relevant parameters. Samples were collected as grab samples. The location of monitoring stations are depicted in Exhibit-3.2.

Soil Quality monitoring stations S1 & S2 were located in the ash dykes, mainly to assess, the effect of lechate release from the ash pond & its effect on soil quality and S3 monitoring station is located within the plant area.

5.6.2 Soil Quality Results

The pH of the soil samples at S1, S2 and S3 are 6.09, 5.9 & 6.3 respectively. The electrical conductivity of the soil samples at S1, S2 and S3 are 1900 µmhos/cm, 2100 µmhos/cm and 2700 µmhos/cm respectively. The moisture content of the soil samples at S1, S2 and S3 are 2.9%, 3.1% and 4.1% respectively. The organic carbon content at S1, S2 and S3 are 0.47%, 0.54% and 0.59% respectively. The organic matter content of the soil samples at S1, S2 and S3 are 0.81%, 0.93% and 1.02% respectively. The results of the soil samples are presented in Table-5.6.1.

The hard copies of the baseline data on soil quality duly stamped & signed by Green C Laboratory Services is presented in Annexure-7D.

Table-5.6.1
Soil Quality Analysis Results

Sl. No.	Parameters	Method	S1	S2	S3
1	pH	IS 2720-Part 26, 1987 by pH meter	6.09	5.9	6.3
2	Electrical Conductivity	Department of Agriculture & Co-operation, Page No. 81-82:2011	1900 µmhos/cm	2100 µmhos/cm	2700 µmhos/cm
3	Moisture	Department of Agriculture & Co-operation, Page No. 76-77:2011	2.9%	3.1%	4.1%
4.	Organic Carbon	IS:2720 - Part 22, 1972, Reaffirmed 2001	0.47%	0.54%	0.59%
5	Organic Matter	IS:2720 - Part 22, 1972, Reaffirmed 2001 (By Calculation)	0.81%	0.93%	1.02%

5.7 ECOLOGY

5.7.1 Flora

An ecological survey of the study area was conducted particularly with reference to listing of species and assessment of the existing baseline ecological (Terrestrial and Aquatic ecosystem) conditions (based on past studies).

5.7.2 Objective of Ecological Studies

The present study was undertaken with the following objectives :

- To assess the nature and distribution of vegetation in and around the project site;
- To assess the distribution of animal life spectra;
- To understand the productivity of the water bodies; and
- To ascertain migratory routes of fauna and possibility of breeding grounds.

5.7.3 Forest Blocks in Study Area

The list of forest blocks in 10 km radius from the plant boundary is presented in Table-5.7.1.

5.7.4 Floristic Composition

Life from Spectrum

Raunkiaer defined life forms as the sum of adaptations of plants to the climate. Braun - Blanquest (1951), whose system is adapted in this study, modified the Raunkiaer's system. The following five best of the ten classes created by Braun-Blanquet are present in the study area and are presented in Table-5.7.2.

5.7.5 Terrestrial Fauna and Ornithology

National Park / Sanctuary

As per MoEF& CC and Forest Department, West Bengal, there are no Wildlife Sanctuaries, National Parks/Biosphere Reserves in 15-km radius from plant boundary.

5.7.5.1 Endangered Animals

A comprehensive Central Legislation namely Wild Life (Protection) Act was enforced in 1972. This law is to provide protection to wild animals and for matters related to their ancillary or incidental death. Schedule-1 of this Act included the list of rare and endangered species, which are completely protected throughout the country.

On comparison of the check list given in the Schedule-1 of the Act and the list of wildlife present in the study area, it can be concluded that 3 species of Schedule-I animals are

existing in the study area (2 mammals viz. elephant, monkey and 1 reptile viz. python) and the rest of the wild animals belong to Schedule II, II, IV and V of Wildlife (Protection) Act, 1972.

5.7.5.2 Wild Life Conservation

The following mitigation measures will be taken for protection of fauna in the study area with the help of forest official.

- Educate the local people to develop awareness to protect the animals.
- Formulation of wild life protection committees in nearby villages to check the poaching and hunting.
- Wild life patrolling committee would be formed to monitor the wild animals movement; and
- Develop thick green belt around the plant site which will attract the avifauna in the study area and increase the aesthetic value of the area.

5.7.6 Aquatic Ecosystem

The objective of aquatic ecological study may be outlined as follows :

- To characterize water bodies like fresh water;
- To understand their present biological status; and
- To characterize water bodies with the help of biota.

5.7.6.1 Phytoplankton and Zooplankton

Phytoplankton group reported from six locations are basillariophyceae, chlorophyceae, myxophyceae and euglenophyceae members. About 45 species of phyto and zooplankton species were reported from six locations. The details are presented in Table-5.7.3.

The water bodies are oligotrophic to slightly mesotrophic in status due to inflow from runoff from surrounding areas. The aquatic status also indicates that there is no evidence of industrial/external contamination.

Table –5.7.1
List of Forest Blocks in 10 Km Radius

(Note: P.F Implies protected forest.)

Sr. No.	Name of the Forest Blocks	Distance from Plant Site Boundary (km)	Direction from Plant Site
1	P.F. Near Jayalbanga village	4.5	N
2	P.F. near Kenddange village	5.4	NNW
3	P.F. near Radhamahanpur village	9.1	N
4	P.F. near Khamarbar village	8.6	N
5	P.F. near Kenjapur village	8.5	NE
6.	P.F. near Dotal village	6.7	NE
7.	P.F. near Janbani village	4.0	NE
8.	P.F. near Bankibandh colony	4.5	NE
9.	P.F. near Bankibandh village	3.2	NE
10.	P.F. near Dakshinsol village	2.7	NE
11.	P.F. near Saiyadpur village	1.9	NE
12.	P.F. near Galghate village	1.2	E
13.	P.F. near Balga village	7.1	SE
14.	P.F. near Lalgarh village	4.8	SSE
15.	P.F. near Jara village	3.0	SSW
16.	P.F. near Maupal village	4.1	SW
17.	P.F. near Bamakata village	7.0	WSW
18.	P.F. near Saltari village	9.8	W
19.	P.F. adjacent to plant site	-	W
20.	P.F. adjacent to plant site	S	
21.	P.F. adjacent to plant site	-	SE/S
22.	P.F. near Gakuipur village	0.9	N

Table -5.7.2
Braun-Blanquet Classes

Phanerophytes	These are trees, shrubs and climbers where the growing buds are located on the upright shoot much above the ground surface and they are the least protected.
Therophytes	These are plants which survive the adverse season in the forms of seeds. The plants produce flowers and seeds in the favourable season. They are annuals, predominantly found in extremes of dry, hot or cold conditions.
Hydrophytes	Water plants except plankton (free floating and submerged macrophytes)
Hemicryptophytes	This type of plant species is again predominantly present in cold climatic regions. Perenneting buds are present just under the surface soil and remain protected there. Mostly these are biennial or perennial herbs whose vegetative growth and aerial parts are conspicuous in warm seasons only. Buds may also be present at the soil surface but they are never exposed. They remain concealed under dead leaves and twigs.
Geophytes	Plants, with perennating parts buried in substratum such as bulb and rhizomes

Table-5.7.3
List of Planktons in Study Area

Sr. No.	Phytoplankton	Zooplankton
1.	*Pediastrum duplex*	*Keratella sp*
2.	*Actinastrum sp*	*Diaptomus sp*
3.	*Coelatrum sp*	*Daphnia sp*
4.	*Syndra ulna*	*Ceriodaphnia sp*
5.	*SWynedra acus*	*Brachionus sp*
6.	*Gomphonema sp*	*Amoeba sp*
7.	*Navicula tracilis*	*Deiaphanosoma sp*
8.	*Pinnularia sp*	*Macrothrix sp*
9.	*Nitzshia sp*	*Asplancha sp*
10.	*Cymbella pucdilla*	*Cypris sp.*
11.	*Cymbella cymbiformix*	*Cyclops sp*
12.	*Cymblella romboides*	
13.	*Achnanthes sp*	
14.	*Eunotia sp*	
15.	*Cyclotella sp*	
16.	*Oxcillatoria sp*	
17.	*Spinulina sp*	
18.	*Chrococcus sp*	
19.	*Microcytis aerusinosa*	
20	*Nostoc sp*	
21.	*Rivularia sp*	
22.	*Anabaena sp*	

5.8 DEMOGRAPHY AND SOCIO-ECONOMICS

In this section, the prevailing socio-economic aspects of people of the district Paschim Medinipur, which would form the basis for making planning efforts for the socio-economic development of people in the area has been presented.

5.8.1 Methodology Adopted for the Study

The methodology adopted for the study mainly includes review of published secondary data, such as the District Census Handbook of 2011, of Paschim Medinipur district for the parameters of demography, occupational structure of people.

The salient features of the demographic and socio-economic aspects are described in the following sections.

5.8.2 Demographic Aspects

5.8.2.1 Distribution of Population

As per 2011 census, Paschim Medinipur district consists of 59,13,457 number of inhabitants. The distribution of population is given in Table-5.8.1.

5.8.2.2 Average Household Size

The district had an average family size of 4.54 persons per household in 2011. This is a moderate family size and is in comparison with other parts of the district.

5.8.2.3 Population Density

The density of population of the district works out to about 631 person per sq.km.

5.8.2.4 Sex Ratio

The configuration of male and female indicates that the males constitute to about 50.87% and females to 49.13% of the total population. The sex ratio i.e. the number of females per 1000 males indirectly reveals certain sociological aspects in relation with female birth, infant mortality among female children and single person family structure, a resultant of migration of industrial workers. The district on an average has 970 females per 1000 males.

5.8.3 Social Structure

In the district, about 14.88% population belong to Scheduled Tribes (ST) and 19.08% Scheduled Castes (SC), indicating that about 33.96% of the population in the district belongs to socially weaker sections. The distribution of population in the district by social structure is shown in Table-5.8.2 and Exhibit-5.8.1.

5.8.4 Literacy Levels

The analysis of the literacy levels in the district reveals a moderate literacy rate of 68.97% in 2011. The distribution of literates and literacy rates in the district is given in Table-5.8.3 and Exhibit 5.8.2.

The male literacy i.e. the percentage of literate males to the total males of the district works out to 55.58%. The female literacy rate, which is an important indicator for social change, is observed to be 44.42% in the study area. This indicates that there is a need for sociological development in the region.

5.8.5 Occupational Structure

The occupational structure of residents in the district Paschim Medinipur is studied with reference to main workers, marginal workers and non-workers. The main workers include 4 categories of workers defined by the Census Department consisting of cultivators, agricultural labourers, those engaged in manufacturing, processing and repairs in household industry, and others including those engaged in household industry, construction, trade and commerce, transport and communication and all other services.

The marginal workers are those workers engaged in some work for a period of less than six months during the reference year prior to the census survey. The non-workers include those engaged in unpaid household duties, students, retired persons, dependents, beggars, vagrants etc, institutional inmates or all other non-workers who do not fall under the above categories.

As per 2011 census records, the main workers account for 25.54% of the total population. The marginal workers and non-workers constitute 16.89% and 57.57% of the total population, respectively. The distribution of workers by occupation indicates that the non-workers are the predominant population. The occupational structure of the district is shown in Table-5.8.4 and Exhibit 5.8.3.

Table-5.8.1
Distribution of Population of District Paschim Medinipur

Particulars	District Paschim Medinipur
No. of Households	13,01,610
Male Population	30,07,885
Female Population	29,05,572
Total Population	5913457
% of Males to Total Population	50.87
% of Females to Total Population	49.13
Average Household Size	5.27
Sex Ratio	966
Density of Population / sq.km	631

Source : District Primary Census Statistics of Paschim Medinipur District 2011

Table – 5.8.2
Distribution of Population by Social Structure

Sl. No.	Particulars	Distribution of District Paschim Medidnipur
1	Scheduled Castes	11,28,269
2	(% of total population)	19.08
3	Scheduled Tribes	8,80,015
4	(% of total population)	14.88
5	Total SC and ST	20,08,284
6	(% of total population)	33.96
7	Other castes	39,05,173
8	(% of total population)	66.04

Source : District Primary Census Statistics of Paschim Medinipur District 2011.

Table-5.8.3
Distribution of Literate and Literacy Rates

Sl. No.	Particulars	Distribution in the District
1	Total literates	40,78,412
2	Average literacy (%)	68.97
3	Male Literates	22,66,913
4	Male literacy (%)	38.33
5	% Male Literates to total Literates	55.58
6	Female literates	18,11,499
7	Female literacy (%)	30.63
8	% Female Literates to Total literates	44.42

Source : District Primary Census Statistics of Paschim Medinipur District 2011.

Table-5.8.4
Occupational Structure

Sl. No.	Occupation	District Paschim Medidnipur	
		No. of Workers	% to Population
1	Total main workers	15,10,548	25.54
2	Marginal Workers	9,98,611	16.89
3	Non-workers	34,04,298	57.57
	Total Population	59,13,457	100

Source : District Primary Census Statistics of Paschim Medinipur District 2011.

5.9 NOISE

5.9.1 Ambient Noise Monitoring

In the present study, sound pressure levels were measured by a sophisticated sound level meter in order to determine sound power or intensity. Since loudness of sound is important by its effects on people, the dependence of loudness upon frequency must be taken into account in environmental noise assessment. This has been achieved by the use of A-weighting filters in the noise measuring instrument which gives a direct reading of approximate loudness. Moreover, A-weighted equivalent continuous sound pressure level (Leq) values have been computed from the hourly values of A-weighted sound pressure level (SPL) measured with the help of noise meter.

A total of eight (8) locations were selected for measurement of ambient noise levels in the study area (Refer Exhibit-3.2).

Though monitoring of ambient noise was not specified in the prescribed ToR of MoEF&CC, the same was carried out for portrayal of the background noise quality.

The 8 ambient noise monitoring stations were selected to cover all the 4 landuse zones deciphered in the ambient air quality standard with respect to noise. Thus, N1 represents a potential industrial area, N2, a commercial area, N3 and N4,silence zones and the remaining 4 stations, the residential areas.

Noise level monitoring has been carried out during the three month period (December, 2013 to March, 2014) representing the winter scenario. At each location, readings were taken weekly twice at hourly intervals over a twentyfour hour period. For a particular location, day time Leq has been computed from the hourly SPL values measured between 6.00 A.M to 10.00 P.M and night time Leq from the SPL values measured between 10.00 P.M to 6.00 A.M, such that comparison could be made with the ambient noise standards circulated through the Gazette Notification of February, 2000 by Ministry of Environment and Forests, Govt of India. The equivalent sound pressure level (Leq) during day and night time, so generated, are presented in Table-5.9.1.

The ambient air quality standards in respect of noise are reproduced in Table-5.9.2.

5.9.2 Ambient Noise in the Study Area

It is observed that the average day and nighttime noise levels at station N1 are obtained at 53.28 dB(A) and 51.23 dB(A), respectively. At station N2, the day and nighttime noise levels are obtained at 48.20 and 42.58 dB(A), respectively, while the same at stations N3 and N4 are obtained at 50.18 and 40.18 dB(A) and 50.26 and 43.28 dB(A), respectively. Similar trends were observed for Stations N5, N6, N7 and N8.

The average daytime Leq value is 49.96 dB(A) and the average night time Leq level is 43.76 dB(A). Ambient noise level as monitored at site is shown in Exhibit-5.9.1.

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 6 dB(A), reflecting the rural nature of the study area.

In comparison to the Ambient Air Quality Standards in respect of noise, stipulated by the Ministry of Environment & Forests, Govt of India (Table-5.9.2), the ambient noise levels in the area are normal and compatible with the Standards.

The principal sources of noise in the study area as observed were sound of traffic (buses, trucks, scooters, tractors, diesel pump sets etc), sound of agricultural activities, murmuring of crowd, chirping of birds, crickets etc, depending on the location and time.

The hard copies of the results of the baseline ambient noise quality data duly stamped & signed by Envirocheck is presented in Annexure-7E.

Table-5.9.1
Ambient Noise in Study Area

DAY TIME

Date	Time (am)	Station code	Station location	Ambient Noise Level dB(A)		
				L_{min}	L_{max}	L_{eq}
17.01.14	09:00	N1	Project site (JSW)	46.2	61.5	53.28
19.01.14	09:30	N2	Goda Piyashal Bazar	43.8	52.8	48.20
15.01.14	10:00	N3	Dhansol JSM Vidyalaya	45.2	52.6	50.18
17.01.14	10:30	N4	Shalboni Hospital	46.3	53.8	50.26
26.12.13	11:00	N5	Dhansol Village	48.2	52.3	50.10
16.01.14	11:30	N6	Tangasol village	42.8	48.6	46.12
30.12.13	10:30	N7	Kashijara village	48.2	53.6	50.28
05.01.14	11:00	N8	Bhusara village	46.2	52.8	51.23

NIGHT TIME

Date	Time (am)	Station code	Station location	Ambient Noise Level dB(A)		
				L_{min}	L_{max}	L_{eq}
17.01.14	09:00	N1	Project site (JSW)	43.5	53.8	51.23
19.01.14	09:30	N2	Goda Piyashal Bazar	40.1	46.3	42.58
15.01.14	10:00	N3	Dhansol JSM Vidyalaya	36.2	42.5	40.18
17.01.14	10:30	N4	Shalboni Hospital	42.8	48.5	43.28
26.12.13	11:00	N5	Dhansol Village	43.6	48.2	45.23
16.01.14	11:30	N6	Tangasol village	42.8	51.2	45.28
30.12.13	10:30	N7	Kashijara village	41.6	46.8	42.18
05.01.14	11:00	N8	Bhusara village	38.5	42.6	40.12

L_{min} : Minimum Noise level L_{max} :Maximum Noise level L_{eq} :Equivalent sound energy

Table-5.9.2
Ambient Air Quality Standards in respect of Noise
(As prescribed by Ministry of Environment and Forests)

Area Code	Category of Area	Noise Limits in dB(A) as L_{eq}	
		Day Time	Night Time
(A)	Industrial Area	75	70
(B)	Commercial Area	65	55
(C)	Residential Area	55	45
(D)	Silence Zone	50	40

Note 1. Day time is reckoned in between 6.00 A.M and 10.00 P.M.

2. Night time is reckoned in between 10.00 P.M and 6.00 A.M

3. Silence zone is defined as areas upto 100 metres around such premises as hospitals, educational institutions and courts. The silence zones are to be declared by the competent Authority. Use of vehicular horns, loud speakers and bursting of crackers shall be banned in those zones.

CHAPTER-6
ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT

6.1 INTRODUCTION

6.1.1 Phases

The proposed project may influence the environment in two distinct phases :

i) During the construction phase which may be temporary or short-term;
ii) During the operation phase which may have long term effects.

The environmental impacts in this study have, as such, been discussed separately for the construction phase and the operation phase of the project.

6.1.1.1 Construction Phase

The following activities among others are likely to contribute towards impacts on the surrounding environment during the construction phase :

a) Land Acquisition
b) Plant Construction
c) Ash Pond Development
d) Creation of Labour Colonies

The impacts are likely to primarily affect landuse, demography and socioeconomics, on-site soils and on-site noise. It could also lead to minor impacts on air and water quality and ecology.

6.1.1.2 Operational Phase

Operational phase activities may have impacts either minor or major, positive or negative, on environmental disciplines such as soils, surface and groundwater hydrology, micrometeorology, landuse, wateruse, water and air quality, terrestrial and aquatic ecology, socioeconomics and noise.

The important activities contributing to environmental impacts are as follows :

a) Fuel Handling and Preparation
b) Water Consumption
c) Liquid Effluent Discharge
d) Emission of Air Pollutants
e) Ash Disposal
f) Operation of Machineries
g) Power Generation

The operation of the thermal power plant would necessarily involve release into the environment of various waste waters, emissions from stacks, production of solid wastes and increased noise levels. There are likely to cause changes in the environmental

parameters. A quantitative or qualitative assessment of the changes in these parameters is essential for determining their impact on environment of the surrounding area.

The operational impacts in this study have accordingly been evaluated for the proposed configuration of the power plant of 1 x 660 MW super critical units. The changes over the existing baseline quality of relevant environmental parameters as a result of the activities causing impacts due to operation have been predicted using suitable mathematical models coupled with qualitative or quantitative predictive techniques. After evaluation of the changes in relevant parameters, the consequential impacts on various aspects of the environment have been discussed. The cause, nature and extent of the impacts on various environmental attributes are discussed in details in Sections 6.2 through 6.11.

6.2 IMPACT ON SOIL

6.2.1 Impact During Construction

Any major construction activity could tend to create changes in the soils of the area. Excavation work tend to denude the soil and make it loose. Destruction of the soil and removal of vegetative cover enhances the possibility of soil erosion.

The excavated soil and construction materials such as sand, etc could tend to infiltrate and clog the intergranular spaces, leading to decreased permeability.

Such construction impacts would, however, be confined principally to the plant site and ash disposal area and thus would be of localised nature. There will not be any major impact on the soil during the construction phase.

Moreover, appropriate soil erosion control measures would be undertaken by the Project Authorities to minimize the chances of soil erosion. Completion of excavation and foundation work in accordance with a judiciously selected time schedule would also reduce the chances of soil erosion.

6.2.2 Impact During Operation

The soil in the area is predominantly clayey (40-45%)

The ash pond leachate is normally alkaline and rich in cations like Na^{+}, K^{+}, Ca^{++}, Mg^{++} etc leading to exchange of cations to increase soil pH and also modify chemical properties as the leachate traverses through the soil. However, there will be no impact due to leaching of toxic metals due to the laying of highly impermeable High Density Polyethylene (HDPE) geomembrane lining or equivalent in the ash pond.

Another manner in which the soils within the impact zone of an operating thermal power plant might undergo changes is due to the deposition of air pollutants. At heavy dosages, the soils, which are already slightly acidic, might tend to reveal a still lower pH over the course of time. However, it would be noted from Section-6.7, peak increments in longterm SO_2 and NO_x levels may be around 1.40 and 1.01 $\mu g/m^3$ respectively. Short term (24 hourly) values of SO_2 and NO_x attain levels of 51.08 and 47.61 microgramme/ cubic metre, respectively. At these levels, however, no appreciable adverse changes in the soils are anticipated. As a precautionary measure, however, soil samples should be periodically collected from close to the ash pond and maximum deposition areas of air pollutants and analysed for relevant parameters during the post operational monitoring programmes to be undertaken by JSWEBL.

6.3 IMPACT ON HYDROLOGY

6.3.1 Impact on Surface Water Hydrology

The overall project has received permission from the Irrigation and Waterways Department, Govt of West Bengal (Refer Annexure 6) for withdrawal of 45 MGD in the initial phase from Rupnarayan river, located about 80 km from the plant site. The water drawal for the Power Plant (1980 cum/hour or 10.5 MGD) would be easily accommodated from this quantum.

The raw water from the intake well of the river would be pumped through pipelines and stored in the reservoir. The raw water after treatment would be supplied for plant purposes.

6.3.2 Impact on Ground Water Hydrology

As stated earlier, the makeup water for the plant would be drawn entirely from surface water sources viz. the Rupnarayan river. Groundwater would not be extracted at all for either industrial or domestic requirements during normal operational phase. As such, no impact would be felt on the groundwater hydrology of the area due to project operations.

6.4 IMPACT ON LANDUSE

6.4.1 Requirement of Land

The land requirement of the project is provided below :

Sl.No.	Purpose	Area (Acres)
1	Main Plant	128
2	Ash Dyke	85
3	Green belt	42
5	Other facilities	105
	Total	**360**

6.4.2 Impact During Construction Phase

In the construction phase, land to the tune of 360 acres would be converted from its existing landuse. 10% land belongs to private ownership and rest is in government acquisition. Only 10% of the land is under cultivation and the rest is wasteland. No forest land is involved in this area. The predominant wasteland would be converted to industrial landuse category.

Preparatory activities like use of existing access roads and construction of new roads, staff quarters, godowns etc will be spread around the project site and would not generally exercise any significant impact except marginally altering the landuse pattern. An estimated workforce of a few thousand persons, comprising skilled, semiskilled and unskilled labourers would flock to the project area during the construction stage. A sizeable portion of this workforce would consist of migrant people from outside the neighbourhood and would, thus, live in temporary camps on vacant/barren lands in and around the construction areas. Under such conditions, the land adjacent to the acquisition limits would be subjected to some pressure for construction of residences, shopping complexes, workshops etc. On the other hand, it would be desirable to keep the requirements of land for such transient use during the construction period to a minimum to obviate the (a) disruption of existing landuse and (b) loss of production and (c) to reduce the social stress as much as feasible. The land required for construction of permanent access roads as well as temporary approach lanes should be minimised by proper planning and time scheduling of construction activities. Likewise, the labour camps may be suitably located and adequately serviced to reduce the pressure on private land to minimise social stresses.

6.4.3 Impact During Operation of the Project

Following a long and hectic construction phase, the modified landuse pattern would gradually stabilise itself during the operation stage. The construction camps, material

godowns and labour colonies would gradually disappear; temporary roads and makeshift services would be either dismantled or realigned and made permanent. Land released from the construction activities should be put to economic and aesthetic use to hasten recovery from adverse impacts.

As stated earlier in Section-6.4.2, the major portion of the land being converted for setting up the plant complex comprise of barren wastelands.

The implementation of the power project with its tall stacks and other sizeable structures would substantially alter the placid, rural landscape. However, the construction of green belts, parks, playgrounds and large scale plantation would largely offset the change to the existing landscape and would provide visual comfort. The improved economy of the area is expected to cause increased outputs to trade and commerce.

6.5 IMPACT ON WATER QUALITY

6.5.1 Impact on Surface Water Quality During Construction

Substantial quantities of water to the tune of 200-250 cum/day would be used in the construction activities and to meet the domestic requirement of the several thousand construction personnel.

Stagnant pools of water would promote breeding of mosquitoes and generally create insanitary conditions. However, suitable drainage network would be made to ensure proper drainage of wastewater from the construction sites, so that such waters do not form stagnant pools nor aggravate soil erosion.

With regard to water quality, wastewater from construction activities would mostly contain suspended impurities.

As the wastewaters would ultimately have to be discharged to surface water bodies, care would be taken so that excess suspended solids in the waste waters are arrested before discharge, to prevent a solids buildup in the streams as well as the existing carrying drains. Thus, the construction site wastewaters would be led to sedimentation basins allowing a hydraulic retention time of 1½-2 hours, where excess suspended solids would be settled out and relatively clear supernatant is discharged to the plant drain.

6.5.2 Impact on Surface Water Quality During Operation

The power plant is based on 'Zero Discharge Concept'. Thus there would not be any change in the surface water quality of the neighbouring rivers due to waste water discharges from the plant operations. There would be no impact on surface water during operation of the power plant.

6.5.3 Impact on Ground Water Quality during Operation

The clay and the silt content together exceeds to 80% with the sand content around 20% of the soil which would appease the chances of lechate percolation into the soil and ground water regime.

The soil being clayey (40-45%), there is possibility of little leaching from the ash pond. However, there will not be any impact on the ground water regime of the area due to leaching of toxic metals as the ash pond will be lined with highly impermeable High Density Polyethylene (HDPE) geomembrane lining or equivalent. The ash would also be disposed through High Concentration Slurry Disposal (HCSD) during occasions.

6.6 IMPACT ON AIR QUALITY

6.6.1 Impact During Construction

Particulate matter would be the predominant pollutant affecting the air quality during the construction phase. The soils of the project area, being generally sandy is likely to generate dust, specially during dry conditions. Dust will be generated mainly during excavation, back filling and hauling operations alongwith transportational activities. However, wind in the area being low, wind blown dust is not expected to have tangible effects.

The vehicular exhausts and other related activities will result in rise of NO_x. However, the incremental values are expected to be negligible, when compared to dust.

6.6.2 Impact During Operation

The proposed project would be firing pulverised coal, resulting in emissions to ambient air from coal preparation and coal combustion. Various measures proposed to be adopted to minimise the pollution are as under :

a) Dust Extraction and Dust Suppression Systems at Coal Handling area for fugitive dust control.

b) High efficiency ESPs with an efficiency of 99.98% to limit the outlet particulate emission to 100 mg/Nm^3.

c) One single flue stack of 275 metres height for wider dispersal of pollutants, resulting in lower ground level concentrations.

The emissions have been classified and discussed below :

6.6.2.1 Point Source Emissions

The main fuel to be used for the operation of the thermal power plant would be coal. Endowed with a high quantity of ash and other constituents as sulphur, etc, the point source emissions would consist of Particulate Matter (PM) as well as gaseous emissions, particularly Sulphur Dioxide (SO_2) and Oxides of Nitrogen (NO_x).

These emissions would be released through a chimney (single flue) of 275 metres height. The stack and emission characteristics pertaining to the 660 MW unit module of the plant is presented in Table-6.6.1.

6.6.2.2 Area Emissions

The area wise emissions from the power plant operations would consist of fugitive dust emissions from the coal handling plant and ash pond which would affect the air quality locally.

6.6.3 Cumulative Impact Assessment

The impact on air quality has been assessed considering the following :

a) The air quality impacts have been predicted for the 1 x 660 MW power plant.

b) Site specific meteorological data has been collected and has been used for prediction purposes.

c) The impacts have been accounted for the proposed 3 MTPA Integrated Steel Plant (ISP), the 300 MW Captive Power Plant (CPP) and the 2.4 MTPA Cement Plant.

d) The impacts have been accounted for the plant of Orissa Cement Ltd, located 4.0 km to the south.

e) The impacts of the Salboni Mint, which is already in operation, has been captured in the baseline data.

6.6.3.1 Features of the Computer Model

The Industrial Source Complex (ISC3) model, developed by the United States Environmental Protection Agency (USEPA), has been used for prediction of air quality due to operation of the project. It provides options to model emissions from a wide range of sources that might be present at a typical industrial source complex. The basis of the model is the straight-line, steady-state Gaussian plume equation, which is used with some modifications to model point source emissions from stacks.

6.6.3.2 Model Options Considered for Computations

The options used for short-term computations are :

- The plume rise is estimated by Briggs formulae, valid for hot, bouyant plumes.
- Stack tip down-wash is not considered;
- Buoyancy Induced Dispersion is used to describe the increase in plume dispersion during the ascension phase;
- Calms processing routine is used by default;
- Wind profile exponents is used by default 'Irwin', for the rural option;
- Dispersion coefficients (σ_y and σ_z) is used by default, for the rural mode;
- Flat terrain is used for computations;
- It is assumed that the pollutants do not undergo any physico-chemical transformation and that there is no pollutant removal by dry deposition;
- Washout by rain is not considered;

6.6.3.3 Model Input Data

The details of stack emissions used as input data for the model are presented in Table-6.7.1. The data relates to the 1 x 660 MW power plant.

6.6.3.4 Meteorological Data

Data recorded at the onsite observatory on wind speed, wind direction, solar radiation and temperature at one hourly intervals during December, 2013 – March, 2014 have been used as meteorological input for the model for calculating the long term and short term concentrations of power plant. The stability class has been calculated as per the 'Modified Bowen Method'.

6.6.3.5 Stability Frequency and Mixing Heights

The distribution of stability classes during the above period are presented below :

Stability Class	Frequency (%)
A	22.3
B	3.0
C	9.7
D	61.3
E	0.6
F	1.1

The mixing heights considered for modeling are reproduced below :

Mixing heights through default resulted for Kolkata as used in modeling is presented below:

Hour of the Day	Winter (in metre)	Pre-Monsoon (in metre)
1		
2		
3		
4		
5		75
6		100
7	50	100
8	75	300
9	175	400
10	400	600
11	900	900
12	1100	1000
13	1000	1000
14	1000	1000
15	1000	1000

Hour of the Day	Winter	Pre-Monsoon
16	1000	1200
17	900	1500
18	400	800
19		
20		
21		
22		
23		
24		

6.6.4 Simulation Results

The computer model was simulated to generate long term (period) ground level concentrations (GLCs) as well as short term (24 hour average) GLCs for the pollutants SO_2 and NO_x for the configuration described in Section-6.6.3.

This exercise was conducted to enable comparison with the National Ambient Air Quality Standards.

6.6.4.1 Long Term Concentrations

The long term (seasonal and annual) GLCs for the plant operation were computed using the on-site meteorological data collected at 1 hourly interval for the period October-December, 2010 at Salboni.

The maximum period concentrations of SO_2 and NO_x works out to 1.40 and 1.01 microgramme/cubic metre (Refer Table 6.6.2). These low concentrations are due to disposal through a 275 m tall stack coupled with wind direction frequencies.

6.6.4.2 Short Term Concentration

The maximum short term incremental concentration due to the power plant works out to 14.12 and 8.43 microgramme/cubic metre for SO_2 and NO_x respectively, resulting in overall resultant concentration of 51.08 and 47.61 microgramme/cubic metre for SO_2 and NO_x after addition to the present day background levels and accounting for the proposed 3.0 MTPA ISP, 300 MW CPP and the OCL Cement Plant. (Refer Tables-6.6.3 and 6.6.4).

It may also be noted that the modelling results depict the worst case scenario as it has been assumed that the entire sulphur has been converted into sulphur dioxide, washout due to rain has not been considered and deposition on other forms of structures as buildings, trees, etc have not been taken into account. Thus, in actuality, these pollutant concentrations are expected to be relatively lower than the predicted values.

Comparison of these resultant values with the National Ambient Air Quality Standards (Refer Table-5.7.5) reveal that the 24-hourly SO_2 and NO_X values are well within the stipulated limit of 80 $\mu g/m^3$ for industrial/residential/rural areas.

Isopleths of SO_2 and NO_X for the shortterm 24 hourly average concentrations have been plotted on the landuse map to depict the pollutant spread at various receptors (Refer Exhibits-6.6.1 and 6.6.2)

Table-6.6.1
Stack and Emission Characteristics for the 1 x 660 MW Power Plant (Used as Inputs to the Mathematical Model)

Particulars and Unit	**Quantity (1 No. 660 MW)**
Number of unit Modules	1
Number of stack	1
Number of flues per stack	1
Physical stack height (m)	275
Internal diameter of flue top (m)	7.50
Exit velocity of flue gas (m/s)	20.0
Temperature of flue gas (^{o}C)	145.0
Density of flue gas (kg/Nm^{3})	0.85
PM emission rate (mg/Nm^{3}) (with ESP functioning)	100
SO_2 emission rate (kg/hour)	4018
NO_x emission rate (ppm)	550

Table-6.6.2
Predicted Long Term (Period Average Concentrations) of SO_2 and NO_x For 1 x 660 MW (UoM)

	SO_2	NO_x
1	1.40	1,01
2	1.38	1.00
3	1.38	1.00
4	1.37	0.98
5	1.23	0.73
6	1.23	0.73
7	1.21	0.72
8	1.19	0.71
9	1.15	0.69
10	1.13	0.68

Table-6.6.3

Predicted 24-hourly Short Term Incremental Concentrations of SO_2 and NO_x for 1 x 660 MW (UoM)

	SO_2	NO_x
1	14.12	8.43
2	13.55	8.11
3	13.34	7.98
4	12.95	7.85
5	12.58	7.53
6	12.46	7.49
7	11.64	6.98
8	11.31	6.88
9	11.25	6.75
10	11.17	6.69

Table-6.6.4
Maximum Resultant Concentration Due to Incremental GLCs of 1 x 660 MW, IPP, 3 MTPA ISP and 300 MW CPP and OCL Plant

Pollutant	Overall Maximum AAQ Concentrations Recorded ($\mu g/m^3$)	Maximum Incremental Concentration due to Operation				Maximum Resultant Concentration ($\mu g/m^3$)
		1 x 660 MW IPP	3 MTPA ISP + 300 MW CPP	2.4 MTPA Cement Plant	OCL Plant	
SO_2	6.94	14.12	17.0	4.26	8.76	51.08
NO_x	20.0	8.43	14.50	-	4.68	47.61

6.7 IMPACT ON TERRESTRIAL ECOLOGY

6.7.1 Impact During Construction

The impact of the construction activities would be primarily confined to the project site. The land is principally barren with some portion being agricultural in nature under single crop cultivation.

Removal of top soil often leads to soil erosion. Deposition of fugitive dust on pubescent leaves of nearby vegetation may lead to temporary reduction of photosynthesis. Such impacts would, however, be confined mostly to the construction phase and would also be regulated and minimised through adoption of such control measures as paving and surface treatment, water sprinkling and plantation schemes. The impact would generally be restricted on surrounding flora within the plant boundary.

The plant, township and the ash disposal area would be extensively landscaped with development of green belts of width upto 100 metres covering about 25% of the plant, ash pond and colony area, consisting of a variety of species. Such plantation activities would enrich the ecology and improve the aesthetics of the area.

6.7.2 Impact During Operation

The maximum resultant short-term 24-hourly concentration for SO_2 and NO_X (Refer Table-6.6.4, Section-6.6, Chapter-6, Page-111) occurs on the Forests located to the west of the plant site (Refer Exhibits-6.6.1 & 6.6.2). These values are much lower than the prescribed ambient air quality standards for these 2 pollutants to effect any adverse impacts on the terrestrial flora and fauna. The concentrations on the other forests would be even lower.

The air pollution control measures that would be adopted would include :

a) 275 metres tall stack to effect wide dispersion.

b) Space provision for FGD system in future.

c) High efficiency ESPs to limit PM emissions to 100 mg/Nm^3.

d) Low NO_X burners (LNBs) to limit NOX emissions to 550 ppm.

e) Installation of Dust suppression and Dust Extraction (DSDE) systems.

f) 50 m wide Greenbelt with large scale plantation and afforestation with a density of 1500 trees/hectare.

Importantly, the post project monitoring in respect of ambient air quality would involve measurement of air pollutant concentrations at selected protected forests.

The impact on the terrestrial ecosystem due to operation of the proposed project would mainly occur from deposition of air pollutants. Particulates, sulphur dioxide and oxides of nitrogen are major pollutants of a coal based thermal power plant. These pollutants affect biotic and abiotic components of the ecosystem individually and synergistically. Chronic and acute effects on plants and animals may be induced when the concentration of these pollutants exceed threshold limits.

The fly ash particles depending upon their size and weight settle down at varying distances on vegetation and soil surfaces in the prevailing wind direction. Deposition of fly ash on the soil alters its physical and chemical characteristics. Such edaphic changes may hamper plant growth at higher concentrations. Foliar deposition of fly ash interrupts gaseous exchange through stomatal clogging, thereby affecting plant growth.

Injuries (necrosis and chlorosis) have been identified for dust deposits by Agrawal and Agrawal (1989) in the range 4.5 to 32.5 g/m^2, but no damage has been observed in the range 1.0 to 2.2 g/m^2.

The emission of particulates from the stacks would be maintained at 100 mg/Nm^3 through efficient functioning of the ESP. Furthermore, emission of flyash through the 275 m tall stack results in a very wide dispersion of the particulates, leading to maximum 24-hourly average ground level concentrations of only about 0.87 $\mu g/m^3$ Such low concentration of fly ash in the air and its deposition would not induce any change in the ecosystem.

Chronic exposure to SO_2 causes injury characterised by yellowing of the leaf (chlorosis). Acute injury is characterised by development of dry dead areas with an ivory to brown colour (necrosis).

Scientific literature reveal that low concentration of SO_2 over long periods lead to intravenal chlorosis in high humidity. However at higher concentrations, SO_2 combines with moisture in the air to form aerosol which erodes cuticle and cell membrane, thus inviting easy entry of pathogens. It may alter the pH of the soil. Changes in pH of the soil may affect microflora and fauna of the soil.

Scientific literature on effect of SO_2 on plants reveal the following :

i) Agricultural crop (rye-grass) suffered growth reduction at 200 $\mu g/m^3$ concentration of SO_2. SO_2 concentrations of 500 $\mu g/m^3$ caused major damage.

ii) SO_2 concentrations in the range of 240 to 1200 $\mu g/m^3$ stimulated stomatal opening.

iii) SO_2 concentrations in the range of 50 to 200 $\mu g/m^3$ changed productivity, but drastic injury to foliage was not caused.
(M J Kejiol et al, 'Gaseous Air Pollutants and Plant Metabolism' – 1984).

The range of injury or possible damage for the most sensitive species is 1.0 ppm (2.5 mg/m^3 for 1 hour to 0.05 ppm (125 $\mu g/m^3$) for 8 hours. Taking a seasonal and annual average, the threshold for chronic plant injury has been estimated at approximately 130 $\mu g/m^3$ (A.J Dvorack and B G Lewis, 1978). Reduction in biomass and productivity have been found by Pandey and Rao (1978) on wheat exposed to 0.8 ppm SO_2 for 2 hours daily for 60 days.

The 24-hour average ground level concentration of SO_2 would be 51.08 $\mu g/m^3$ during operation of the station (Section-6.6).

These values are well within the National Ambient Air Quality Standards for industrial, residential and rural areas and as such SO_2 levels would not cause any visible injury to the plants.

It would thus be observed that pollutant concentrations due to operation of the project are much lower than the threshold limits for damage to terrestrial flora established above and as such, the impact on the terrestrial ecosystem would be marginal.

6.8 IMPACT ON AQUATIC ECOLOGY

6.8.1 Impact During Construction

The construction wastewaters would contain suspended impurities. These wastewaters would be subjected to sedimentation in settling basins, with adequate retention time where the suspended solids would settle and the clear supernatant allowed to discharge. This would ensure that turbidity levels and sediment buildup in the receiving sink, the Parang river, is not enhanced to cause any impact on the aquatic biota.

6.8.2 Impact During Operation

A recirculating condenser cooling water system with natural/induced draft cooling towers has been proposed for the plant. As the water circulation system will draw water from the Rupnarayan river, fish may tend to get entrapped and impinged in the intake system. Smaller organisms as phytoplankton, zooplankton are entrainable in the cooling system. The entrained organisms would be subjected to a combination of physico-chemical and mechanical stresses, leading to their destruction.

There would not be any change in the water quality characteristics of the neighbouring rivers due to the wastewater discharges from the plant operations as the plant is based on a ‘Zero Discharge’ concept, resulting in no waste water discharge to the external environment. The various water quality parameters of concern are within the threshold limits. As such, it may be concluded that no adverse effects leading to the depletion of growth of the existing aquatic biota are envisaged due to the discharges from the project operation.

6.9 IMPACT ON DEMOGRAPHY AND SOCIOECONOMICS

6.9.1 IMPACT DURING CONSTRUCTION

6.9.1.1 Impact on Demography

The peak labour strength during construction would be about few thousand persons. JSWEBL officials and supervisors may constitute another few hundred persons. Though the technical persons and skilled labours would by and large, be imported from outside the study area, bulk of the labour force would comprise of unskilled and semi-skilled workers, a substantial number of whom would presumably be recruited from the surrounding areas itself. Since majority of the unskilled workforce would be from surrounding areas, they would settle in the adjacent villages. Therefore, unplanned and haphazard development of slums would not be significant. 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. Therefore, the demographic scenario including population, sex-ratio, literacy level etc would undergo certain local changes within a limited peripheral zone. The overall impact over the study area would be marginal.

6.9.1.2 Impact on Socioeconomics

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.

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 if any.

6.9.1.3 Land Requirement

The land requirement for the 1 x 660 MW project would be of the order of 360 acres, which is part of the total land of 4335 acres already acquired for the Integrated Steel, Power & Cement projects.

6.9.1.4 Rehabilitation and Resettlement Programme

About 10% land belongs to private ownership and the rest is in government acquisition. The R&R scheme have already been accomplished by JSWEBL, which has been duly elucidated in Section 7.12, Chapter-7.

6.9.2 Impact During Operation

6.9.2.1 Impact on Demographic Pattern

Operation of the Power Plant will require an appreciable quantum of skilled and semi-skilled workforce which, almost totally, would have to be imported from outside the project area. Alongwith this migration, a significant portion of the unskilled labour force will also infiltrate from outside.

Moreover, a sizeable number of service class people who are directly connected with the operating personnel of the Power Plant, e.g. house servants, washermen, barbers, shop keepers etc will flow in from the neighbouring areas. As the power plant and its ancillary facilities act as an active nucleus of activity, a shift of population towards this centre will also occur within the study area. This trend is evident from the operation of other existing units.

The migration of people will increase the total population in the study area particularly in the peripheral zone, specially the Salboni area. This would result in a slight alteration of the local demographic pattern. The high literacy level of people and their families involved in the operation of the power plant would certainly enhance the overall literacy rate within the study area. The population density in the peripheral zone will also tend to rise, though very marginally.

6.9.2.2 Impact on Socioeconomics

The setting up of the proposed township would result in enhancement of urban development of Salboni and its neighbourhood with the establishment of social infrastructural facilities. The additional operating personnel for the plant, who would be accommodated in the township would not result in tangible impacts on the socioeconomic pattern of the area as these impacts have already been witnesssed in the area during the other industries of the area and as such, the region now has the capacity to withstand any similar effects.

On the other hand, the additional JSWEBL personnel could lead to expanded markets, increased employment avenues in the domestic sector and an increase in the income levels of the area, leading to better lifestyles.

6.10 IMPACT ON NOISE

6.10.1 Impact During Construction

The construction phase would witness operation of heavy construction and earthmoving machineries, which are known to emit sounds with high decibel levels. Based on data generated at construction sites of other power projects, the noise levels could attain values of about 85 dB(A) at a distance of 1 metre. The noise levels would substantially decrease close to the plant boundary due to attenuation phenomena. Careful scheduling of the operation of the high noise machines is however required during this period, particularly during night time, so that minimum disturbances are caused.

6.10.2 Impact During Operation

In thermal power projects, of the type planned here, high noise levels could be expected specially near Draft Fans, Turbines, Compressors, Pumps and Coal Handling Plants. However, the sound pressure level (SPL) generated by noise sources decreases with increasing distance from the source mainly due to wave divergence (geometric attenuation).

The phenomenon of decrease in SPL with increasing distance has been studied with the help of computer simulation of "multisource noise attenuation model" which is based on Community/In-Plant Noise Model developed by Fluor. The corresponding algorithms considering geometric attenuation are presented below :

$L_{p1} = L_{p2} + 10 \log [F(R)] + DI + K$

Where,

L_{p1} = SPL at any receptor in dB(A)
L_{p2} = SPL of a source in dB(A)
F(R) = Geometric Attenuation Factor, $[F(R)] = 1/R^2$ for point sources)
R = Distance between source and receptor in m.
DI = Source Directivity Factor (0 for spherical radiation)
K = $10 \log 4\pi$

The different noise sources and their SPL used in the computer simulation are presented in Table-6.10.1. The noise sources were derived from equipment specifications. All the sources have been assumed to be point sources with spherical radiation of sound waves.

The results of the noise attenuation model are presented in Table-6.10.2.

The isopleths of noise are shown in Exhibit-6.10.1.

It would be observed that noise levels decrease to less than 35 dB(A) within the plant boundary. Negligible noise is predicted to cross the plant limits. The ambient noise level measured in the nearby villages lies between the range of 43.7-49.9 (Refer Section 5.8) dB(A). Due to masking effect, as the ambient noise is higher than predicted noise level, there will not be any impact due to operation of the power plant.

It may also be noted that this attenuation exercise was conducted without accounting for ground effects and absorption due to screens, which would further lower the receptor noise levels. The green belt around the plant site would also assist in dampening noise effects.

In environmental noise assessment for the proposed project, considerations have been given to two aspects, those relating to the noise source and the other relating to potential receivers. An attempt has, therefore, first been made to describe the physical characteristics of sound, i.e. characterization of its loudness as a function of frequency in the audible frequency range weighing them according to their response to the human ear. The value, thus obtained could be compared to the damage risk criteria for hearing as enforced by the Occupational Safety and Health Administration (OSHA) of USA.

Impacts on persons working very close to the sources are likely. Therefore, the latter should be provided with adequate protection against noise in the form of ear plugs, helmets, etc.

Table-6.10.1
Input Data Used for Computer Simulation of Multisource Noise Attenuation Model

Sr No.	Xcord (m)	Ycord (m)	SPL Db(A)	Freq (hz)	Source Code	Description of Noise Source
1	0.00	0.00	90.00	1000	N1	Turbine Generator
2	-15.00	-71.66	90.00	1000	N2	Boilers
3	-2.20	99.38	85.00	1000	N3	Transformer Yard
4	-289.62	-291.69	90.00	1000	N4	DM Plant Area
5	-302.92	-193.29	85.00	1000	N5	Clarified Water Tank & Pump House
6	-267.92	88.75	90.00	1000	N6	CT MCC Room
7	-26.54	-435.24	90.00	1000	N7	Coal Handling Plant & MCC Room

Table-6.10.2
Noise Attenuation Model Results

Dir	Radial Distance of the Point from the Origin (m)									
	100	200	300	400	500	600	700	800	900	1000
N	67	38	35	33	31	30	29	27	27	26
NNE	44	38	35	32	31	29	28	27	26	25
NE	42	37	34	32	30	29	28	27	26	25
ENE	42	37	34	32	30	29	28	27	26	25
E	42	37	34	32	31	29	28	27	26	25
ESE	42	37	35	33	31	30	29	28	27	26
SE	43	38	36	34	32	31	30	29	27	27
SSE	45	39	37	36	35	33	31	30	29	27
S	49	40	39	46	43	36	33	31	30	28
SSW	50	40	39	40	38	35	33	31	30	29
SW	46	40	41	58	41	36	33	31	30	29
WSW	44	40	40	40	37	34	32	31	29	28
W	43	41	41	38	35	33	31	30	29	28
WNW	43	42	50	39	35	32	31	29	28	27
NW	43	40	38	36	33	31	30	29	28	27
NNW	45	39	36	34	32	30	29	28	27	26

CHAPTER-7
ENVIRONMENTAL MANAGEMENT PLAN

7.1 BASIC CONTENTS

A comprehensive environmental management plan consisting of proposed pollution control systems and additional mitigatory measures for abatement of the undesirable impacts elucidated earlier has been drawn up, which are discussed in the following sections. A post study monitoring programme to be undertaken after commissioning of the project, which would assist in detecting the development of any unwanted environmental situations have also been designed and presented in Chapter-10.

The Environmental Management Plan consists of various interventions towards control of pollution during the construction and the operation stage, as summarized below :

Construction Stage	i) Demarcation of construction camp sites and provision of infrastructural services. ii) Implementation of necessary sanitation & drainage facilities with provision of sedimentation basin for construction waste water. iii) Sprinkling of water for control of fugitive dust. iv) Extensive plantation and afforestation activities. v) Provision of personnel protection equipments at construction site. vi) Implementation of ash dyke safety features.
Operation Stage	1. Air Pollution Control i) 275 m tall stack ii) Space provision for FGD system iii) High Efficiency ESPs iv) Dust suppression and extraction system v) Plantation and afforestation. vi) Low NO_x burners 2. Water Pollution Control i) Cooling towers ii) Neutralisation Pit iii) Central Effluent Treatment Plant iv) Sewage Treatment Plant v) Oil & Grease Separators vi) Recirculation of ash water in the system vii) Sludge treatment and disposal system
	3. Solid Waste Disposal i) Fly ash utilization ii) Disposal of bottom ash and fly ash into ash pond iii) Operation and management of ash pond iv) Ash pond reclamation

	4. Provision for necessary protection equipments for protection against dust and noise. 5. Provision of radiation enclosures at designated locations.

These mitigatory measures are discussed in the next few Sections.

7.2 MITIGATORY MEASURES DURING CONSTRUCTION STAGE

The impacts of the construction phase on the environment would be basically of transient nature and are expected to wear out gradually on completion of the construction programme. However, once the construction of various units are completed and its operations started, these operation stage impacts would overlap the impacts due to the construction activities.

The impacts on different aspects of environment due to the construction programme have been elucidated in Chapter-6. In order to mitigate such impacts and restrict them within tolerable levels, the following measures should be adopted by the Authorities :

i) Designation and demarcation of sites for construction camps and ensuring due provision of necessary infrastructural services.

ii) Implementation of necessary sanitation & drainage facilities, inclusive of soakpits, catchpits or sedimentation basins for the drainage of construction wastewater, prior to discharge.

iii) Regular sprinkling of water around vulnerable areas of the construction sites from trucks or through installation of water sprinklers or any other suitable methods, to control fugitive dust.

iv) Initiation of an extensive plantation and vegetation cover in the vacant areas of the plant and township. This would serve the dual purpose of controlling fugitive dust and abatement of noise levels in addition to improving the aestheticity of the area.

v) Provision of adequate personnel protection equipment for the workers.

7.3 SOURCES OF POLLUTION DURING OPERATION STAGE

The main sources of air and water pollution and solid wastes from the proposed Power Plant would be :

A. Coal Handling and Storage Areas :

- Fugitive dust emission
- Effluent due to dust suppression
- Storm Water
- Runoff containing coal particles

B. Boiler :

- Flue gases containing PM, SO_2 and NO_x
- Bottom ash and fly ash

C. Cooling System :

- Hot Water Discharge

D. Turbine – Generator Bay :

- Service Water effluent containing suspended solids, oil & grease

E. Fuel Oil handling and storage :

- Waste containing oil

F. Ash Disposal System :

- Ash Pond leachate
- Fugitive Dust emissions

G. Guard Pond :

- Effluent

H. Township :

- Domestic Sewage

I. Water Treatment Plant :

- Sludge
- Regeneration waste

J. D M Plant Area

- Effluents

K. Pretreatment Plant Area

- Effluents & Sludge

7.4 POLLUTION CONTROL MEASURES

7.4.1 Air Pollution Control System

High efficiency Electrostatic Precipitators (ESP) having efficiency not less than 99.98% would be installed to control the emission of ash particles. The precipitators would be designed to limit the particulate emission to 100 mg/Nm^3.

To facilitate wider dispersion of pollutants, one single flue stack of height 275 m above plant grade level is envisaged for this project. The chimney shall be provided with personal access doors and sampling ports for continuous online monitoring.

Low NO_x burners would be installed to limit NO_x emission to 1050 mg/Nm^3.

Fugitive dust emission at all requisite points in coal handling plant and coal stackyard will be controlled by providing water sprinklers.

To control dust emission during unloading coal by Wagon tippler Spray Nozzles would be installed in the tippling area

Water would be sprayed on the tippler hoppers and coal carrying conveyers during feeding.

An additional mobile dust suppression system would be installed in the wagon tippler area.

7.4.1.1 Space provision for retrofitting Flue Gas Desulphurization (FGD) system

Space will be provided for retrofitting the Flue Gas Desulphurisation system. The design and layout of steam generator and its auxiliaries would be such that a wet/dry FGD system can be installed in future, if required.

7.4.2 Water Pollution Control System

An effluent management scheme would be implemented with the objective of optimization of various water systems so as to reduce intake water requirement and consequent reduction in effluent discharge. The effluent management scheme would involve collection, treatment and recirculation / disposal of effluents. Adequate treatment facilities would be provided to all the waste streams emanating from the power plant to control water pollution. This would include physico-chemical and biological treatment.

The effluents from the Power Plant can be broadly classified into the following categories:

1. **Thermal Discharges from Condenser and Auxiliary Cooling**

2. **Water Treatment Plant Wastes like**:

   - Clarifier Sludge
   - Filter Back Wash
   - DM Plant Regeneration Waste

3. **Miscellaneous wastes like:**

   - Coal Handling Plant Waste
   - Service Waste Water
   - Oil Wastes
   - Boiler Blowdown

4. **Ash Pond effluent**

5. **Sanitary Waste from Plant and township**

The treatment and handling of the above wastes are discussed below :

1. Thermal Discharges

To avoid thermal discharge, closed cycle Induced or Natural Draft Cooling Towers has been envisaged. CT will be designed for continuous operation. The blow down from CT will be used for transporting unutilized ash to ash dyke.

2. Water Treatment Plant Wastes and Misc Wastes

The waste emanating from cation/anions exchanges and mixed bed units of DM plant shall be neutralized in a neutralization pit through acid/alkali to control pH of the effluent.

Runoff/effluents from coal handling area and coal piles shall be led to a settling tank and decanted water shall be conveyed to guard pond.

For oily wastes, oil separators will be provided to trap oil from the effluent arising from fuel oil handling areas.

3. Ash Pond Effluent

A dry extraction and wet disposal system in the form of thick slurry has been envisaged for fly ash disposal. The bottom ash, however, will be collected and disposed of either in dry or in wet form hence a re-circulation of ash pond water is not required.

Efficient operation of the treatment plant would be ensured so that the quality of effluents conforms to the relevant standards prescribed by the Regulatory Agencies. All the treated effluents would be led to the guard pond.

To take advantage of dilution and ensuring single point discharge. The effluent from the guard pond shall be monitored before re-circulation.

Power plant drains originating from boiler and ESP area will have ash traps and all drains will have oil traps. The clear drain water will be taken to guard pond.

4. Sanitary Wastes from Plant and Township

The sewage from plant and township shall be led to a sewage treatment plant to control BOD and suspended solids. The treated effluent conforming to prescribed standards shall be discharged to guard pond.

7.4.3 Noise Pollution

The major noise generating sources are turbines, generators, compressors, pumps, fans, coal handling plant etc. Acoustic enclosures shall be provided to control the noise level below 85 dB(A). Personal protective equipments shall be provided to the persons working in high noise areas.

7.4.4 Solid Waste Management

As per MOEF notification of November, 2009, 100% ash utilisation should be ensured within four years of commissioning of the plant.

All efforts would be made to utilize the fly ash for various purposes. However, unused fly ash and bottom ash would be disposed off safely in the ash disposal area. On the ash mount built up, a thin earth cover will be provided to prevent fugitive dust emissions. After the ash pond is abandoned, it would be reclaimed by providing earth cover and thereafter tree plantation.

7.5 QUALITY, ENVIRONMENT AND OCCUPATIONAL HEALTH & SAFETY POLICY

QUALITY POLICY

JSWEBL is committed to achieve & sustain world class standard of quality in electric power generation and supply to customers by adopting, innovating and continually improving the best industrial practices in operation, maintenance, procurement, safety, house keeping and manning of power stations.

7.5.1 Environment, Occupational Health & Safety Policy

JSWEBL is committed to:

- Comply / better the statutory limits, norms and organizational requirements of environment, occupational health & safety.
- Conserve the natural resources, protect the environment, and minimize solid, liquid and gaseous waste by continual improvement through systematic use of skill & technology in conducting its business.
- Effective communication of OH & S and environment policies, objectives and obligations to all employees and interested parties.
- Earn recognition from society as an environmental friendly company
- Implement corrective, preventive and upgrade measures in the area of occupational health, safety and environment through periodic reviews, hazard identification and risk assessment with the involvement of all employees and outsourced personnel wherever needed.

7.5.2 Standard Operating Process/Procedure

In reference to the policy, a Management System has been framed for Occupational health, safety and environment in JSWEBL. Statutory and Regulatory compliance is reviewed in every management meeting being held twice a year and also periodically as required by respective Statutory and Regulatory requirement. Relevant records of the periodic evaluation of environmental related compliance are maintained by the Section In-charge, Chemistry & Environment Department of each Plant.

7.5.3 The Hierarchical system

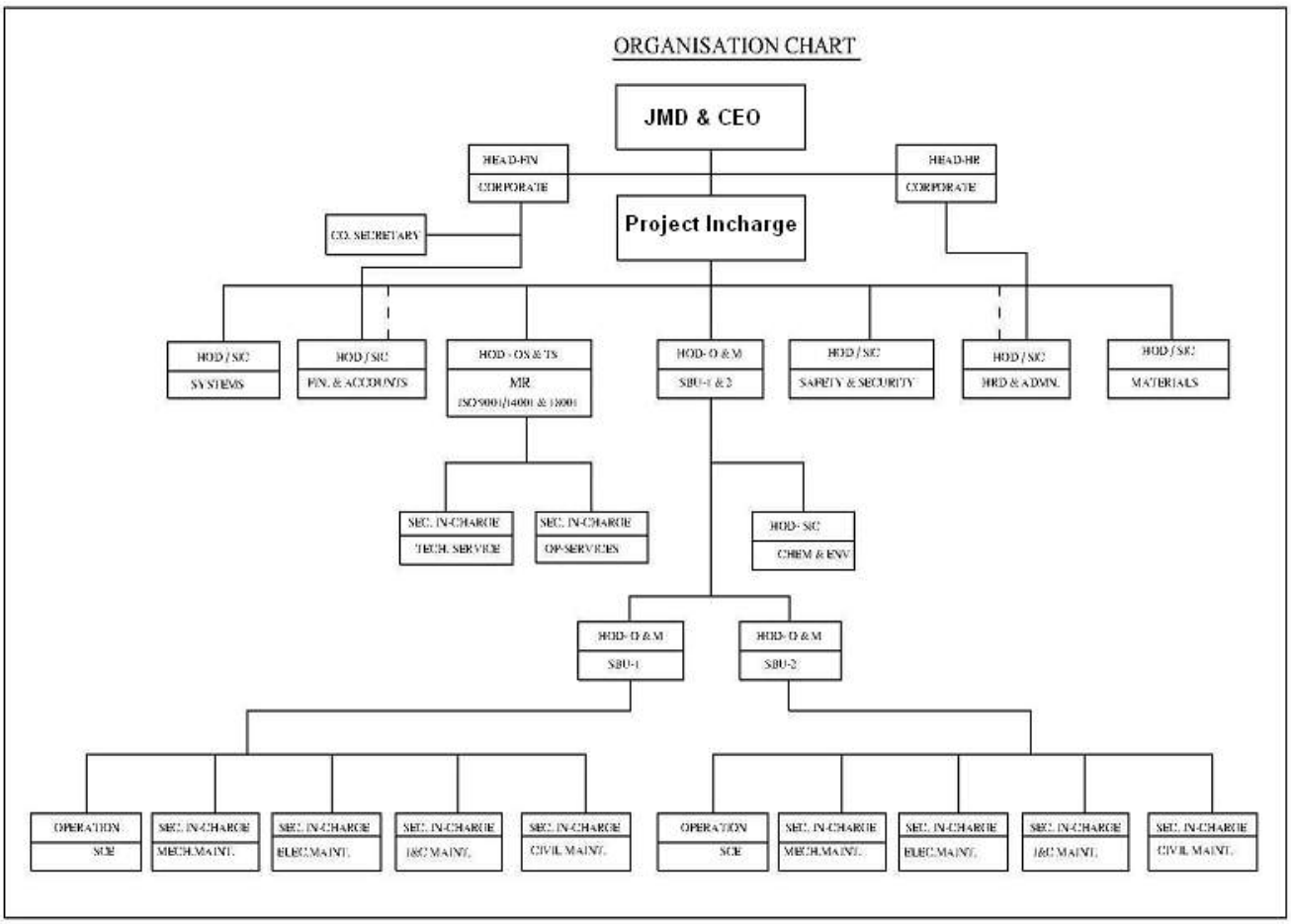
The hierarchical order or administrative order of the company to deal with environmental issues and for ensuring compliance with the environmental clearance conditions is as mentioned below:

- Section In-Charge, Environment & chemistry
- Project Head
- JMD & CEO, JSWEBL

7.5.4 Reporting of non compliances/violations of Environmental norms

A detail audited statutory report duly signed by respective plant heads, VP HR, Head-Company Secretary, Director Finance and JMD & CEO is presented before the Board of Directors during Board Meeting being held every quarter giving information on non-compliance/violations of environmental norms, if any. The shareholders /stakeholders of the company are informed about non-compliances/ violations of environmental norms by publishing it in Annual Report of the company.

Organization Chart



7.6 HARNESSING SOLAR POWER

About 10% of the Campus lighting/Street lighting shall be done by harnessing solar power.Initiatives will be taken for using solar power for illumination of street lights, in the gardens and for hot water in canteens.

7.7 GREEN BELT DEVELOPMENT

7.7.1 General

Green belt is an important sink for air pollutants and it also absorbs noise. Enhancing green cover not only mitigates pollutants but also improves the ecological conditions /aesthetics and reduces the adversities of extreme weather conditions. Trees also have major long-term impacts on soil quality and the ground water table. By using suitable plant species, green belts can be developed in strategic zones to provide protection from emitted pollutants and noise.

Plant species suitable for green belts should not only be able to flourish in the area but must also have rapid growth rate, evergreen habit, large crown volume and small /pendulous leaves with smooth surfaces. All these traits are difficult to get in a single species. Therefore a combination of these is sought while selecting trees for green belt.

7.7.2 Purpose of the Green Belt : The green belt / cover will serve the following purposes

- Compensate the damage to vegetation due to setting up and operation of the proposed plant.
- Prevent the spread of fugitive dust generated due to the project and allied activities.
- Attenuate noise generated by the project.
- Reduce soil erosion
- Help stabilize the slope of project site.
- Increases green cover and improve aesthetics.
- Attract animals to re-colonise the area

7.7.3 Selection of Species

In the proposed plant, green belt will be developed in vacant areas, around office buildings, around stores, along the side of roads, along the plant's boundaries (at least 50 m wide) and around the waste dump area. The species for green belt development will be selected in consultation with the State Forest Department. The species suitable for

planting in the area would be derived from Central Pollution Control Board in their publication “Guidelines for Developing Greenbelts” (PROBES/75/1999-2000).

7.7.4 Plantation Scheme

Plant saplings will be planted in pits at about 2.0 m to 3.0 intervals so that the tree density is about 1500 trees per ha. The pits will be filled with a mixture of good quality soil and organic manure (cow dung, agricultural waste, kitchen waste) and insecticide.

The saplings / trees will be watered using the effluent from the sewage treatment plant and treated discharges from project. They will be manured using sludge from the sewage treatment plant. In addition, kitchen waste from plant canteen can be used as manure either after composting or by directly burying the manure at the base of the plants. Since tests have shown that availability of phosphorus, a limiting nutrient, is low, phosphoric fertilisers will also be added. The saplings will be planted just after the commencement of the monsoons to ensure maximum survival. The species selected for plantation will be locally growing varieties with fast growth rate and ability to flourish even in poor quality soils.

A total of about 33% of the project area will be developed as green belt or green areas in project area (including waste dump site) and other areas. The widths of the belt around the plant will be erected all around the project boundary, depending on the availability of space. Over and above the green belt, JSWEBL has taken initiatives to develop social forestry around the areas.

In order to supply seedlings for the proposed green belt and green cover development, a small nursery will be developed with the help of the state forest department. In this nursery, saplings will be developed from seeds or seedlings collected from nearby forest areas / other nurseries.

Inside the plant works area, the regions with high pollution load are areas around raw material & coal handling areas, Fly-ash handling areas, etc

To arrest the fugitive emissions emitted from such polluting units, a two pronged approach will be adopted as described below:

- Plantation all around the concerned units close to the source in available spaces to arrest fugitive emissions at the source
- Plantation by taking the concerned unit as centre and planting trees in a “V” in down wind (D/W) direction. However, the above-mentioned thickness of each belt may be proportionately reduced or increased in view of the total space available for plantation work.

As there will be limited space (in height) due to various overhead pipelines, small and medium sized species are suggested and they should be planted depending on the vertical height and lateral space available for the plant growth.

The above-mentioned areas / direction should be covered with pollution tolerant species (in the space available around) as mentioned below:

Pollution tolerant species

Scientific Name	**Common Name**
Acacia mangium	Mangium
Acacia nilotica	Babool
Annona squamosa	Sharifa
Bougainvilea sp	Bougainvilea
Cassia auriculata	Cassia
Duranta sp.	Duranta
Ficus religiosa	Peepal
Murraya exotica	Kamayani
Nerium sp	Pink Kaner
Pithecolobium dulce	Sweet Tamarind
Pongamia pinnata	Karanj
Saraca indica	Ashok
Thevieta peruviana	Yellow Kaneer
Zizyphus mauritiana	Indian jujube

In the curtain belt the following species of trees would be planted keeping a space of 2.5m from plant to plant as well as from row to row:

i) Species of trees Along Roads and Around Office Buildings

Scientific Name	**Common Name**
Acacia mangium	Mangium
Albizzia lebbek	Siris
Artocarpus heterophyllus	Kathal
Azadirachta indica	Neem
Butea sp.	Palas
Dalvergia sisoo	Shisham
Leucaena leucocephala	Subabool
Pithecolobium dulce	Junglee jilebi
Polyalthia longifolia	Druping Ashok
Pongamia pinnata	Karanj
Syzygium cuminii	Jamun
Tectona grandis	Teak

ii) Around Ash Pond

Plants selected for plantation around the ash pond should have pollution hardy nature, fast growth rate, glabrous/ pendulous leaves, and large crown volume to surface area of fluttering leaves. The species selected will be from among the following:

Plants selected for plantation around the ash pond :

Scientific Name	**Common Name**
Anthocephalus cadamba	Kadamb
Azadirachta indica	Neem
Bougainvillea spp.	Bougainvellea
Cassia auriculata	Cassia
Cassia fistula	Amaltas
Cassia javanica	Java-ki-rani
Cassia siamea	Kassod Tree
Dalbergia latifolia	Sisham
Delonix regia	Gul mohar
Duranta sp.	Duranta
Ficus bengalensis	Bargad
Ficus religiosa`	Peepal
Lagerstroemia parviflora	Lagerstroemia
Mangifera indica	Mango
Nerium sp	Pink Kaner
Polyalthia longifolia	Ashok

7.7.5 Post Plantation Care

Immediately after planting the seedlings, watering will be done. The wastewater discharges from cooling pond outfalls will be used for watering the plants during non monsoon period. Further watering will depend on the rainfall. In the dry seasons, watering will be regularly done especially during February to June. Watering of younger saplings will be more frequent. Manuring will be done using organic manure (animal dung, agricultural waste, kitchen waste etc.). Younger saplings will be surrounded with tree guards. Diseased and dead plants will be uprooted and destroyed and replaced by fresh saplings. Growth / health and survival rate of saplings will be regularly monitored and remedial actions will be undertaken as required.

7.7.6 Phase Wise Green Belt / Cover Development Plan

Green belt will be developed in a phase wise manner right from the construction phase of the proposed project area. In the first phase along with the start of the construction activity the plant boundary, around proposed ash pond and the major roads will be planted. In the

second phase the office building area will be planted. In the third phase when all the construction activity is complete, plantation will be taken up in the plant area, around different units, in stretch of open land and along other roads.

(Letter written to Divisional Forest Officer, Midnapore for the development of additional plantation on identified blocks of degraded forest is enclosed as Annexure-8.)

7.8 RAINWATER HARVESTING AND ITS PROPOSED UTILISATION IN THE PLANT

Facilities will be provided for rain water harvesting in the plant area where ever feasible. While developing the plant general layout, it will be ensured that rain water is harvested from building rooftops. Run-off water from the office areas & shop roofs will be collected and stored for future use. Proper functioning of the systems provided will be ensured by regular monitoring.

The roof top area for the proposed project is 50 acres or 2,02,400 sqm. As per SEAC, the Rainwater Harvesting Potential in 1,000 sqm of roof area was considered to be 7,68,000 litres annually based on the rainfall characteristics.

For 1000 sqm of roof area, RWH annually is	=	7,68,000 L
For 2,02,400 sqm of roof area, RWH annually is	=	7,68,000 / 1,000 x 2,02,400 L
	=	155443200 L
	=	1.55 lakh litres

Therefore, 1.55 lakh litres of rainwater will be harvested annually & 10% of this will be available for surface storage & 10% of this amount will be for sub-surface recharge, in accordance with the guidelines of SEAC, West Bengal.

7.9 CORPORATE SOCIAL RESPONSIBILITY

7.9.1 Detailed CSR Plan with activities wise break up of financial commitment for the year 2016-2017 is enclosed as Annexure – 19.

7.9.2 CSR Scheme

Besides own monitoring mechanism developed by CSR team, JSW is in the process of developing a third party monitoring mechanism. Efforts will be made to incorporate local University Deptt/ IIT. All the CSR initiatives that are planned are designed and developed keeping in many ways to supplement/ complement the existing Govt programmes/initiatives. Further, CSR programmes are designed in coordination with Block officials and Panchyat members.

CSR initiatives undertaken so far which shall be continued in next 3–5 yrs cycle are given below:

CSR Initiatives- Till Mar 2016

JSW has carried out Socio-economic Study and Skill Mapping Survey of the neighboring villages with a view to ascertain the actual developmental requirements of the people in the area which covered 26 villages / hamlets in and around the project area covering a population of approximately 25000 people. Another Baseline survey was conducted to assess the needs of the persons in Project affected area (PAA) conducted by Rural Development Authority, Midnapore, based on which the following thrust areas have been selected by the Company to drive benefit activities and which shall be implemented in a phased manner:-

- Environment - Drinking Water Supply, and Sanitation
- Health Services- primary healthcare intervention, and preventive measures (by awareness campaigns).
- Education- Supplement govt. education schemes at local schools.
- Livelihood generation.
- Developmental activities like village roads, drainage, culverts, and rainwater management

The Company is working on various fronts a short summary status of which is described below:-

a) Healthcare

Details of activities in Rural Healthcare Services at Salboni, as part of CSR initiative in healthcare by JSW.

Patients que up at the Rural Health Centre

- Provision of free healthcare services to the rural people of Salboni was started by JSW with start of the project and has continued uninterrupted through challenging circumstances.

- The programme is delivered increasingly through 'Health Assistants' who have been trained in this work and are from among women in the villages.

- There is a strong component of Information Technology in this, which will enable appropriate and secure data storage and analysis, thus allowing measurement of its impact.

- Current public health emphasis is on 'Women and Children' – anaemia & malnutrition; but the scope is being enlarged to include Reproductive health and cervical cancer.

- General aspects of Hygiene, water and sanitation are also being addressed.

- Design for Peace, a major organisation, with experience in developing public health education material has also been inducted to add content to the work.

b) Medical Intervention

- Medical services through the team of MBBS and Homoeopath doctors have continued uninterrupted through fixed and mobile clinics.

- 21499 patients have been seen during the year, compared to 30888 during FY 2012, demonstrating the success of preventive public health awareness.

- There has been a decline in the number of new patients 6159 in 2013 from 8513 in 2012- a reflection of the effectiveness of medical services.

- A little over 10% of new patients come from beyond the project area of 23 villages – indicating acceptance of the services among the population

c) Other related activities

- Visit by specialist doctors - Gynaecology and Dentistry – Eye Care and Skin - common problems in the area.

- Free Cataract operation and Vision correction (through glasses) have been carried out among villagers.

- Software is under development for monitoring Public Health Impact; its basic version has already been used by Health Assistants in the de-worming programme.

Health assistants at work

d) Vocational Skill Development

- Second batch of 6 girls from Land-giver families have completed their training as Health Assistants.
- The Health Assistants have completed following projects –
- Oral Rehydration Solution to construction workers on site
- Mass De-worming among villagers in project area
- Immunization Status identification among children below 10 yrs in project area

e) Clinic-based Consultation services

No. of villages covered	23
Total geographical area of Salboni	559.41 sq. km.
Total Population of Salboni Block(2011)	198,298
Total Patients seen:	21499
Male	9378(43.62%)
Female	12121(56.38%)
Below 14 yrs.	9575(26.46%)
Opted for Homoeopathy	5659(29.7%)
Opted for Allopathy	15840(73.68%)
Mobile camps in Villages:	
Total locations	8
No. of camps held	339
Fixed-site Clinic:	535
Diagnostic services in Year 2015 :	
Pathology	1004
Radiology	208
Others	47
Ambulance services :	
Total Ambulance usage for Community patients	86

f) Use of Technology – Ongoing

JSW's technology partners developed a Public Health Software; the software was loaded in a 'Tablet' to ensure portability and lack of human error in data collection. The Rural Health Assistants are trained in using the tablet and the software to increase efficiency. This software has helped to collect accurate data on the de-worming programme carried out this year.

g) New Initiatives

- Introduce Public Health Education initiative extensively among the project-affected area population
- Make significant inroads in the community's general health through intervention on Water, Sanitation and Hygiene
- 'Women and Child Health' to become the epicentre for the public health intervention programme
- Measure and Monitor effectiveness of public health programme through IT-enabled facilities under development
- Increasing the area under the project ambit to provide health benefits to more people.Issue 'Health cards' to all residents of project-affected area to capture their health/disease history and facilitate future monitoring

h) Environment and sanitation

Easy access to potable water was one of the needs of the community, identified by CSR team. The company has taken initiatives to install a number of hand pumps in neighboring villages to ensure availability of safe drinking water. The onus of repair of these hand pumps is on the local community. Besides, toilets were constructed at local schools as a part of sanitation programme.

Installation of Handpump

Toilet constructed at local school

i) Entrepreneurship Development

JSW is facilitating development of local youth by not only making them financially independent but also aims to develop them as entrepreneurs and has accordingly identified sincere and hard working youth from the villages. The company has purchased at its own cost and provided them with Local made (indigenous) transportation carts in order to help them to set up and facilitate public transport system around the Plant Site.

A local with the transportation cart

j) Developmental Work

The Road network around Project site is being widened and strengthened, besides the efforts to establish linkages with the highways, district headquarters, important towns, tourist centers etc. To manage rain water, culverts have been prepared at number of places.

Widening & Development of Panchyat Road

Culverts built to channelize rainwater

Park constructed for village children

The Company is organizing social awareness camps and exposure trips, where people from the neighboring villages are taken to other JSW Plants in India so as to make them familiar with the functioning of a factory and help them analyze their future prospects with the development of the Project and the organization.

k) Promotion of Education

Hostel Facility

The Company is supporting other social and community initiatives including providing monetary and financial support to Tribal Hostels in the neighboring villages. 56 boys and girls from Primitive tribal group are lodged at three hostels run by Yogacharya Vivekananda Seva Samiti. The students are showing remarkably good results with most of them obtaining A, A+ grading at school examinations.

Tuition programme

The JSW Group is in constant pursuit of making life better for communities with its various initiatives in the fields of health, education, livelihood and sports along with art and culture. Accordingly, The Company is implementing a package of social benefits and social welfare measures including educational facilities for the larger section of the Society in the surrounding villages and to the local community. Interaction with village communities and Gram Panchyats by PR/CSR team members has highlighted the scarcity of qualified teachers to teach three subjects viz. Mathematics, Science and English for 8-10th standard students. The local children, mostly from tribal community, need additional coaching to grasp these subjects. However, due to inadequate govt facility, students have to seek extra tution classes. Local boys and especially girls are unable to go to Salboni 15-20 kms away, or to Midnapore 30-35 Kms away, where some private tution facility is available.

In line with its policy of promoting education to the children belonging from local neighborhood, the Company is providing 'Tution Classes' two to three times a week for 8th- 12th standard on elementary English, and 8th- 10th standard for Mathematics. The teachers were nominated by The Company and accordingly all payments in relation to their charges etc. is borne by the company; while, permission for usage of necessary infrastructure like the school campus buildings and classrooms was obtained. About 240 students are availing this facility.

Hostel facility and education for 56 boys and girls from primitive tribal & Tuition facility for students at local High/Madhyamik schools

l) Organising Competitions/Environment day at Schools

JSW makes endeavour to integrate local school children during important national events like Independence day, Republic day and Environment Day etc. Competitions and awareness campaigns are conducted.

Drawing Competition

Recitation Competition

Tree plantation on Environment day

m) Development of Sports Activities

Though sports do not fall under the ambit of CSR, JSW has been actively engaged in sponsoring local clubs in organizing sports events like football, athletics and cricket. Besides, JSW organized six month long football coaching camps at two locations for tribal boys and girls, the result of which was encouraging. About 300 youth took part in the camps

p

Football Coaching Camp

n) Way Forward

In forthcoming years, JSW plans to consolidate its CSR initiatives by complementing and supplementing various government schemes to effectively tackle mal-nutrition, aneamia amongst women, primary and secondary education, and environment to include sanitation. These are the ills of the society which are the need of the community in project affected area and JSW is committed to alleviate these issues substantially.

7.10 ACTION PLAN FOR IDENTIFICATION OF LOCAL EMPLOYABLE YOUTH

The major benefit, accruing to the local community, due to the proposed project will be in the sphere of generating employment for substantial number of personnel. Approximately 1500 persons would be required for the construction work, most of whom would be unskilled workers, although the power plant construction needs a large number of skilled personnel as well. The major skill sets required are Welding, Carpentry, Electrician etc.

These construction workers are proposed to be sourced mainly from the adjoining villages of the project. The man-power requirements for the operational phase of the power project shall be about 150 persons. The local youth, who will be engaged during construction phase, would be selectively provided jobs at this phase. With a view to progress towards the goal of developing these skill sets, JSW has tied-up with near-by ITIs at Salboni and Jhargram for getting the local youths trained in batches.

Accordingly, 34 local youth, nominees of land giver families and who are class 10 graduates, have undergone training, primarily in mechanical fitter trade with knowledge of welding, turning & milling at ITI, Salboni as per module of D.G.E.T, Govt of India with certification of NCVT(National Council of Vocational Training). The total cost of training is borne by JSW

Of these 34 trainees, ten have been sent to the JSW Vijayanagar plant to undergo rigorous training in maintenance activities. This training is being provided by NTTF (Nettur Technical Training Foundation), a renowned name in the technical skill training. Further, 20 youth from the neighbouring areas have been selected from ITI, Jhargram & have been trained by NTTF and all costs has been borne by JSW.

From the above trainees, 16 have already been absorbed at JSW, Vijayanagar plant and have been working there

Various other employment opportunities for the rest of the trainees are being explored.

This process of training is not only confined to the domain of technical training but they are also being provided soft skill training. About 26 nominees were provided training in housekeeping, gardening etc and provided jobs at the project site to manage various facilities. Till date employment has been provided to 112 land givers.

For enhancing employability skill of the community further, appropriate actions will be initiated under CSR.

7.11 OCCUPATIONAL HEALTH AND SAFETY MEASURES FOR THE WORKERS

The JSWEBL operates an Occupational health centre at it's project site at Salboni to cater for the health needs of it's employees and workforce engaged in project development activities. The OHC has served a total of 15153 patients up to 31 December 2015.

a) Number of Patients : Trend 2013-2015

Year	Number of patients
2013	6224
2014	5852
2015	3077

b) *Staff Position*

Designation	Number	Status (Full-time/Part-time)
Doctor	1	Full time
Doctor (locum)	1	Part time
Pharmacist	1	Full time
Paramedics	3	Full time
In-charge	1	Full time

The OHC operates a pharmacy and medicine is dispensed free of cost. An ambulance is available round the clock to transfer patients with serious injuries to Mednipur Medical College and Hospital.

c) List of Equipment

Equipment	NO.	Function
ECG machine cardiovit AT-2C	1	ECG
X Ray	1	X-Ray
Nebulizer Machine	1	-
Ambu-bag silicon (adult)	2	Facilitates respiration
Bedsite monitor truescope mini (ESN) digit	1	-

Equipment	NO.	Function
Spyrometer Spirovit SP _ 1	1	PFT
LED Torch	2	-
Tongue Depressor (L SHAPE)	2	-
Nasal Specullum Killians Set of 3 (L)	1	To examine the nose
Oxygen FA Valve with gauge and flow meter	1	
Suction Machine Crompton Motor ¼ HP	1	For aspirating fluids
Hospito Instrument tray	2	-
Medifit trial set illuminated rim	1	To view X ray
Eye testing drum (near vision)	1	Eyesight testing
Eye testing drum (distance vision)	1	Eyesight testing
ENT Spotlight	1	Eyesight testing
Eye Chart	1	Eyesight testing
Near Vision Book	1	Eyesight testing
Electrical aluminum autoclave	1	Sterilize instruments
Dressing drum	1	-
Instrument Trolley	1	-
Instrument Sterilizer	1	-
Halogen spotlight	1	-
Head adjustable beds	4	-
Patient examination couch	1	-
Blood Pressure Monitor	1	To measure blood pressure
Electro nystagmo graphy (ENG)	1	Vertigo test
Pulse Monitor	1	-
Weighing Machine	1	-
Ambulance	1	-

d) Test Carried out on Staff, including labour

ECG	Capillary blood sugar test
ENG	Vertigo monitoring
PFT	Lung Function
X-Ray	

OHC maintains all patient reports for future reference.

e) Training Provided

Type of training	Trainer
Initial management of Snake bite	Dr. Rajarshi Roy Chowdhury MBBS, FAEM (Accident & Emergency)
Labour emergency trauma care	Dr. Rajarshi Roy Chowdhury MBBS, FAEM (Accident & Emergency)
Labour emergency trauma care	Senior Paramedic

As a large number of workers are engaged outdoor all day in strenuous activities during peak summer months at Salboni where the temperature exceeds 46 degree Celsius, a project was undertaken to mitigate the effects of such heat exposure among workers through preparation of 'ORS' as per guideline of WHO and distributed to workers over the entire project site of Salboni in an ambulance, twice a day. The distribution is carried on between the months of April to July every year benefitting approximately 400 employees/ labourers per day. The success of the project lies in the fact that no incident of heat stroke or dehydration was reported in the site in the two years of this project.

Given that the plant is located amidst dense vegetation, incidents of snake bites are rampant in the adjacent areas. To combat this, a basic training on initial management of snake bite has been given by Dr. Rajarshi Roy Chowdhury MBBS, FAEM (Accident & Emergency) among all the Staff of JSW to prevent fatalities through snake bite. 44 staff attended the training programme, a hand on training on management was demonstrated by Dr. Roy Chowdhury and SOP on the same was also distributed to the staff.

Since September 2012 an initiative was taken to prevent a dengue outbreak in the site though free distribution of homeopathic medicine among the JSW employees and other contractual labourers and service providers. A total of 550 medicines were distributed and only one case of dengue was reported that year.

7.12 LAND ACQUISITION AND R&R SCHEME

7.12.1 Issues relating to land acquisition and R&R Scheme

No land acquisition and R&R are involved as the project is situated within the land, already acquired for the Integrated Steel Plant Project. However, JSW group of companies have an elaborate CSR plan. As a part of CSR commitment, JSW had installed about 10 hand pumps in 10 different villages within the study area for analysis of water quality. Two samples have been collected randomly from 2 tubewells & it is found that the iron content is within the range (Refer Annexure-7B).

7.12.2 Compensation

This parcel of land falls within the overall project conceptualised as detailed in Section 4.4 Chapter 4. Acquisition of the entire 4335 acres of land has already been completed.

JSW has already provided compensation packages to the farmers as approved by the State Government who has given their land for the project.

7.13 INFRASTRUCTURE FACILITIES

Infrastructure facilities such as sanitation, bathing area & toilets, rest rooms, OHC facility & personal protective equipment will be provided by JSW and its contractors.

Dedicated safety officer along with a team of safety supervisors will be employed to look after safety during construction.

7.14 ASH UTILIZATION

JSWEBL proposes to achieving 100% ash utilization by exporting ash to the surrounding cement plants and brick industries in line with the requirements of the MoEF & CC Notification. Also ash will be utilized in ash-dyke raising, road works, ready-mix concrete, lightweight aggregate and agriculture application.

JSWEBL will prepare and submit action plan for utilization of ash, considering the utilization as mentioned above.

30 tons/hr of ash is being generated which implies a total of 0.264 MTPA of ash generation.

The ash is proposed to be evacuated and stored in silos in dry form so that most of it can be utilized/marketed in dry form.

The ash generated in thermal power stations has commercial value because of its usage in cement and construction industries. Ash generated from the proposed power plant will be commercially utilized in one or more of the following industries, to the extent possible :

a) Cement industry
b) Brick/Block/Tiles manufacturing
c) Ash aggregate making industry
d) Road making / paving
e) Roads and embankment construction
f) Structural fill for reclaiming low lying areas
g) Mines fill
h) Agriculture, Forestry and Waste land development
i) Part replacement of cement in mortar and concrete.

The Letter of Agreement between JSW Energy (Bengal) Limited and OCL India Limited in this regard is presented vide Annexure-10A.

The fly ash available from JSWEBL's power plant will be used in the JSW Cement Plant at Salboni (Refer Annexure-10B).

CHAPTER-8
RISK ASSESSMENT

8.1 DESCRIPTION OF PLANT LAYOUT

The general layout plan for the proposed project is depicted in Exhibit-4.1.

A total of two (Heavy Fuel Oil) HFO and one (Light Diesel Oil) LDO storage tanks have been proposed for the project (Refer Exhibit-4.1).

8.2 FUEL FOR PLANT OPERATIONS

The basic fuel for this project has been considered as coal. However, HFO and LDO will be required for boiler start-up and flame stabilization purposes.

A total of three tanks of capacities mentioned below will store the fuel oil required for the 660 MW unit. This fuel oil will be pumped from the fuel dyke area to the boilers. The details of the tanks are as under:

Material	Tank No	Storage Tank Capacity (M^3)	Diameter (mts)	Height (mts)
HFO	1	1500	16.0	8.0
HFO	2	1500	16.0	8.0
LDO	1	1000	15.0	6.0

8.3 HAZARD IDENTIFICATION

Disaster scenarios for the purpose of this study is defined as an accident viz., Fire, Explosion, Release of Toxic substances, where

- There may be multiple casualties needing hospitalization and /or
- Significant loss to plant and surrounding areas.

The following failure scenarios are derived for further consequence analysis and risk estimation.

8.3.1 Possible Risks at Plant Area

- Pipeline rupture or Leakages (Continuous release)
- Fuel oil storage/dyke fire (Instantaneous release)

8.4 MAJOR HAZARD INSTALLATIONS

Major Hazard Installations are usually defined with the help of the list of hazardous substances and their triggering quantities (threshold limits). As per the Ministry of Environment and Forests Notification No. S.D. 227 (E) dated March 24, 1992, the noted substances in the quantities equal to or greater than those specified are hazardous substances. This list of hazardous substances is divided into 5 groups as stated below :

Group 1 & 2	Toxic Substances
Group 3	Highly Reactive Substances
Group 4	Explosive Substances
Group 5	Flammable Substances

8.5 CONSEQUENCE ANALYSIS

The facilities at the Fuel Dyke area terminal mainly comprise of HFO and LDO storage tanks. The hazards posed by them are mainly in the form of fire. There is a possibility of flash fire taking place in the event of large spill of hydrocarbons, mainly major failure scenarios were evaluated to assess the effect on people and property inside the plant area as well as outside.

a) Tank Fire
b) Bund Fire
c) Flash fire

The effect of fire on people and property outside will chiefly manifest itself in the form of thermal radiation. A criteria was selected for deciding the maximum level of thermal radiation to which the outside population can be subjected. Thermal radiation levels from fire scenarios of each tank are worked out at various distances and their effects are evaluated against the set criteria.

8.5.1 Thermal Radiation

Thermal radiation due to pool fire may cause various degrees of burns on exposed human bodies. Moreover their effects on inanimate objects like piping, equipment or vegetation also need to be evaluated to assess their impact.

For continuous presence of persons, the following thermal radiation intensity levels are usually adopted :

- 1.6 Kw/m^2 for outside population.
- 4.5 Kw/m^2 for plant operators.

This is the criteria that is followed in case of flare design where peak load condition may occur for a short time but mostly without warning. The operators are usually trained and properly clothed; they are expected to run for shelter quickly. For secondary fire, an incident radiation intensity of 12.5 Kw/m^2 is required. This is usually taken as the minimum criteria.

The facilities at the storage area mainly comprises of vertical cylindrical tanks of structural steel (IS-2062 Grade-A). The hazard posed by them are mainly in the form of fire. There is a possibility of tank fire taking place and is evaluated to assess the effect on people and property.

8.5.2 Damage Criteria

Damage estimates due to thermal radiation has been arrived at by correlating recorded incidents. The consequences can then be visualized by super imposing the effects on the proposed site plan and identifying the elements within the project site as well as the neighbouring environment which may be affected.

The damage criteria due to accidental release of hydrocarbon arise primarily from fire. Contamination of soil or water is not expected as fuel will vapourise quickly and would not leave any residue as it happens with oil. The vapour of HFO/LDO are not toxic and hence no effects of toxicity are expected.

8.5.3 Consequence of Fuel Oil Spill

The tank on fire situation would occur if the heat on peripheral surface of the tank leads to internal tank pressure. Pool fire would occur when fuel oil collected in the dyke due to leakages get ignited.

8.5.3.1 Thermal Damage

The following table presents the damage and effects due to thermal radiation on inanimate objects like piping, equipment or vegetation in addition to effects on human beings.

Incident radiation (in kW/m^2)	Type of damage
62.0	Spontaneous ignition of wood.
37.5	Sufficient to cause damage to process equipment.
32.0	Maximum thermal radiation intensity allowed on thermally protected adjoining equipment
25.0	Minimum energy required to ignite wood at infinitely long exposure (non-piloted)
8.0	Maximum thermal radiation intensity allowed on thermally unprotected adjoining equipment
4.5	Sufficient to cause pain to personnel if unable to reach cover within 50 seconds, however blistering of skin (1st degree burns)
1.6	Causes no discomfort on long exposures
0.7	Equivalent to solar radiation

The effect of incident radiation and exposure time on lethality is stated in the following table:

Radiation Exposure and Lethality

Incident Radiation (Kw/m^2)	Exposure time (seconds)	Lethality (%)	Degree of burns
4.5	20	0	1st
4.5	50	0	1st
8.0	20	0	1st

Incident Radiation (Kw/m^2)	Exposure time (seconds)	Lethality (%)	Degree of burns
8.0	50	<1	3rd
8.0	60	<1	3rd
12.0	20	<1	2nd
12.0	50	8	3rd

8.5.4 Model Details

The hazard distances are computed based on the guidelines specified by World Bank, Technical Paper No. 55 (Techniques for Assessing Industrial Hazards, Technica, Limited).

8.6 METHODOLOGY

Each tank at the storage facility is evaluated to assess the effect in the event of its catching fire.

For the present study, the scenarios under consideration assume that the peak level of radiation intensity will not occur suddenly. Based on the past experience, it is found that 20-30 minutes time will be required before a tank fire grows to full size. For radiation calculations, full tank fire has been considered. From the above considerations, the criteria of 4.5 kW/m^2 has been selected to judge acceptability of the scenarios.

The assumptions for calculations are :

- it is not continuous exposure;
- there is not enough time available for warning the public and initiating emergency action;
- Within 10 minutes, plant personnel would attend any eventuality
- secondary fire at public road and building is not likely to happen;
- the effect of smoke on reduction of source radiation intensity has not been considered; therefore hazard distances calculated tend to be conservative; and
- Shielding effect of intervening trees or other structures has not been considered. No lethality is expected from this level of intensity although burn injury takes place depending on time of exposure.

8.6.1 Pool Fire

Following an accidental release, chemicals will form a confined pool with in the dyke area or an unconfined pool in case liquids were allowed to be stored in the absence of a dyke. Should the vapour above the pool ignite, the liquid will burn as a pool fire. The pool fire will result in thermal radiation. It could also damage the storage tanks located within the common dyke area.

8.6.1.1 Release Rate Estimation

Leakage rates for various scenarios are estimated based on the storage facilities. These are given below.

Release Rate Estimation

Fuel	HFO	LDO
Roof Type	Fixed Roof	Fixed Roof
Capacity of each Tank (KL)	600	150
Failure of Liquid Fuel supply line (Kg/S)	1.33	1.33

8.6.1.2 Model Computations

Although the interest of this study is to find out the distance from a burning tank to a radiation intensity level of 4.5 Kw/m^2, calculations of the levels of radiation intensity as indicated have been included, the hazard distances for storage tank on fire: (i) Plant area instantaneous spill (Single Tank, HFO) (ii) Plant area instantaneous spill (Single Tank, LDO) and (iii) Catastrophic rupture of storage facility Continuous spill (All tanks) are stated in Tables-8.1, 8.2 and 8.3 and are shown in Exhibits-8.1 and 8.2.

Radiation distances shown in above tables are at tank elevations. At ground level the radiation intensity will be comparatively low.

8.7 CONCLUSION

1. The 4.5 kw/m^2 heat intensity radiation will not spread beyond the plant boundary.

2. The following arrangements are available for the storage tanks:

   Independent high level alarm and trip off liquid inlet-line.

   Low level alarm.

   Provision of auto deluge water sprinkler system for each bulk storage tank. The auto deluge water sprinkler would be set to start working at a temperature of 66^0 C.

3. The turbine building, switchyard, transformer yard, administrative building, pantry, first aid center, fire stations etc. should be located safely, if viewed in the light of worst accident scenarios.

4. In case of any tank on fire or fire in the vicinity, the cooling of adjoining tank should be resorted promptly in addition to tank on fire so that the tank shell of neighboring tanks does not give away.

5. The night vision wind sock is mounted on top of administrative building, and Fuel Dyke area with adequate illumination so that people can move in upwind directions in the event of massive spillage.

6. Population growth around the plant and colony should be watched by appropriate authorities. Unauthorised growth of shanty colonies and hutments around Power Project should be avoided.

7. No machinery of vital importance like fire fighting pump house, Hydrant and Fuel oil pump house should be placed within radiation contours of 32.0 kw/m^2 heat intensity.

Strict adherence to standards and accepted maintenance and operation of the plant plays a vital role in maintaining the plant. The monitoring of the health of equipment, pipeline and machines, thickness survey will improve plant performance and safety.

Table-8.1
Distances of Occurence of Various Thermal Radiation Intensities
Storage Tank on Fire
Plant Area Instantaneous Spill (Single Tank, HFO)

Radiation Intensity (kw/m^2)	**Distance of Occurrence (metres)**
Tank Capacity (KL)	600
37.5	10.20
32.0	11.00
12.5	17.50
8.0	22.00
4.5	29.30
1.6	49.20

Table-8.2
Distances of Occurrence of Various Thermal Radiation Intensities
Storage Tank on Fire
Plant Area Instantaneous Spill (Single Tank, LDO)

Radiation Intensity (kw/m^2)	Distance of Occurrence (metres)
Tank Capacity (KL)	150
37.5	2.70
32.0	3.00
12.5	4.40
8.0	5.85
4.5	7.80
1.6	13.10

Table-8.3
Distances of Occurrence of Various Thermal Radiation Intensities
[Catastrophic Rupture Storage Facility Continuous Spill (All Tanks)]

Radiation Intensity (kw/m^2)	Distance of occurrence from dyke centre (metres)
37.5	7.60
32.0	8.24
12.5	13.20
8.0	16.50
4.5	22.00
1.6	34.25

CHAPTER-9
DISASTER MANAGEMENT PLAN (DMP)

9.1 DISASTER MANAGEMENT

In order to prevent occurrence of any disaster, the plant will be provided with various safety and disaster control facilities. Normally, in the power plant no major disaster affecting nearby population areas are foreseen. However, accidents inside the plant affecting workplace in the vicinity cannot be ruled out. Work-force inside the plant shall be exposed to various high pressure system pipelines and vessels, acids and chemicals, fuel such as coal and furnace fuel oil and other process equipment which, if not properly operated and maintained, can cause serious accidents affecting life and property in the vicinity of accident site. In addition to these, numerous material handling systems, heavy road transport, high-tension electric lines, level crossings, overhead cranes and various other handling and transport systems always have chances of accidents.

9.1.1 Definition of Disaster

A situation will be called a `Disaster' if it entails any one or more of the following factors:

i) Risk of loss of human lives - ten or more in one single situation.

ii) Loss of property as a consequence of the incident is over Rs.1 crore and/or bears a potential to the above.

iii) A situation which goes beyond the control of the available resource of the plant.

iv) A situation apparently may not have much loss but its long-term severity can affect loss of life, production and property.

The types of possible disaster are given below:

Type of disasters

i) Disaster due to emergencies on account of:

a) Fire
b) Explosion
c) Oil spillage
d) Electrocution
e) Acid/Alkali Spillage

ii) Disaster due to natural calamity on account of:

a) Flood
b) Earthquake / cyclone / Storm / Cloud burst / lightning

iii) Disaster due to external factors on account of:

a) Food poisoning / water poisoning
b) Sabotage
c) War

Objectives

Objectives of disaster control/management plan for proposed Power Plant are:

i) To identify type of major disasters that may occur in the proposed plant.

ii) To collect data on type of disasters that has happened already in other thermal power plants.

iii) To prepare an action plan to handle disaster.

9.2 IDENTIFICATION OF HAZARDOUS PROCESS / AREA

1. Boiler area – Explosion
2. Oil tanks - fire & spillage
3. Turbine Hall – Explosion
4. Electrical premises

    i) Electrical Rooms - Fire & Electrocution
    ii) Transformer area - Fire & Electrocution
    iii) Cable Tunnel - Fire & Electrocution

5. Other premises

    i) Storage facilities for coal and fuel oil -Fire/spillage

9.3 LEVEL OF ACCIDENT

If there is any disaster in any part of the plant /work place due to any reason the area which may be affected can be classified in the following four classes.

1. Level I - Operator level
2. Level II - Local/community level
3. Level III - Regional/ national level
4. Level IV - International level

Only level I and II class of accidents can be considered for the thermal power plant.

Level I

Under this level, disasters may happen due to fire, explosion, oil spillage and spontaneous ignition of inflammable materials.

This level has probability of occurrence affecting persons inside the plant. The various shops, which have been mentioned as potential hazard areas, will be affected during this level of accident.

Level II

In case of sabotage/complete failure of all automatic control/warning systems the fuel oil stored in tanks and covered by tank bunds may leak out. However, the probability of this is very low due to adequate security and training of persons of the plant operating such system.

9.4 DISASTER PREVENTIVE MEASURES

If any disaster takes place it is not easy to control if contingency plans are not available. For effective control of disaster, adequate manpower, technical know-how, alertness and internal help is necessary. It always better to take preventive measures to avoid any disaster. In the proposed plant, following prevention measures will be taken to prevent disaster.

9.4.1 Plant layout

i) Design, manufacture and construction of all plant and machineries and buildings will be as per national and international codes as applicable in specific cases and lay down by statutory authorities.

ii) Provision of adequate access ways for the movement of equipment and personnel are kept.

iii) Minimum two numbers of gates for escape during disaster shall be provided.

iv) Installation of fuel oil storage shall be in protected fenced area inside tank bunds.

v) Water spraying in coal storage area.

9.4.2 Fire Fighting

It is proposed to have a well equipped fire fighting group for the proposed power plant with 4 officers, 50 workers trained in this field. Following fire-fighting equipment shall also be provided:

i) Fire Tender - 1 No.
ii) Jeep - 4 Nos
iii) Portable Extinguishers Lot
iv) Foam generator Lot
v) Static tanks Lot

9.4.3 List of Fire Extinguishers Required at Different Locations is as follows

Name of the Site	**Type**
Turbo Generator Area	CO_2 type and Foam type, Dry Chemical Type
Cable Galleries	CO_2 type and Foam type, Dry Chemical Type
High Voltage Panel	CO_2 type and Foam type, Dry Chemical Type
Various Control rooms	CO_2 type and Foam type, Dry Chemical Type
Various MCC rooms	CO_2 type, Dry Chemical Type
Various Pump Houses	CO_2 type and Foam type, Dry Chemical Type
Fuel Tank Area	CO_2 type and Foam type, Sand Baskets
Guest Houses & Offices	Dry Chemical type
Go downs Crusher House	Foam Type, CO^2 type and Foam type, Dry Chemical Type

However before installing fire station & safety equipment, an experienced safety officer would be appointed who would carry out an in-depth study and shall decide about the selection of equipment.

Safety

The existing plant safety department manned by experienced engineers and staff whose main job will be to bring about safety consciousness amongst the work force in the plant.

For proposed plant also, the safety department will conduct regular safety awareness courses by organizing seminars and training of the personnel among the various working levels.

Safety awareness will also be created by the various posters highlighting the safe working practices in different shops, hazards in working area, public places and roads etc. Safety engineers of the plant will conduct regular checks and mock exercises on the safe working of their department and report will be given to departmental head for corrective measures to improve the safety conditions.

Training

A department of training will also be set up to train officers. They will arrange training on safety accident prevention, first aid, hazard control, house -keeping and environmental management. Special emphasis with mock drills in disaster control will also be planned.

Communication

The proposed plant will be provided with up-to-date communication facilities with telecommunication and wireless facilities, walkie-talkies, telecommunication and loud speakers in each shop, office and gate to warn workers in case of an accident.

9.5 ORGANIZATION TO COMBAT CONTINGENCY

The proposed contingency plan is prepared from the experiences of accidents that have occurred in various other Power Plants. The contingency plan being a dynamic plan will need periodical reviews and modifications with new experiences. Even with all precautionary measures taken to avoid disaster, disaster may occur. To tackle situations during and after disaster, a well-defined contingency plan is a must.

9.5.1 The Emergency Plan

The Plan, involves noticing an emergency by an employee, summoning of Declarer of Emergency by Shift In-charge, declaring of emergency with or without shutting the plant by sounding the coded siren, controlling of emergency, performing rescue, leakage control and

repair functions by respective teams under Works Incident Controller, informing the local authorities in the event of a likely off-site emergency and making available all the resources for safety and security of the people inside and outside the plant, sounding of 'All Clear Signal' after having complete control over emergency to indicate that everything is normal again.

9.5.2 Emergency Organisation

Responsibilities of various functionaries during "on-site" and "off-site" emergency.

Any one noticing an emergency

A. Actuate the nearest Manual Call Point in case of Fire

B. Inform immediately Plant manager about location and nature of emergency

Plant manager (WIC)

a) Assess the situation and classify the situation as emergency or minor.

b) Initiate action to control emergency

c) Mobilize fire fighting personnel and equipments

d) Shift-in-charge can declare the emergency, if the situation is grave

Declarer of Emergency (Works Incident Controller)

a) Assess the situation and shut down the plant if not done so

b) Declare Emergency

c) Inform Works Manager

d) Inform Factory/Nearest Hospital Medinipur

e) Assemble the Leak Control & Repair Team, Rescue Team and arrange necessary safety equipments for them.

f) Ensure that the paths for evacuation are lit through emergency lighting.

g) Keep in touch with the different teams and advise them regarding the method of control to be used.

h) Give a All Clear Signal when the emergency has been controlled.

i) Prepare a detailed report.

Security

a) To co-ordinate assembling of people working, transporters and visitor at assembly point.

b) Help police for sending affected persons to hospitals etc.

c) Looking after the law and order within factory premises.

Nearest Hospital

a) Send ambulance to the place of emergency

b) Ensure that those requiring medical attention are separated.

c) Treat all those who can be treated in the Occupational Health Centre (OHC)

d) Send the other injured/affected to the local hospitals.

e) Inform outside hospitals about antidotes and supply the same if required.

Police

a) Control crowd of onlookers to keep the area clear.

b) Maintain law and order

c) Help to take injured to hospitals.

Transport in-charge

a) Arrange transportation as required.

b) Be in close contact with Works Incident Controller.

c) Arrange for ambulance and other vehicles.

9.6 DECLARATION OF EMERGENCY

When emergency situation arises due to leakage of oil fire, any employee who notices the same will inform the Shift in-charge. The Shift in-charge will activate the siren or use radio/mobile communication depending upon the nature of leakage. The Shift in-charge will also assess the situation. Simultaneously, the Fire detectors installed in various locations in the plant shall also trigger alarm when content of release is above the set norm.

The works-in-charge will take necessary action to control the Leakage/fire with the available resources. In case the Emergency situation is of serious nature, the works in-charge will declare the emergency himself.

9.6.1 Emergency Alarm – Style and Duration

For Major Fires : Continuous Siren for Five Minutes

With this, the emergency is considered to have been declared. The works in-charge will simultaneously take steps to control the emergency and act as WORK INCIDENT CONTROLLER (WIC) In the event, the emergency is of off-site nature, the Works Incident Controller (WIC) will get in touch with the Superintendent of Police (SP) Medinipur or alternatively the Dy.Supdt. of Police (Dy.S.P.). The SP/Dy.S.P. will act as CONTROLLER OF OFFSITE EMERGENCY and will inform the public with the help of siren and Public Address System mounted on vehicle.

9.6.2 Evacuation of persons, medical treatment and plant shutdown

Evacuation of persons

It is natural that the persons inside the factory premises shall get panicky and do things which may expose them to harm. It is therefore very important that in case of emergency, the persons should know exactly which way to go so that they are guided to a safe place.

At some locations escape masks are provided where people can use them and reach the safe assembly point on hearing the emergency siren.

1. Administrative Building
2. Canteen Hall

People should rush to this point keeping in view the wind direction

9.6.3 Counting for missing persons

Attendance will be taken in this collection point by tuning computerized attendance systems to know the names of the persons who might have been trapped during emergencies.

Collection point attendance i/c (checkers)

1. Administrative Building HR& A/ Finance Person
2. Canteen Hall

Attendance In-charge (Checkers) should check with other persons to first know the names of missing persons of their sections. He should give these names by telephone to Control Room. Shift In-charge / Works incidence Controller will then send rescue teams to evacuate the trapped persons.

Rescue Team will comprise of the following persons

a) Safety –Assistant
b) Fireman -1
c) First Aid attendant -1
d) Security Personnel -1

The above Rescue Team members shall assemble in the Control Room (Site Emergency Control Room) and report to WIC.

Ambulance / cars (vehicle) will be used for rescue operation. Driver shall park these vehicles in front of Administrative Building Entrance.

At a time, only 4 rescue team members will go for search of trapped persons in the vehicle and send the affected persons to First Aid Centre. During General Shift, HR&A personnel will send a vehicle to the Site Control Room area.

In case of Off-Site emergency, the evacuation will be done by police. In case of emergency colony residents should not remain outdoor. They should remain inside a room of the house and should close all windows, doors and ventilators etc. They should try to keep the room air tight by putting old news papers and cloth in the gaps of doors, windows etc. if required. They can use wet cloth on their nose if they smell chlorine or feel difficulty in breathing, They should remain indoors till there is an all clear signal.

Important persons in the nearby industry/ villages will be informed of the emergency for availing assistance in evacuation. The police will arrange for guarding the property and maintain law and order. Police will arrange for temporary shelter, food and also make arrangements to take the public back to their residences after the all clear signal is given.

9.6.4 Medical team and medical treatment

Medical Team will comprise of following persons:

i) Medical Officer
ii) Security Personnel
iii) Shift First Aid attendant

Security Personnel/HR personnel will send the shift vehicle to pickup doctors from their residence immediately after the declaration of the emergency and then park the vehicle in front of Control Room for use by Rescue Team.

9.6.5 Control of emergency

The Site in-charge (WIC) performs the function of leakage control, repairs and also rescue of gas affected personnel with help of trained staff.

Leak control & repair team consists of following members:

1. Safety Personnel
2. Mechanical Engineer
3. Fitter

9.6.6 Mutual aid scheme

Mutual Aid scheme is established with local fire brigade and also with nearby industries, viz. OCL Ltd and Salboni Mint.

9.6.7 All clear signal

It is the duty of the Declarer of Emergency to inform everyone concerned after the situation is brought under control.

Once the signal is given, all the persons inside and outside the plant can perform their normal duties as the emergency has been completely controlled.

CHAPTER-10
ENVIRONMENTAL MONITORING PLAN

10.1 NEED FOR MONITORING

It is imperative that the Project Authorities set up regular monitoring stations to assess the ambient levels in relevant areas of environment after the commissioning of the project. A post study monitoring programme is important as it provides useful information on the following aspects :

i) It helps to verify the predictions on environmental impacts presented in this study

ii) It helps to indicate warnings of the development of any alarming environmental situations, and thus, provides opportunities for adopting appropriate control measures in advance.

The monitoring programme in different areas of environment, have been based on the findings of the impact assessment studies, described earlier. The post study monitoring programme including areas, number and location of monitoring stations, frequency of sampling and parameters to be covered are summed up in Table-10.1.

10.2 METEOROLOGY

Meteorology forms one of the important categories of environment in the area as it directly controls the levels of air quality parameters as well as affecting the water quality of rivers and various other waterbodies. As such, a meteorological observatory is proposed to be set up at a suitable location within the township for monitoring of relevant parameters. The observatory should house equipments for monitoring of temperature, relative humidity, rainfall, atmospheric pressure as well as wind speed and wind direction. Equipments of continuous recording type, now available indigenously, should be preferred which would lessen manpower requirements.

10.3 AMBIENT AIR QUALITY

Monitoring of ambient air quality around the project site should be carried out on a regular basis to ascertain the levels of harmful pollutants in the atmosphere, as air quality could represent one of the worst affected environmental disciplines due to the power plant operations. The stations could be located at a suitable place at surrounding villages, the township and protected forests. Such a monitoring network would provide an overall picture of the air quality around the site. Monitoring should be undertaken at a frequency of twice a week with minimum 104 measurements in a year taken 24-hourly at uniform intervals to enable comparison with the Air Quality Standards. The samples should be analysed for PM_{10}, $PM_{2.5}$, SO_2 and NO_x.

10.4 STACK EMISSIONS

Stack emissions should also be monitored, preferably at a frequency of once a fortnight to ascertain that PM emissions are within the design level of 100 mg/Nm^3. SO_2 and NO_x should also be monitored in order to determine the emission levels and correlate with the anticipated or design data. Particle size may be analyzed once in a year to assess the impact on RPM.

10.5 SURFACE WATER QUALITY

Water quality constitutes another important area in the post study monitoring programme. The water quality of the major water bodies of the area should be carefully monitored with three stations being set up on different rivers/canals.

The sampling frequency could be maintained at once a month and the samples should be analysed for physical, chemical and bacteriological parameters. The samples should also be tested for the presence of heavy metals and toxic constituents at a frequency of once in three months.

10.6 GROUND WATER QUALITY

Ground water quality is also required to be checked periodically to detect any contamination arising out of the ash disposal area. Two wells situated close to the ash pond area should be generally sampled once a month and analysed for physical, chemical and bacteriological parameters, including heavy metals and trace inorganics.

10.7 LIQUID EFFLUENTS

Samples should be collected from the effluent discharge channel of the power plant as well as the outlet of the sewage treatment plant of the township, once a month and analysed in accordance with the parameters stated as per EPA, 1986, to ensure that the effluent quality meets the stipulated standards.

10.8 SOILS

Soil samples, close to the ash disposal area and from nearby the ambient air monitoring stations should be collected once in 3 years. Thus, two soil monitoring stations should be located around the ash pond and two stations near the air quality monitoring stations.The samples should be analysed for physical and chemical parameters as well as organic and nutrient content and heavy metals. This would help to detect any contamination or build-up of harmful or toxic elements due to leachate from the ash pond or fallout of pollutants from the stack emissions.

10.9 TERRESTRIAL ECOLOGY

Crop samples close to the air quality monitoring stations may be collected, once in three years, during the premonsoon and postmonsoon seasons of the same year and examined for any injury symptoms due to fallout of air pollutants.

10.10 AQUATIC ECOLOGY

Samples for analysis of aquatic ecology parameters should be collected from the three surface water quality sampling stations described earlier, so that co-relation may be drawn between the two sets of data. Samples may be drawn once in three years, during the premonsoon and postmonsoon seasons of the same year. Samples should be anlaysed for densities and diversities of fish, plankton, macro-invertebrates etc with particular emphasis on nuisance species and pollution indicators. Species level identification should be carried out during the analysis.

10.11 NOISE

Ambient noise levels should be monitored at 6 stations covering industrial, commercial, residential and sensitive areas once every season, in order to compare and ensure that the existing noise levels are maintained within the stipulated limits specified in the Gazette Notification of February, 2000. 2 stations representing the industrial area could be located at the plant boundary, 1 station can be sited at any market representing the commercial area, 2 stations representing the residential area could be located at the Township and any village, while the last station representing the silence zone could be located at a nearby Hospital.

10.12 INFRASTRUCTURAL FACILITIES REQUIRED FOR MONITORING

An Environment Monitoring Group (EMG) should be established at the project under the Deputy General Manager (DGM). The group should consist of 2-3 chemists and scientists, along with adequate number of field assistants, so that this division may assume overall responsibility of carrying out the environmental monitoring programme detailed earlier.

A full fledged laboratory should be established for this purpose. The essential equipments required in the laboratory are listed in Table-10.2. Necessary transportation facilities as jeeps, etc are also to be procured for smooth conduct of the monitoring programme.

Besides these, the other infrastructural facilities like computer, environmental softwares, books and Indian Standards etc would have to be established for post study monitoring.

Table-10.1
Environmental Monitoring Programme

Sl. No.	Area of Monitoring	Number and Location of Sampling Stations	Frequency of Sampling	Parameters to be analyzed
1.	Meteorology	One observatory in the township area	Hourly and Daily Basis, depending on the parameter	Wind Speed, Wind Direction, Temperature — Hourly basis for each day Relative Humidity and Atmospheric Pressure — 2 observations daily Rainfall — Daily
2.	Ambient Air Quality	3 Stations viz : i) Surrounding villages ii) Township iii) Protected forests	Twice a week; each for 24 hour period.	PM_{10}, $PM_{2.5}$, SO_2 and NO_x
3.	Stack Emission	One	Once a fortnight Once in a year	PM, SO_2 and NO_x. Particle size.
4.	Surface Water Quality	3 stations, on major water bodies	Once a month	Physical and chemical parameters.
5.	Ground Water Quality and depth of Water Table	2 stations, close to the ash disposal site	Once a month.	Physical and chemical parameters.
6.	Plant and Township Effluents	From the plant and ash pond effluent discharge channels and outlet of sewage treatment plant	Once a month.	In accordance with EPA, 1986.
7.	Soils	Two stations around the ash disposal areas and two stations close to the air quality monitoring stations	Once in three years	Physical and chemical parameters, organic content and heavy metals.
8	Terrestrial Ecology	3 stations, close to the ambient air monitoring stations	Once in three years	Symptoms of injuries on plants.
9.	Aquatic Ecology	3 stations – same as surface water quality	Once in three years	Densities and diversities of fish, plankton and macro-invertebrates.

Table-10.1 (Contd)

Sl. No.	Area of Monitoring	Number and Location of Sampling Stations		Frequency of Sampling	Parameters to be analysed
10.	Noise	6 Stations viz		Once every season.	Ambient Equivalent continuous Sound Pressure Levels (Leq) at Day and Night Times.
		i) 2 Nos at plant boundary	Indus-trial Zone		
		ii) Any market	Commer-cial area		
		iii) Township iv) Any village	Residen-tial area		
		v) A Hospital	Silence zone		

Table-10.2
Laboratory Equipment Required for Environmental Monitoring

Sl. No	Equipment	Quantity
I.	***Meteorology***	
1.	Automatic Weather Station (Max and Min, Dry and Wet bulb, Barograph, Thermohygrograph, Rainfall and Wind Speed and Direction)	1 Set
II.	**Stack and Ambient Air**	
1.	Respirable Dust Sampler	2 Sets
2.	Vaccum pump with electric motor	2 Sets
3.	Spectrophotometer	1 No.
4.	Ammeter and Voltmeter	1 Set
5.	Generator	1 Set
6.	Stack emission kit with necessary accessories	1 Set
7.	Gas Liquid Chromatograph	1 Set
III.	**Noise**	
1.	Integrating Noise Level Meter with frequency analyser	1 Set
IV.	**Water**	
1.	BOD incubator	1 No.
2.	Bacteriological incubator	1 No.
3.	Oven	1 No.
4.	Muffle furnace	1 No.
5.	Analytical balance (Singlepan)	1 No.
6.	pH meter	1 No.
7.	Turbidimeter	1 No.
8.	Electrical conductivitimeter	1 No.
9.	Thermometer	1 No.
10.	Flame Photometer	1 No.
11.	Atomic Absorption Spectrophotometer	1 Set
12.	Distillation apparatus	1 Set

Table-10.2 (Contd)

Sl. No	Equipment	Quantity
13.	Hot Plate	4 Nos
14.	Magnetic stirrers	1 No.
15.	Colorimeter	1 No.
16.	DO Meter	1 No.
17.	Orset Apparatus	1 No.
18.	Kjeldal Nitrogen Assembly	1 No.
19.	Refrigerator	1 No.

CHAPTER-11
PUBLIC HEARING PROCEEDINGS

The Public Hearing for environmental clearance of the proposed 1 x 660 MW Thermal Power Project at Salboni, West Medinipur, West Bengal of M/s. JSW Energy (Bengal) Limited was held on August 26, 2014 from 12 noon onwards at the Salboni Panchayat Samity Community Hall (near Durga Mandir), PO and PS Salboni, Dist. West Medinipur, West Bengal. The copy of the Public Hearing Proceedings is attached as Annexure-11.

The meeting was presided by Sri R Arjun, IAS, Additional District Magistrate (General), Dist. Medinipur. Sri S Ganguly, Sri S Barua and Sri K Sahoo, Environmental Engineers of WBPCB assisted in conducting the meeting. Sri Nepal Singh, Sabhapati, Salboni Panchayat Samiti was also present on the dias. Sri Aloke Bhattacharjee, Associate Vice-President (Projects) of JSW initiated the discussions by making a presentation on the salient features of the project relevant to environmental aspects, followed by suggestions and responses by the Public and the Project proponent, respectively, which is reflected below :

Sl.No.	Name and address of the public present	Questions raised/ suggestions/ agenda	Response / Replies of Project Proponent
1.	Sri Chandan Manna, Village Jambedia	Stated that the villagers are helping and shall continue to help in future but the benefits from the proposed project specifically for the local people should be explained to them.	It was assured that the project will generate direct and indirect jobs to local people. It will also impart entrepreneural skills to start small businesses. JSW will provide the promised jobs to landgivers as and when the project starts functioning. All local issues as medical facility and other CSR activities will be implemented through dialogues with the local authorities keeping in view the needs of the community.
2.	Sri Deepak Mahato, Village Asnasuli	Demanded further improvements of medical facilities extended to villagers under CSR Programmes of the Company. He further requested the project proponent to fulfil other commitments like skill development for local unemployed youth, supply of potable water to the local villages, improvement of road conditions and sanitation facilities of the area, extend help to the local schools etc. He further requested the JSW authorities authorities to ensure that proper rehabilitation is provided to the land losers.	This point has already been responded to earlier.

Sl.No.	Name and address of the public present	Questions raised/ suggestions/ agenda	Response / Replies of Project Proponent
3.	Sri Tanmoy Saha, Village Jambedia	Expressed his grievances about numbers of commitments made long back regarding issues related to local developments. He requested the JSW authorities to initiate efforts immediately for providing better medical facilities for the local villagers, generate employment for the local residents, supply of potable water to the local villages and improvement of road conditions of the area; Sri Saha also requested the project proponent to start activities like football camps to improve overall sporting environment for the local youth.	It was assured that the project will generate direct and indirect jobs to local people. It will also impart entrepreneural skills to start small businesses. JSW will provide the promised jobs to landgivers as and when the project starts functioning. All local issues as medical facility and other CSR activities will be implemented through dialogues with the local authorities keeping in view the needs of the community. The CSR activities would also include training on sports and sociocultural activities.
4.	Sri Parishkar Mahato, Village – Asnasuli	Stated that many people had given their land with the belief that they will get jobs, but due to the delay in the project the people are distressed. He also wanted to know about the detailed compensation scheme to be provided to the land losers. He also urged for improvement of medical facilities.	This point has already been responded to earlier.
5.	Sri Ganeshwar Mahato, Village Asnasuli	Wanted to know when the certificates of training conducted through ITI and OPJC would be distributed to those trainees who had completed their training under CSR programmes conducted by the JSW. He expressed his grievance regarding such delay in distribution of certificates and failure to provide jobs by the JSW authorities to the trainees who have undergone such training. He urged the project proponent to address the issue at the earliest.	It was assured that the certificates would be distributed at the earliest opportunity. JSW will provide the promised jobs to landgivers as and when the project starts functioning.
6	Sri Taraknath Modak, Village Salboni	Enquired about the distribution of training certificates, generation of local employment and improvement of medical assistance. He requested the JSW authorities to maintain good relation with the local villagers. He further requested the project proponent to ensure	It was assured that the certificates would be distributed at the earliest opportunity. JSW will provide the promised jobs to landgivers as and when the project starts functioning. It was assured that the project activities would not hamper agriculture.

Sl.No.	Name and address of the public present	Questions raised/ suggestions/ agenda	Response / Replies of Project Proponent
6.	(contd)	that the local agricultural activities are not disturbed as a result of their upcoming project	
7.	Sri Manobilas Mahato, Village Asnasuli	Wanted to know the timeframe within which the land losers will be provided with permanent jobs by the JSW authorities.	JSW will provide the promised jobs to landgivers as and when the project starts functioning.
8.	Sri Shambhunath Mahato, Village Asnasuli	Urged that the priority should be given to maintain environment by reducing the pollution hazards while implementing the project. He further stated that extensive plantation program should be initiated in the locality to prevent environmental degradation of the area due to industrial activities.	It was assured that all pollution control measures will be implemented and pollutant levels would be maintained within prescribed limits. Green verge and extensive plantations would be undertaken in the plant and ash disposal areas.
9.	Sri Shyamal Ghosh, Village, Baragarh	Expressed his disappointment about non-fulfillment of commitments regarding creation of direct and indirect employment for the local people. He requested the JSW authorities to take the local people into confidence by organizing meetings at village level involving the representatives of local administration regarding issues like compensation to land losers, providing local employment and fulfillment of different CSR commitments.	This point has already been responded to earlier.
10.	Sri Salil Kanti Saha, Village Salboni	Spoke about loss of valuable cultivable land and the increasing rate of Global Warming due to industrialization. He also expressed his concern about forest depletion and deposition of fly ash may lead to the extinction of very high quality local species of mushrooms in the neighbouring jungles. He expressed his concern over proper installation of pollution control measures in the proposed project. He requested the WBPCB to keep proper vigil on the existing and upcoming industries of the locality. He expressed his hope	It was assured that all pollution control measures will be implemented and pollutant levels would be maintained within prescribed limits. Green verge and extensive plantations would be undertaken in the plant and ash disposal areas. WBPCB Officials stated that they will maintain strong vigil on the industries of the area to provide a pollution free environment to the local residents.

Sl.No.	Name and address of the public present	Questions raised/ suggestions/ agenda	Response / Replies of Project Proponent
10.	(contd)	about cooperation of the local villagers to the project proponent provided they fulfill the commitments regarding proper pollution control measures, generation of employment and CSR activities.	
11.	Sri Sambhunath Soren, Village - Ramraidihi	Raised concern about the delay for implementation of the project as they being the land losers, are eagerly waiting for employment.	The point was noted.
12.	Sri Chandan Ghosh, Krishi Karmadhakkhya of Salboni Panchayat Samity	Requested the project proponent to take the poor people of the area into confidence by fulfilling their commitments. He expressed his hope that local villagers will welcome the project as it will generate local employment and contribute to overall socio-economic development of the backward villages of the area.	The point was noted.
13.	Janab Syed Toiab Ali Sijua, Village Salboni	Said that the project will be welcomed by the local people and they will help the project proponent in all respects as there will be overall development of the backward area if the project materializes.	The point was noted.

RESPONSE TO QUERIES RAISED IN THE PUBLIC HEARING

Medical facilities:

Comprehensive medical coverage is provided to the residents of villages in Direct Impacted Zone (DIZ) through medical camps, held in villages and also at the RHC, located inside the township. Allopathic and homeopathic doctors examine patients and medicines are provided free of cost. Certain medical tests are also done free of cost.

Additionally, basic hygiene and health awareness campaigns are also conducted in local schools and surveys are carried out on anaemia, malnutrition, institutional delivery, reproductive health of adolescent girls, diabetes, hypertension etc. Suitable medical interventions are being planned, based on this data.

- Total expenditure till date (16-17): Rs 45.0 lac
- Total annual budget (17-18): Rs 70.0 lac.

Drinking water facilities:

Hand operated tube wells have been provided in ten different villages.

- Total expenditure (17-18): Rs 5.0 lac

Skill development activities

Thirty-four nominees of land givers were trained at Salboni ITI in different skill sets, e.g. Mechanical and electrical fitter/technician and welding.

Ten nominees were sent to JSW training institute at Vijaynagar for training in electrical technician. All the expenditures towards, journey, board and lodging, training, pocket money were borne by JSW.

Recently, dept. Of Paschim Banga Society for Skill development, under Technical Education, Training and Skill Development, Govt. of West Bengal, in collaboration with JSW, has signed a MOU, to initiate a training programme in different skill sets, required in industry. It will be provided to about 250 land giver nominees.

- Total expenditure till date: Rs. 2.5 lac
- Total annual budget (17-18): Rs 5.0 lac.

Education

JSW has collaborated with two schools in the vicinity of the project and discussed with their teachers to understand the knowledge gap that exists in different subjects. On their advice, a free tuition programme for 48 students of X – XII standards in English and mathematics has been started. The responses from students are encouraging and results in secondary and higher secondary examinations have been good for these students.

Planning is being done for development of educational institutions (School buildings, school equipments & school furniture, Construction/ repairing of Aanganwadis etc).

Total expenditure till date for 2016-17: Rs 1,53,000/-

- Total annual budget (17-18): Rs 5.00 lac

Improvement of infrastructures

1. The unmanned railway level crossing on ‘Farm’ road, the main road connecting the surrounding villages with NH-60, has been converted into a manned and automatic level crossing, being funded (Rs 3.0 cr) entirely by JSW.

2. Farm road, the existing morum road, was widened from 5 M to 26 M by JSW. This road is now being transformed into a 10 M concrete road by GoWB.

3. Morum roads inside the villages are regularly maintained and many culverts, on these roads, have been constructed

4. Children’s park has been constructed in Sitanathpur village.

5. Planning is being done for development community learning centers, home for destitutes, draining constructions, crematory facilities etc.

- Total annual budget (17-18): Rs 10.0 lac

Recreational activities

Village youths were provided football coaching. JSW give donations to Durga puja organisers and tribal festivals.

- Total annual budget (17-18): Rs 1.00 lac

Other Benefits to the locals

1. Providing sanitation facilities through construction of individual toilets, community toilet blocks, rural drainage systems.

2. Formation of & guidance to SHG, training & livelihood generation programs for SHGs. Other women empowerment initiatives.

- Total annual budget (17-18): Rs 6.00 lac

Employment to land losers

Land givers will be provided jobs under contractors during project construction period. Direct employment opportunities in this highly automated plant will be assessed during operation phase and land givers will be absorbed suitably.

Detailed compensation scheme to land losers

Besides monetary compensations, decided by GoWB, JSW has allotted ten rupee shares, equivalent to compensation received, of the company. These shares are kept in trust, headed by District Magistrate of West Medinipur district. Additionally, JSW has committed one job per khaitan of land loser families.

Distribution date of ITI and IPJC training

Last lot of certificates are yet to be received from ITI/Salboni. These are expected by July, 2017. Scanned copy of a letter received from ITI Salboni in this regard, is enclosed. As soon as these certificates are received, all the certificates will be distributed among the trainees.

Trainees sent to OPJC had received their certificates.

Plantation programme

Will be taken up as per MoEF & CC guidelines.

Extinction of high quality species of mushrooms due to deposition of fly ash etc

On 19th January, 2017, Mr. Aloke Bhattacharjee of JSW met Mr. Salil Saha, who raised the above issue, to understand his concerns.

Mr. Saha explained that the falling sal leaves in the forest (at a distance of about 2.5 to 3 Km from the project site) work as natural manure for the soil and the mushrooms grow of their own during month of September – October in this fertilised soil. The tribal collect these mushrooms and sell them. Mr. Saha is apprehensive that, the ash particles emitted from the power station chimney will get deposited on the sal leaves and when these leaves fall and decompose in the soil, the soil will become contaminated with the deposited ash. This will disturb natural growth of the mushrooms.

In this context it may be noted that the maximum incremental concentration of SPM would be only 0.8 µg/m^3 due to the particulate emissions from the power plant at a distance of about 4 kms from the stack in the downwind direction that is primarily to the west-south-west side of the plant site. This is due to the particulate emission being controlled to 100 mg/Nm^3 & wide dispersal through a 275 m tall stack. The negligible concentration would not cause any adverse impact on the terrestrial fauna, including mushrooms and fauna that exist within the study area.

In conclusion, the local people present in the hearing welcomed the project, provided that the project proponent implements all the commitments made during the Public Hearing.

Government of West Bengal
Irrigation & Waterways Department
Jalasampad Bhavan, 3rd Floor, Western Block
Bidhannagar, Salt Lake City, Kolkata 700091

No. 1259 – SIW
I 4M-20/2011

Dated, 3rd November 2011

From: Sri A K Chatterjee
Secretary to the
Government of West Bengal

To: The Land Reforms Commissioner
& Principal Secretary to the
Government of West Bengal
Land & Land Reforms Department
Writers' Buildings, Kolkata 700001

Sub: ***Transfer of more or less 5.039 acre of land in favour of Irrigation & Waterways Department for construction of diverted Keshpur Branch Canal under Kangsabati Reservoir Project in Mouza Salgeria (J.L. No.294), Mouza Ghagrasole (J.L. No.293), Mouza Radhagobindapur (J.L. No.299) and Mouza Khasjangal (J.L. No.300) under P.S. Salboni, District Paschim Medinipur lying at the disposal of Collector, Paschim Medinipur for settlement in favour of JSW Bengal Steel Plant along the boundary of the proposed Integrated Steel Plant at Salboni.***

Sir,

I am to inform you that Collector, Paschim Medinipur has taken over possession of 154.48 acre of land involving original course in the tail end of Keshpur Branch Canal (KBC) from Chainage 215.00 to Chainage 453.00 and its Distributary canals under P.S. Salboni, Paschim Medinipur relating to the proposed JSW Bengal Steel Limited, 10 MTPA Integrated Steel Plant at Salboni. It has since been reported that the irrigation command area of the Keshpur Branch Canal has partly been included within the proposed JSW Bengal Steel Limited Project land. Also, it reveals from records that irrigation water from Kangsabati Reservoir Project practically does not reach the tail end. However, some command still exists in the upstream of the lowermost reach, where irrigation facility needs to be continued. In order to achieve this purpose, only a small area of land measuring 5.039 acre is required to be handed over to this Department for the remaining irrigation command stated above for which the Keshpur Branch Canal is required to be diverted along the boundary of the project area for a length of 2.37 km up to Chainage 36.00 of Distributary No.5 of KBC. This 5.039 acre of land, more or less, comprises Mouzas Salgeria (J.L. No.294), Ghagrasole (J.L. No.293), Radhagobindapur (J.L. No.299) and Khasjangal (J.L. No.300) under P.S. Salboni, District Paschim Medinipur.

The said land measuring more or less 5.39 acre is reportedly under physical possession of JSW Bengal Steel Limited. The matter has been discussed with the District Magistrate, Paschim Medinipur and authorized representatives of JSW Bengal Steel Limited by the Superintending Engineer-I, Kangsabati Circle and Chief Engineer-I, Irrigation & Waterways Directorate, and JSW Bengal Steel Limited has agreed to withdraw their claim for LTS of the land and also offered to bear the cost for construction of diverted Keshpur Branch Canal.

Jb. D:\LILAM\Transfer of Land\4M 20 2011.1

In view of above, I am to hereby submit the formal proposal for transfer of the 5.39 acre of land in favour of Irrigation & Waterways Directorate.

In this connection, one copy of the proposed land transfer plan drawn on mouza map containing schedule of plots of land and 5 copies of the same in ammonia print, report of the Chief Engineer-I, Irrigation & Waterways Directorate and reference of JSW Bengal Steel Limited is being annexed hereto for favour for transfer of the same in favour of this Department.

You are requested to please instruct the Collector, Paschim Medinipur for necessary action.

Yours faithfully,

A K Chatterjee
Secretary to the
Government of West Bengal

Encl. as stated

No.1259/1(4) – SIW

Dated, 3rd November 2011

Copy with a copy of the Land Plan forwarded for information to the:

1 The District Magistrate & Collector
Paschim Medinipur
PO & District Paschim Medinipur

The photocopy of the letter of Superintending Engineer-I, Kangsabati Circle, Irrigation & Waterways Directorate addressed to him dated 10.06.2011 is enclosed.

2 The Additional Chief Secretary to the
Government of West Bengal
Commerce & Industries Department
4,Camac Street, Kolkata 700016

3 Chief Engineer-I
Irrigation & Waterways Directorate

This has reference to his proposal submitted vide his Memo No.02677-CI dated 03.11.2011.

4 CEO & Jt. MD
JSW Bengal Steel Limited
Tower-A, 3rd Floor, DLF IT Park
8, Major Arterial Road, Block-AF
New Town, Kolkata 700156

A K Chatterjee
Secretary to the
Government of West Bengal

Encl. as stated

Jb. D:\LL\LAM\Transfer of Land\4M 20 2011.2

J-13012/18/2013 - IA. II (T)
Government of India
Ministry of Environment & Forests

Ph: 011-2436 4067
e-mail: sarojmoef@yahoo.com
Paryavaran Bhavan, C.G.O. Complex,
Lodi Road, New Delhi -110003.
Dated: January 7, 2014.

To

M/s JSW Energy (Bengal) Ltd.
Tower-A, 3rd Floor, DLF IT Park,
08, Major Arterial Road,
Block-AF, New Town,
Kolkata-700 156
Ph. No. 033-4000 2020
Fax No. 033-4000 2021

Sub: **1x660 MW Super Critical Power Plant of M/s JSW Energy (Bengal) Ltd. at Salboni, District- West Medinipur, West Bengal - *reg. TOR.***

Sir,

The undersigned is directed to refer to your letter dated 25.09.2013 on the above mentioned subject.

2. It is to inform that the proposal was considered by the Expert Appraisal Committee (Thermal Power) during its 1st and 3rd Meetings held during September 19-20, 2013 and October 10, 2013 respectively for determination of the Terms of Reference (TOR) for undertaking detailed EIA study in accordance with the provisions of the EIA notification dated September 14, 2006.

3. Based on the information provided by you with regard to the above mentioned project proposal, the Committee has prescribed the following Terms of Reference (TORs) for preparation of the Environmental Impact Assessment (EIA) Report and Environment Management Plan (EMP), in respect of your above mentioned project.

i) Vision document specifying prospective long term plan of the site, if any, shall be formulated and submitted.
ii) A certified compliance report from the Regional Office of this Ministry for the compliance to the conditions stipulated in the EC and CRZ clearance (if any) of the existing units shall be submitted.
iii) Executive summary of the project indicating relevant details along with recent photographs of the approved site shall be provided. Response to the issues raised during Public Hearing and to the written representations (if any), along with a time bound Action Plan and budgetary allocations to address the same, shall be provided in a tabular form, against each action proposed.
iv) Harnessing solar power within the premises of the plant particularly at available roof tops and other available areas shall be formulated and status of implementation shall be submitted to the Ministry.
v) The coordinates of the approved site including location of ash pond shall be submitted along with topo sheet (1:50,000 scale) and confirmed GPS readings of plant boundary and NRS satellite map of the area, shall be submitted. Elevation of plant site and ash pond with respect to HFL of water body/nallah/river shall be specified, if the site is located in proximity to them.
vi) Layout plan indicating break-up of plant area, ash pond, area for green belt, infrastructure, roads etc. shall be provided.
vii) Land requirement for the project shall be optimized and in any case not more than what has been specified by CEA from time to time. Item wise break up of land requirement and revised layout (as modified by the EAC) shall be provided.

viii) Present land use as per the revenue records (free of all encumbrances of the proposed site, shall be furnished. Information on land to be acquired) if any, for coal transportation system as well as for laying of pipeline including ROW shall be specifically stated.

ix) The issues relating to land acquisition and R&R scheme with a time bound Action Plan should be formulated and clearly spelt out in the EIA report.

x) Satellite imagery or authenticated topo sheet indicating drainage, cropping pattern, water bodies (wetland, river system, stream, nallahs, ponds etc.), location of nearest villages, creeks, mangroves, rivers, reservoirs etc. in the study area shall be provided.

xi) Location of any National Park, Sanctuary, Elephant/Tiger Reserve (existing as well as proposed), migratory routes / wildlife corridor, if any, within 10 km of the project site shall be specified and marked on the map duly authenticated by the Office of the Chief Wildlife Warden of the area concerned.

xii) Topography of the study area supported by toposheet on 1:50,000 scale of Survey of India, alongwith a large scale map preferably of 1:25,000 scale and the specific information whether the site requires any filling shall be provided. In that case, details of filling, quantity of fill material required; its source, transportation etc. shall be submitted.

xiii) A detailed study on land use pattern in the study area shall be carried out including identification of common property resources (such as grazing and community land, water resources etc.) available and Action Plan for its protection and management shall be formulated. If acquisition of grazing land is involved, it shall be ensured that an equal area of grazing land to be acquired is developed alternatively and details plan shall be submitted.

xiv) A mineralogical map of the proposed site (including soil type) and information (if available) that the site is not located on economically feasible mineable mineral deposit shall be submitted.

xv) Details of 100% fly ash utilization plan as per latest fly ash Utilization Notification of GOI along with firm agreements / MoU with contracting parties including other usages etc. shall be submitted. The plan shall also include disposal method / mechanism of bottom ash.

xvi) Water requirement, calculated as per norms stipulated by CEA from time to time, shall be submitted along with water balance diagram. Details of water balance calculated shall take into account reuse and re-circulation of effluents which shall be explicitly specified.

xvii) Water body/nallah (if any) passing across the site should not be disturbed as far as possible. In case any nallah / drain has to be diverted, it shall be ensured that the diversion does not disturb the natural drainage pattern of the area. Details of diversion required shall be furnished which shall be duly approved by the concerned department.

xviii) It shall also be ensured that a minimum of 500 m distance of plant boundary is kept from the HFL of river system / streams etc.

xix) Hydro-geological study of the area shall be carried out through an institute/ organisation of repute to assess the impact on ground and surface water regimes. Specific mitigation measures shall be spelt out and time bound Action Plan for its implementation shall be submitted.

xx) Detailed Studies on the impacts of the ecology including fisheries of the river/estuary/sea due to the proposed withdrawal of water / discharge of treated wastewater into the river/creek/ sea etc shall be carried out and submitted alongwith the EIA Report. In case of requirement of marine impact assessment study, the location of intake and outfall shall be clearly specified along with depth of water drawl and discharge into open sea.

xxi) Source of water and its sustainability even in lean season shall be provided along with details of ecological impacts arising out of withdrawal of water and taking into account inter-state shares (if any). Information on other competing sources downstream of the proposed project. Commitment regarding availability of requisite quantity of water from the Competent Authority shall be provided along with letter / document stating firm allocation of water.

xxii) Detailed plan for carrying out rainwater harvesting and its proposed utilisation in the plant shall be furnished.

xxiii) Feasibility of zero discharge concept shall be critically examined and its details submitted.

xxiv) Optimization of COC along with other water conservation measures in the project shall be specified.

xxv) Plan for recirculation of ash pond water and its implementation shall be submitted.

xxvi) Detailed plan for conducting monitoring of water quality regularly with proper maintenance of records shall be formulated. Detail of methodology and identification of monitoring points (between the plant and drainage in the direction of flow of surface / ground water) shall be submitted. It shall be ensured that parameter to be monitored also include heavy metals.

xxvii) Socio-economic study of the study area comprising of 10 km from the plant site shall be carried out by a reputed institute / agency which shall consist of detail assessment of the impact on livelihood of local communities.

xxviii) Action Plan for identification of local employable youth for training in skills, relevant to the project, for eventual employment in the project itself shall be formulated and numbers specified during construction & operation phases of the Project.

xxix) If the area has tribal population it shall be ensured that the rights of tribals are well protected. The project proponent shall accordingly identify tribal issues under various provisions of the law of the land.

xxx) A detailed CSR plan along with activities wise break up of financial commitment shall be prepared. CSR component shall be identified considering need based assessment study. Sustainable income generating measures which can help in upliftment of poor section of society, which is consistent with the traditional skills of the people shall be identified. Separate budget for community development activities and income generating programmes shall be specified.

xxxi) While formulating CSR schemes it shall be ensured that an in-built monitoring mechanism for the schemes identified are in place and mechanism for conducting annual social audit from the nearest government institute of repute in the region shall be prepared. The project proponent shall also provide Action Plan for the status of implementation of the scheme from time to time and dovetail the same with any Govt. scheme(s). CSR details done in the past should be clearly spelt out in case of expansion projects.

xxxii) R&R plan, as applicable, shall be formulated wherein mechanism for protecting the rights and livelihood of the people in the region who are likely to be impacted, is taken into consideration. R&R plan shall be formulated after a detailed census of population based on socio economic surveys who were dependant on land falling in the project, as well as, population who were dependant on land not owned by them.

xxxiii) Assessment of occupational health as endemic diseases of environmental origin shall be carried out and Action Plan to mitigate the same shall be prepared.

xxxiv) Occupational health and safety measures for the workers including identification of work related health hazards shall be formulated. The company shall engage full time qualified doctors who are trained in occupational health. Health monitoring of the workers shall be conducted at periodic intervals and health records maintained. Awareness programme for workers due to likely adverse impact on their health due to working in non-conducive environment shall be carried out and precautionary measures like use of personal equipments etc. shall be provided. Review of impact of various health measures undertaken at intervals of two years shall be conducted with an excellent follow up plan of action wherever required.

xxxv) One complete season site specific meteorological and AAQ data (except monsoon season) as per MoEF Notification dated 16.11.2009 shall be collected and the dates of monitoring recorded. The parameters to be covered for AAQ shall include SPM, RSPM (PM10, PM2.5), SO_2, NO_x, Hg and O_3 (ground level). The location of the monitoring stations should be so decided so as to take into consideration the predominant downwind direction, population zone, villages in the vicinity and

sensitive receptors including reserved forests. There should be at least one monitoring station each in the upwind and in the pre - dominant downwind direction at a location where maximum ground level concentration is likely to occur.

xxxvi) A list of industries existing and proposed in the study area shall be furnished.

xxxvii) Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be well assessed. Details of the Model used and the input data used for modelling shall also be provided. The air quality contours should be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any. The wind roses should also be shown on the location map as well.

xxxviii) Radio activity and heavy metal contents of coal to be sourced shall be examined and submitted along with laboratory reports.

xxxix) Fuel analysis shall be provided. Details of auxillary fuel, if any, including its quantity, quality, storage etc should also be furnished.

xl) Quantity of fuel required, its source and characteristics and documentary evidence to substantiate confirmed fuel linkage shall be furnished.

xli) Details of transportation of fuel from the source (including port handling) to the proposed plant and its impact on ambient AAQ shall be suitably assessed and submitted. If transportation entails a long distance it shall be ensured that rail transportation to the site shall be first assessed. Wagon loading at source shall preferably be through silo/conveyor belt.

xlii) For proposals based on imported coal, inland transportation and port handling and rolling stocks /rail movement bottle necks shall be critically examined and details furnished.

xliii) Details regarding infrastructure facilities such as sanitation, fuel, restrooms, medical facilities, safety during construction phase etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase should be adequately catered for and details furnished.

xliv) EMP to mitigate the adverse impacts due to the project along with item - wise cost of its implementation in a time bound manner shall be specified.

xlv) A Disaster Management Plan (DMP) along with risk assessment study including fire and explosion issues due to storage and use of fuel should be carried out. It should take into account the maximum inventory of storage at site at any point of time. The risk contours should be plotted on the plant layout map clearly showing which of the proposed activities would be affected in case of an accident taking place. Based on the same, proposed safeguard measures should be provided. Measures to guard against fire hazards should also be invariably provided.

xlvi) The DMP so formulated shall include measures against likely Tsunami/Cyclones/Storm Surges/Earthquakes etc, as applicable. It shall be ensured that DMP consists of both on-site and off-site plan, complete with details of containing likely disaster and shall specifically mention personnel identified for the task. Smaller version of the plan shall be prepared both in English and local languages.

xlvii) Detailed plan for raising green belt of native species of appropriate width (50 to 100 m) and consisting of at least 3 tiers around plant boundary (except in areas not possible) with tree density of 2000 to 2500 trees per ha with a good survival rate of about 80% shall be submitted. Photographic evidence must be created and submitted periodically including NRSA reports.

xlviii) Over and above the green belt, as carbon sink, additional plantation shall be carried out in identified blocks of degraded forests, in close consultation with the District Forests Department. In pursuance to this the project proponent shall formulate time bound Action Plans along with financial allocation and shall submit status of implementation to the Ministry every six months.

xlix) Corporate Environment Policy

i. Does the company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.
ii. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.
iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions. Details of this system may be given.
iv. Does the company has system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism should be detailed in the EIA report.

All the above details should be adequately brought out in the EIA report and in the presentation to the Committee.

l) Details of litigation pending or otherwise with respect to project in any court, tribunal etc. shall invariably be furnished.

4. Besides the above, the following general points will be followed:

a. All documents to be properly referenced with index, page numbers and continuous page numbering.
b. Where data is presented in the report especially in table, the period in which the data was collected and the source should invariably be indicated.
c. Where the documents provided are in a language other than English, an English translation should be provided.
d. The Questionnaire for environmental appraisal of thermal power projects as devised earlier by the Ministry shall also be filled and submitted.
e. The consultants involved in the preparation of EIA/EMP report after accreditation with Quality Council of India (QCI) / National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA/ EMP reports prepared by them and data provided by other organization / Laboratories including their status of approvals etc. In this regard circular no. F.No. J-11013/77/2004-IA-II (I) dated 2nd December, 2009 is posted on the Ministry's website http://www.moef.nic.in may be referred.

In addition to the above, information on the following may also be incorporated in the EIA report.

1. Is the project intended to have CDM-intent?

(i) If not, then why?
(ii) If yes, then

a. Has PIN (Project Idea Note) {or PCN (Project Concept Note)} submitted to the PNCA? (National CDM Authority) in the MoEF?
b. If not, then by when is that expected?
c. Has PDD (Project Design Document) been prepared?
d. What is the Carbon intensity? from your electricity generation projected (i.e. CO_2 Tons/MWH or Kg/KWH)
e. Amount of CO_2 in Tons/year expected to be reduced from the baseline data available on the CEA?s web-site (www.cea.nic.in)

2. Notwithstanding 1(i) above, data on (d) & (e) above shall be worked out and reported.

5. **The Environmental clearance shall be applied only after firm fuel and water linkages are obtained.**

6. After preparing the Draft EIA (as per the generic structure prescribed in Appendix-III of the EIA Notification, 2006) covering the above mentioned issues, the same shall be submitted to the SPCB for conducting the public hearing as per procedure of EIA notification 2006. The issues emerged during public hearing shall be further incorporated in the Draft EIA/EMP report. The final EIA/EMP report along with public hearing report and the requisite documents (*including written objections, if any*) shall be submitted to the Ministry for appraisal by the Expert Appraisal Committee for consideration of awarding environmental clearance under the provisions of Environmental Impact Assessment notification dated September 14, 2006.

7. The TORs prescribed shall be valid for a period of two years for submission of EIA/EMP reports, after public consultation.

Yours faithfully,

(Dr. Saroj)
Director

Copy to:

1. The Secretary, Ministry of Power, Shram Shakti Bhawan, Rafi Marg, New Delhi 110001.
2. The Secretary, Forests & Environment Deptt., Government of West Bengal, Writer's Building, Kolkata-700001.
3. The Chairman, Central Electricity Authority, Sewa Bhawan, R.K. Puram, New Delhi-110066.
4. The Chairman, West Bengal Pollution Control Board, Parivesh Bhawan, Bldg No. 10A, Block-LA, Sector-III, Salt Lake City, Kolkata-700098 with a request to display a copy of the clearance letter at the Regional Office, District Industries Center and Collector's office for 30 days.
5. The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi-110032.
6. The Chief Conservator of Forests, Eastern Regional Office, Ministry of Environment & Forests, A/3, Chandersekharpur, Bhubaneswar-751023.
7. Guard file.

(Dr. Saroj)
Director

ANNEXURE – 2

J-13012/18/2013- IA. I (T)
Government of India
Ministry of Environment, Forest and Climate Change

3rd Floor, Vayu Block,
Indira Paryavaran Bhawan, Jor Bagh Road,
Aliganj, New Delhi-110003

Dated: 20th January, 2016

To

M/s JSW Energy (Bengal) Ltd.
JSW Centre, Bandra Kurla Complex,
Bandra (East),
Mumbai-400 051

Tel. No. 022-42861000 Fax: 022-42863000

Sub: 1x660 MW Super Critical Thermal Power Plant at Salboni, District West Medinipur, West Bengal by M/s JSW Energy (Bengal) Ltd.- reg. extension of validity of ToR.

Sir,

This has reference to your letters dated 23.09.2015, 05.11.2015, 20.11.2015 and 11.12.2015 on the above subject. It is noted that Terms of Reference (ToR) for preparation of EIA/EMP was accorded for the above project vide this Ministry's letter of even no. dated 07.01.2014.

2. The matter was placed before the Expert Appraisal Committee (Thermal Power) in its 46th Meeting held during 26th-27th November, 2015. In acceptance of the recommendation of the EAC and based on the information/clarification furnished by you with respect to the above mentioned power project, the validity period of the ToR is extended for one more year i.e. till 06.01.2017 for submission of final EIA/EMP report and other requisite documents for consideration of environmental clearance.

This issues with the approval of the Competent Authority.

Yours faithfully,

(B. B. Barman)
Scientist 'F'

Copy to:

1. The Secretary, Forests & Environment Department, Government of West Bengal, Writer's Building, Kolkata-700001.
2. The Chairman, West Bengal Pollution Control Board, Parivesh Bhawan, Bldg No. 10A, Block-LA, Sector-III, Salt Lake City, Kolkata-700098.
3. The Additional Principal Chief Conservator of Forests (C), Ministry of Environment, Forest & Climate Change, Regional Office (EZ), A/3, Chandersekharpur, Bhubaneswar-751023.
4. Guard file/Monitoring file.
5. Website of MoEF&CC

(B. B. Barman)
Scientist 'F'

182

ANNEXURE-2

J-13012/18/2013- IA. I (T)
Government of India
Ministry of Environment, Forest and Climate Change

3rd Floor, Vayu Block,
Indira Paryavaran Bhawan, Jor Bagh Road,
Aliganj, New Delhi-110003

Dated: 20th January, 2016

To

M/s JSW Energy (Bengal) Ltd.
JSW Centre, Bandra Kurla Complex,
Bandra (East),
Mumbai-400 051

Tel. No. 022-42861000 Fax: 022-42863000

Sub: 1x660 MW Super Critical Thermal Power Plant at Salboni, District West Medinipur, West Bengal by M/s JSW Energy (Bengal) Ltd.- reg. extension of validity of ToR.

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(B. B. Barman)
Scientist 'F'

Copy to:

1. The Secretary, Forests & Environment Department, Government of West Bengal, Writer's Building, Kolkata-700001.
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3. The Additional Principal Chief Conservator of Forests (C), Ministry of Environment, Forest & Climate Change, Regional Office (EZ), A/3, Chandersekharpur, Bhubaneswar-751023.
4. Guard file/Monitoring file.
5. Website of MoEF&CC

(B. B. Barman)
Scientist 'F'

183

ANNEXURE-2

J-13012/18/2013 - IA. II (T)
Government of India
Ministry of Environment & Forests

Ph: 011-2436 4067
e-mail: sarojmoef@yahoo.com
Paryavaran Bhavan, C.G.O. Complex,
Lodi Road, New Delhi -110003.
Dated: January 7, 2014.

To

M/s JSW Energy (Bengal) Ltd.
Tower-A, 3rd Floor, DLF IT Park,
08, Major Arterial Road,
Block-AF, New Town,
Kolkata-700 156
Ph. No. 033-4000 2020
Fax No. 033-4000 2021

Sub: **1x660 MW Super Critical Power Plant of M/s JSW Energy (Bengal) Ltd. at Salboni, District- West Medinipur, West Bengal - *reg. TOR.***

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2. It is to inform that the proposal was considered by the Expert Appraisal Committee (Thermal Power) during its 1st and 3rd Meetings held during September 19-20, 2013 and October 10, 2013 respectively for determination of the Terms of Reference (TOR) for undertaking detailed EIA study in accordance with the provisions of the EIA notification dated September 14, 2006.

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184

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ix) The issues relating to land acquisition and R&R scheme with a time bound Action Plan should be formulated and clearly spelt out in the EIA report.

x) Satellite imagery or authenticated topo sheet indicating drainage, cropping pattern, water bodies (wetland, river system, stream, nallahs, ponds etc.), location of nearest villages, creeks, mangroves, rivers, reservoirs etc. in the study area shall be provided.

xi) Location of any National Park, Sanctuary, Elephant/Tiger Reserve (existing as well as proposed), migratory routes / wildlife corridor, if any, within 10 km of the project site shall be specified and marked on the map duly authenticated by the Office of the Chief Wildlife Warden of the area concerned.

xii) Topography of the study area supported by toposheet on 1:50,000 scale of Survey of India, alongwith a large scale map preferably of 1:25,000 scale and the specific information whether the site requires any filling shall be provided. In that case, details of filling, quantity of fill material required; its source, transportation etc. shall be submitted.

xiii) A detailed study on land use pattern in the study area shall be carried out including identification of common property resources (such as grazing and community land, water resources etc.) available and Action Plan for its protection and management shall be formulated. If acquisition of grazing land is involved, it shall be ensured that an equal area of grazing land to be acquired is developed alternatively and details plan shall be submitted.

xiv) A mineralogical map of the proposed site (including soil type) and information (if available) that the site is not located on economically feasible mineable mineral deposit shall be submitted.

xv) Details of 100% fly ash utilization plan as per latest fly ash Utilization Notification of GOI along with firm agreements / MoU with contracting parties including other usages etc. shall be submitted. The plan shall also include disposal method / mechanism of bottom ash.

xvi) Water requirement, calculated as per norms stipulated by CEA from time to time, shall be submitted along with water balance diagram. Details of water balance calculated shall take into account reuse and re-circulation of effluents which shall be explicitly specified.

xvii) Water body/nallah (if any) passing across the site should not be disturbed as far as possible. In case any nallah / drain has to be diverted, it shall be ensured that the diversion does not disturb the natural drainage pattern of the area. Details of diversion required shall be furnished which shall be duly approved by the concerned department.

xviii) It shall also be ensured that a minimum of 500 m distance of plant boundary is kept from the HFL of river system / streams etc.

xix) Hydro-geological study of the area shall be carried out through an institute/ organisation of repute to assess the impact on ground and surface water regimes. Specific mitigation measures shall be spelt out and time bound Action Plan for its implementation shall be submitted.

xx) Detailed Studies on the impacts of the ecology including fisheries of the river/estuary/sea due to the proposed withdrawal of water / discharge of treated wastewater into the river/creek/ sea etc shall be carried out and submitted alongwith the EIA Report. In case of requirement of marine impact assessment study, the location of intake and outfall shall be clearly specified along with depth of water drawl and discharge into open sea.

xxi) Source of water and its sustainability even in lean season shall be provided along with details of ecological impacts arising out of withdrawal of water and taking into account inter-state shares (if any). Information on other competing sources downstream of the proposed project. Commitment regarding availability of requisite quantity of water from the Competent Authority shall be provided along with letter / document stating firm allocation of water.

185

xxii) Detailed plan for carrying out rainwater harvesting and its proposed utilisation in the plant shall be furnished.

xxiii) Feasibility of zero discharge concept shall be critically examined and its details submitted.

xxiv) Optimization of COC along with other water conservation measures in the project shall be specified.

xxv) Plan for recirculation of ash pond water and its implementation shall be submitted.

xxvi) Detailed plan for conducting monitoring of water quality regularly with proper maintenance of records shall be formulated. Detail of methodology and identification of monitoring points (between the plant and drainage in the direction of flow of surface / ground water) shall be submitted. It shall be ensured that parameter to be monitored also include heavy metals.

xxvii) Socio-economic study of the study area comprising of 10 km from the plant site shall be carried out by a reputed institute / agency which shall consist of detail assessment of the impact on livelihood of local communities.

xxviii) Action Plan for identification of local employable youth for training in skills, relevant to the project, for eventual employment in the project itself shall be formulated and numbers specified during construction & operation phases of the Project.

xxix) If the area has tribal population it shall be ensured that the rights of tribals are well protected. The project proponent shall accordingly identify tribal issues under various provisions of the law of the land.

xxx) A detailed CSR plan along with activities wise break up of financial commitment shall be prepared. CSR component shall be identified considering need based assessment study. Sustainable income generating measures which can help in upliftment of poor section of society, which is consistent with the traditional skills of the people shall be identified. Separate budget for community development activities and income generating programmes shall be specified.

xxxi) While formulating CSR schemes it shall be ensured that an in-built monitoring mechanism for the schemes identified are in place and mechanism for conducting annual social audit from the nearest government institute of repute in the region shall be prepared. The project proponent shall also provide Action Plan for the status of implementation of the scheme from time to time and dovetail the same with any Govt. scheme(s). CSR details done in the past should be clearly spelt out in case of expansion projects.

xxxii) R&R plan, as applicable, shall be formulated wherein mechanism for protecting the rights and livelihood of the people in the region who are likely to be impacted, is taken into consideration. R&R plan shall be formulated after a detailed census of population based on socio economic surveys who were dependant on land falling in the project, as well as, population who were dependant on land not owned by them.

xxxiii) Assessment of occupational health as endemic diseases of environmental origin shall be carried out and Action Plan to mitigate the same shall be prepared.

xxxiv) Occupational health and safety measures for the workers including identification of work related health hazards shall be formulated. The company shall engage full time qualified doctors who are trained in occupational health. Health monitoring of the workers shall be conducted at periodic intervals and health records maintained. Awareness programme for workers due to likely adverse impact on their health due to working in non-conducive environment shall be carried out and precautionary measures like use of personal equipments etc. shall be provided. Review of impact of various health measures undertaken at intervals of two years shall be conducted with an excellent follow up plan of action wherever required.

xxxv) One complete season site specific meteorological and AAQ data (except monsoon season) as per MoEF Notification dated 16.11.2009 shall be collected and the dates of monitoring recorded. The parameters to be covered for AAQ shall include SPM, RSPM (PM10, PM2.5), SO_2, NO_x, Hg and O_3 (ground level). The location of the monitoring stations should be so decided so as to take into consideration the predominant downwind direction, population zone, villages in the vicinity and

sensitive receptors including reserved forests. There should be at least one monitoring station each in the upwind and in the pre - dominant downwind direction at a location where maximum ground level concentration is likely to occur.

xxxvi) A list of industries existing and proposed in the study area shall be furnished.

xxxvii) Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be well assessed. Details of the Model used and the input data used for modelling shall also be provided. The air quality contours should be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any. The wind roses should also be shown on the location map as well.

xxxviii) Radio activity and heavy metal contents of coal to be sourced shall be examined and submitted along with laboratory reports.

xxxix) Fuel analysis shall be provided. Details of auxillary fuel, if any, including its quantity, quality, storage etc should also be furnished.

xl) Quantity of fuel required, its source and characteristics and documentary evidence to substantiate confirmed fuel linkage shall be furnished.

xli) Details of transportation of fuel from the source (including port handling) to the proposed plant and its impact on ambient AAQ shall be suitably assessed and submitted. If transportation entails a long distance it shall be ensured that rail transportation to the site shall be first assessed. Wagon loading at source shall preferably be through silo/conveyor belt.

xlii) For proposals based on imported coal, inland transportation and port handling and rolling stocks /rail movement bottle necks shall be critically examined and details furnished.

xliii) Details regarding infrastructure facilities such as sanitation, fuel, restrooms, medical facilities, safety during construction phase etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase should be adequately catered for and details furnished.

xliv) EMP to mitigate the adverse impacts due to the project along with item - wise cost of its implementation in a time bound manner shall be specified.

xlv) A Disaster Management Plan (DMP) along with risk assessment study including fire and explosion issues due to storage and use of fuel should be carried out. It should take into account the maximum inventory of storage at site at any point of time. The risk contours should be plotted on the plant layout map clearly showing which of the proposed activities would be affected in case of an accident taking place. Based on the same, proposed safeguard measures should be provided. Measures to guard against fire hazards should also be invariably provided.

xlvi) The DMP so formulated shall include measures against likely Tsunami/Cyclones/Storm Surges/Earthquakes etc, as applicable. It shall be ensured that DMP consists of both on-site and off-site plan, complete with details of containing likely disaster and shall specifically mention personnel identified for the task. Smaller version of the plan shall be prepared both in English and local languages.

xlvii) Detailed plan for raising green belt of native species of appropriate width (50 to 100 m) and consisting of at least 3 tiers around plant boundary (except in areas not possible) with tree density of 2000 to 2500 trees per ha with a good survival rate of about 80% shall be submitted. Photographic evidence must be created and submitted periodically including NRSA reports.

xlviii) Over and above the green belt, as carbon sink, additional plantation shall be carried out in identified blocks of degraded forests, in close consultation with the District Forests Department. In pursuance to this the project proponent shall formulate time bound Action Plans along with financial allocation and shall submit status of implementation to the Ministry every six months.

xlix) Corporate Environment Policy

i. Does the company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.
ii. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.
iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions. Details of this system may be given.
iv. Does the company has system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism should be detailed in the EIA report.

All the above details should be adequately brought out in the EIA report and in the presentation to the Committee.

l) Details of litigation pending or otherwise with respect to project in any court, tribunal etc. shall invariably be furnished.

4. Besides the above, the following general points will be followed:

a. All documents to be properly referenced with index, page numbers and continuous page numbering.
b. Where data is presented in the report especially in table, the period in which the data was collected and the source should invariably be indicated.
c. Where the documents provided are in a language other than English, an English translation should be provided.
d. The Questionnaire for environmental appraisal of thermal power projects as devised earlier by the Ministry shall also be filled and submitted.
e. The consultants involved in the preparation of EIA/EMP report after accreditation with Quality Council of India (QCI) / National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA/ EMP reports prepared by them and data provided by other organization / Laboratories including their status of approvals etc. In this regard circular no. F.No. J-11013/77/2004-IA-II (I) dated 2nd December, 2009 is posted on the Ministry's website http://www.moef.nic.in may be referred.

In addition to the above, information on the following may also be incorporated in the EIA report.

1. Is the project intended to have CDM-intent?

(i) If not, then why?
(ii) If yes, then

a. Has PIN (Project Idea Note) (or PCN (Project Concept Note)} submitted to the ?NCA? (National CDM Authority) in the MoEF?
b. If not, then by when is that expected?
c. Has PDD (Project Design Document) been prepared?
d. What is the Carbon intensity? from your electricity generation projected (i.e. CO_2 Tons/MWH or Kg/KWH)
e. Amount of CO_2 in Tons/year expected to be reduced from the baseline data available on the CEA?s web-site (www.cea.nic.in)

2. Notwithstanding 1(i) above, data on (d) & (e) above shall be worked out and reported.

188

5. **The Environmental clearance shall be applied only after firm fuel and water linkages are obtained.**

6. After preparing the Draft EIA (as per the generic structure prescribed in Appendix-III of the EIA Notification, 2006) covering the above mentioned issues, the same shall be submitted to the SPCB for conducting the public hearing as per procedure of EIA notification 2006. The issues emerged during public hearing shall be further incorporated in the Draft EIA/EMP report. The final EIA/EMP report along with public hearing report and the requisite documents (*including written objections, if any*) shall be submitted to the Ministry for appraisal by the Expert Appraisal Committee for consideration of awarding environmental clearance under the provisions of Environmental Impact Assessment notification dated September 14, 2006.

7. The TORs prescribed shall be valid for a period of two years for submission of EIA/EMP reports, after public consultation.

Yours faithfully,

(Dr. Saroj)
Director

Copy to:

1. The Secretary, Ministry of Power, Shram Shakti Bhawan, Rafi Marg, New Delhi 110001.
2. The Secretary, Forests & Environment Deptt., Government of West Bengal, Writer's Building, Kolkata-700001.
3. The Chairman, Central Electricity Authority, Sewa Bhawan, R.K. Puram, New Delhi-110066.
4. The Chairman, West Bengal Pollution Control Board, Parivesh Bhawan, Bldg No. 10A, Block-LA, Sector-III, Salt Lake City, Kolkata-700098 with a request to display a copy of the clearance letter at the Regional Office, District Industries Center and Collector's office for 30 days.
5. The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi-110032.
6. The Chief Conservator of Forests, Eastern Regional Office, Ministry of Environment & Forests, A/3, Chandersekharpur, Bhubaneswar-751023.
7. Guard file.

(Dr. Saroj)
Director

189

ANNEXURE-2A

1 x 660 MW Super Critical Power Plant of M/s. JSW Energy (Bengal) Ltd at Salboni, District – West Medinipur, West Bengal
[POINTWISE REFERRAL IN EIA REPORT TO TOR OF MoEF PRESCRIBED BY LETTER NO. J-13012/18/2013-IA.II (T) DATED 7.1.2014 AND EXTENDED VIDE LETTER NO. J-13012/18/2013-IA.I (T) DATED 20.01.2016]

	TOR POINTS	REFERRAL IN EIA REPORT
i)	Vision document specifying prospective long term plan of the site, if any, shall be formulated and submitted.	The flagship company, JSW Steel is India's leading integrated steel producer with a capacity of 14.3 MTPA & has a vision of achieving 40 MTPA capacity by 2025. JSW Energy, the energy vertical, aims to achieve 6320 MW Power Plant capacity. Toward this end, the group has planned to built a 3 MTPA Integrated Steel Plant with associated 300 MW Power Plant at Salboni, West Bengal. The Group has also envisaged setting up a 2.4 MW Cement Plant at Salboni. [**(Refer Section-4.1, chapter-4 (Page-11)]**
ii)	A certified compliance report from the Regional Office of this Ministry for the compliance to the conditions stipulated in the EC and CRZ clearance (if any) of the existing units shall be submitted.	Not Applicable, as this is a Greenfield Project.
iii)	Executive summary of the project indicating relevant details along with recent photographs of the approved site shall be provided. Response to the issues raised during Public Hearing and to the written representations (if any), along with a time bound Action Plan and budgetary allocations to address the same, shall be provided in a tabular form, against each action proposed.	The water required during construction phase of the project will be 200-250 cum/day. Wastewater generated during this phase will be properly drained out allowing hydraulic retention time of 1½ hours in the sedimentation basin to remove the suspended impurities. The power plant is based on 'Zero Discharge Concept', as it will not alter the water quality of neighbouring rivers, from the waste water, it will be discharging. There will be little or no impact on ground water quality from the ash pond lechate as it will be lined by HDPE geomembrane. Particulate matter will be the predominant pollutant affecting air quality during construction phase. Dust will also be generated from excavation, back filling, hauling and transportational activities. NO_X will also rise minimally due to vehicular exhaust. During operation the proposed project will be firing pulverised coal & the resulting emission will be controlled by Dust Extraction and Dust Suppression system, high efficiency ESP. Flue stack of height 275 metres will be in operation for wide dispersal of pollutants. ISC3 model will be used for prediction of ambient air quality during operation of the project. **[Submitted separately alongwith the complete EIA Report. Refer Chapter-11 (Page-167-173)].**
iv)	Harnessing solar power within the premises of the plant particularly at available roof tops and other available areas shall be formulated and status of implementation shall be submitted to the Ministry.	About 10% of campus lighting / street lighting shall be done by harnessing solar power for illumination of street lights, in the garden & for hot water in canteens. **[Refer Section-7.6, Chapter-7 (Page-128)].**

	TOR POINTS	REFERRAL IN EIA REPORT
v)	The coordinates of the approved site including location of ash pond shall be submitted along with topo sheet (1:50,000 scale) and confirmed GPS readings of plant boundary and NRS satellite map of the area, shall be submitted. Elevation of plant site and ash pond with respect to HFL of water body/nallah/river shall be specified, if the site is located in proximity to them.	The coordinates of the plant & ash pond of the proposed project 1 x 660 MW Supercritical Thermal Power Project of JSW are presented in Exhibit-2.3. The elevation of the plant site varies from 39 m – 58 m & the elevation of ash pond varies from 50.5 m to 58.5 m. The HFL of Parang River (nearest to the site) is 12.650 m (1978). The distance of the plant boundary from the HFL of this river is in excess of 500 metres. **[Refer Section-2.3, Chapter-2 (Page-2, 3)].**
vi)	Layout plan indicating break-up of plant area, ash pond, area for green belt, infrastructure, roads etc. shall be provided.	The land area inside the power plant is as follows : Main Plant – 18 acres, Coal Handling Plant – 16 acres, Water System – 16 acres, Switch Yard – 18 acres, Miscellaneous BOP facilities – 32 acres, Water Reservoir – 28 acres, land for green belt – 42 acres. The land area outside the power plant is as follows : Land for ash disposal – 85 acres, Land for township – 30 acres, land for corridor, for ash slurry, raw water pipeline & railway – 75 acres. Total area outside the plant including green belt – 190 acres. Total power plant area 360 acres. **[Refer Exhibit-4.1 and Section-4.4, Chapter-4 (Page-13)].**
vii)	Land requirement for the project shall be optimized and in any case not more than what has been specified by CEA from time to time. Item wise break up of land requirement and revised layout (as modified by the EAC) shall be provided.	The land area inside the power plant is as follows : Main Plant – 18 acres, Coal Handling Plant – 16 acres, Water System – 16 acres, Switch Yard – 18 acres, Miscellaneous BOP facilities – 32 acres, Water Reservoir – 28 acres, land for green belt – 42 acres. The land area outside the power plant is as follows : Land for ash disposal – 85 acres, Land for township – 30 acres, land for corridor, for ash slurry, raw water pipeline & railway – 75 acres. Total area outside the plant including green belt – 190 acres. Total power plant area 360 acres. **[Refer Section-4.4, Chapter-4 (Page-13)].**
viii)	Present landuse as per the revenue records (free of all encumbrances of the proposed site, shall be furnished. Information on land to be acquired) if any, for coal transportation system as well as for laying of pipeline including ROW shall be specifically stated.	The present landuse of the proposed site is 90% barren land & 10% agricultural land. The land to be used for laying of railway line for transportation of coal near the plant site is agricultural land. The land to be used for laying the water pipeline is agricultural land but the pipe shall be buried atleast 1.0 m below the ground & covered. This land shall be returned to the farmers. The landuse classification for the study area is as follows :

	TOR POINTS	REFERRAL IN EIA REPORT
		Forest land : 19.47%, Residential land:1.23%, Scrub land:1.95%, Cultivated / barren land : 77.35%. **[Refer Section-5.3, Chapter-5 (Page-66), Exhibits-5.3.1, 5.3.2 & 5.3.3].**
ix)	The issues relating to land acquisition and R&R scheme with a time bound Action Plan should be formulated and clearly spelt out in the EIA report.	No land acquisition and R&R are involved as the project is situated within the land already acquired for the Integrated Steel Plant project. JSW has already provided compensation packages to the farmers as approved by the State Government who has given their land for the project. **[Refer Section-7.12, Chapter-7 (Page-143)].**
x)	Satellite imagery or authenticated topo sheet indicating drainage, cropping pattern, water bodies (wetland, river system, stream, nallahs, ponds etc.), location of nearest villages, creeks, mangroves, rivers, reservoirs etc. in the study area shall be provided.	**(Refer Exhibit-2.3, Chapter-2).** Elevation of plant site : 39-50 m Elevation of Ashpond : 50.5 – 58.5 m HFL of Parang River : 12.65 m No filling required.
xi)	Location of any National Park, Sanctuary, Elephant / Tiger Reserve (existing as well as proposed), migratory routes /wildlife corridor, if any, within 10 km of the project site shall be specified and marked on the map duly authenticated by the Office of the Chief Wildlife Warden of the area concerned.	There is no National Park, Wildlife Sanctuary within 10 km of the project site **[Refer Section-2.2, Chapter-2 (Page-2)].**
xii)	Topography of the study area supported by toposheet on 1:50,000 scale of Survey of India, alongwith a large scale map preferably of 1:25,000 scale and the specific information whether the site requires any filling shall be provided. In that case, details of filling, quantity of fill material required; its source, transportation etc. shall be submitted.	**[Refer Section-2.3, Chapter-2 (Pages-2-3)].** Elevation of Plant site : 39-58 m Elevation of Ash Pond : 50.5 – 58.5 m HFL of Parang River : 12.65 m No filling required.
xiii)	A detailed study on land use pattern in the study area shall be carried out including identification of common property resources (such as grazing and community land, water resources etc.) available and Action Plan for its protection and management shall be formulated. If acquisition of grazing land is involved, it shall be ensured that an equal area of grazing land to be acquired is developed alternatively and details plan shall be submitted.	The present landuse of the proposed site is 90% barren land & 10% agricultural land. The land to be used for laying of railway line for transportation of coal near the plant sit is agricultural land. The land to be used for laying the water pipeline is agricultural land but the pipe shall be buried atleast 1.0 m below the ground & covered. This land shall be returned to the farmers. The landuse classification for the study area is as follows: Forest land:19.47%, Residential land:1.23%, Scrub land:1.95%, Cultivated / barren land : 77.35%. **[Refer Section-5.3, Chapter-5 (Page-66), Exhibits-5.3.1, 5.3.2 & 5.3.3].**
xiv)	A mineralogical map of the proposed site (including soil type) and information (if available) that the site is not located on economically feasible mineable mineral deposit shall be submitted.	**Refer Exhibit-5.1, Chapter-5**

	TOR POINTS	REFERRAL IN EIA REPORT
xv)	Details of 100% fly ash utilization plan as per latest fly ash Utilization Notification of GOI along with firm agreements / MoU with contracting parties including other usages etc. shall be submitted. The plan shall also include disposal method./ mechanism of bottom ash.	JSWEBL proposes to achieving 100% ash utilization by exporting ash to the surrounding cement plant & brick industries in line with the requirement of MoEF&CC Notification. Ash will also be used in ash dyke raising, road work, ready mix concrete, light weight aggregate & agriculture application, Wet / Dry type bottom ash removal system is proposed for bottom ash removal. The large bottom ash shall be cooled & conveyed using special conveyer system. Large size clinker will be crushed & stored in the site. This ash would be disposed off by trucks. Fly ash removal system would be either vacuum-cum-pressure type or pressure type pneumatic system with dry disposal by closed trucks for utilisation with provision for ash disposal to ash disposal area in high concentrate slurry form in emergency. **[Refer Section-7.14, Chapter-7 (Page-144); Section-4.8.2, Chapter-4 (Page-19-20) and Annexure-10A & 10B)]**
xvi)	Water requirement, calculated as per norms stipulated by CEA from time to time, shall be submitted along with water balance diagram. Details of water balance calculated shall take into account reuse and re-circulation of effluents which shall be explicitly specified.	The plant water requirement for condenser cooling, cycle make up and other consumptive requirement after pre-treatment will be met from Rupnarayan river. Estimated total consumptive raw water requirement is about 1980 m^3/hr considering re-circulating closed cooling water system with cooling towers. **[Refer Section-4.9, Chapter-4 (Page-20-23), Exhibits-4.3 & 4.4].**
xvii)	Water body/nallah (if any) passing across the site should not be disturbed as far as possible. In case any nallah / drain has to be diverted, it shall be ensured that the diversion does not disturb the natural drainage pattern of the area. Details of diversion required shall be furnished which shall be duly approved by the concerned department.	A dried up water passage exists in the site. Approval of the diversion has been accorded by the I&W Directorate to JSWEBSL on requisite payment. **[Refer Section-2.4, Chapter-2 (Page-3) and Annexure-1.**
xviii)	It shall also be ensured that a minimum of 500 m distance of plant boundary is kept from the HFL of river system / streams etc.	The HFL of Parang River (nearest to the site) is 12.650 m (1978). The distance of the plant boundary from the HFL of this river is in excess of 500 metres. **[Refer Section-2.3, Chapter-2 (Page-2)]**
xix)	Hydro-geological study of the area shall be carried out through an institute/ organisation of repute to assess the impact on ground and surface water regimes. Specific mitigation measures shall be spelt out and time bound Action Plan for its implementation shall be submitted	The overall project has received permission from the Irrigation and Waterways Department, Govt of West Bengal **(Refer Annexure 6)** for withdrawal of 45 MGD in the initial phase from Rupnarayan river, located about 80 km from the plant site. The water drawal for the Power Plant (1980 cum/hour or 10.5 MGD) would be easily accommo-dated from this quantum. The raw water from the intake well of the river would be pumped through pipelines and stored in the reservoir. The raw water after treatment would be supplied for plant purposes. As stated earlier, the makeup water for the plant would be drawn entirely from surface water

	TOR POINTS	REFERRAL IN EIA REPORT
xix)	(contd)	sources viz. the Rupnarayan river. Groundwater would not be extracted at all for either industrial or domestic requirements during normal operational phase. As such, no impact would be felt on the groundwater hydrology of the area due to project operations. **[Refer Section-5.1.2, Capter-5 (Page-27) and Section-6.3, Chapter-6 (Page-100).]**
xx)	Detailed Studies on the impacts of the ecology including fisheries of the river/estuary/sea due to the proposed withdrawal of water / discharge of treated wastewater into the river/creek/ sea etc shall be carried out and submitted alongwith the EIA Report. In case of requirement of marine impact assessment study, the location of intake and outfall shall be clearly specified along with depth of water drawl and discharge into open sea.	The impact on terrestrial ecology during construction phase of the project would be minimised through water sprinkling & plantation schemes. The impact during operation of the proposed project may arise from the pollutants like particulates, SO_2 & NO_X, only then, when these pollutants will exceed its threshold limits. The waste water generating from the power plant during operation stage will not be discharged to the Parang river immediately. It will be allowed to stand for some time in settling basin & the supernatant will be discharged to the river, so as to cause less adverse impact to the aquatic biota. During operation stage as the water circulating system will draw water from the Rupnarayan river, some small fish, phytoplankton, zooplankton will get trapped & subjected to mechanical stress, which will cause there destruction. **[Refer Section-6.7 and 6.8, Chapter-6 (page-112-115)].**
xxi)	Source of water and its sustainability even in lean season shall be provided along with details of ecological impacts arising out of withdrawal of water and taking into account inter-state shares (if any). Information on other competing sources downstream of the proposed project. Commitment regarding availability of requisite quantity of water from the Competent Authority shall be provided along with letter / document stating firm allocation of water.	Water allocation letter for 45 MGD water of river Rupnarayan from Irrigation & Waterways Department, GoWB is enclosed as Annexure-6. The water drawal for the power plant (1980 cum/hour or 10.5 MGD) would be easily accommodated from this quantum. **[Refer Section-4.9.1, Chapter-4 (Page-21-25) and Section-6.3, Capter-6 (Page-100) and Annexure-6)].**
xxii)	Detailed plan for carrying out rainwater harvesting and its proposed utilisation in the plant shall be furnished.	Facilities will be provided for rainwater harvesting in the plant area wherever feasible. While developing the plant general layout, it will be ensured that rainwater harvested from building rooftops would be done in accordance with the guidelines of SEAC, West Bengal. **[Refer Section-7.8, Capter-7 (Page-132)].**
xxiii)	Feasibility of zero discharge concept shall be critically examined and its details submitted.	The effluent generated from the power plant will use Reverse Osmosis process to reclaim as much water as possible to minimise the consumption of water & sludge from the effluent treatment plant will be disposed to ash pond, thus ensuring zero discharge of liquid effluent. **[Refer Section-4.10, Chapter-4 (Page-25), Exhibits-4.3 & 4.4].**

	TOR POINTS	REFERRAL IN EIA REPORT
xxiv)	Optimization of COC along with other water conservation measures in the project shall be specified.	Based on evaporation loss & blow down quantity the cycle of concentration ratio is about 4.0. Chemical dosing is required to prevent scaling & corrosion due to the operation of the CW system at this COC. **[Refer Section-4.9.1.8, Chapter-4 (Page-23)].**
xxv)	Plan for recirculation of ash pond water and its implementation shall be submitted.	**[Refer Sections-4.8 and 4.9, Chapter-4 (Pages-18-25)].**
xxvi)	Detailed plan for conducting monitoring of water quality regularly with proper maintenance of records shall be formulated. Detail of methodology and identification of monitoring points (between the plant and drainage in the direction of now of surface / ground water) shall be submitted. It shall be ensured that parameter to be monitored also include heavy metals.	The monitoring of surface water quality will be done once a month & sample should be analysed for physical, chemical & bacteriological parameter & also tested for presence of heavy metal & toxic constituents at a frequency of once in three months. **[Refer Section-10.5, Chapter-10 (Pages-161-163), Annexures-7A & 7B].**
xxvii)	Socio-economic study of the study area comprising of 10 km from the plant site shall he carried out by a reputed institute / agency which shall consist of detail assessment of the impact on livelihood of local communities.	The socio-economic characteristics of the study area has been sourced from District Census Handbook of 2011 of Paschim Medinipur District. **[Refer Section-5.7, Chapter-5 (Pages-84-88)].**
xxviii)	Action Plan for identification of local employable youth for training in skills, relevant to the project, for eventual employment in the project itself shall be formulated and numbers specified during construction & operation phases of the Project.	1500 persons will be required for construction works which will be sourced from adjoining villages. 150 persons will be required during operation, which will be selected from the workers working during construction phase. Accordingly 354 local youths, nominees of land giver families and those who are class 10, graduates, have undergone training, primarily in mechanical fitter trade with knowledge of welding, training & milling at ITI, Salboni as per module of D.G.E.T, Govt of India will certification of NCVT. **[Refer Section-7.10, Chapter-7 (Pages-111-112)].**
xxix)	If the area has tribal population it shall be ensured that the rights of tribals are well protected. The project proponent shall accordingly identify tribal issues under various provisions of the law of the land	Not Applicable
xxx)	A detailed CSR plan along with activities wise break up of financial commitment shall be prepared. CSR component shall be identified considering need based assessment study. Sustainable income generating measures which can help in upliftment of poor section of society, which is consistent with the traditional skills of the people shall be identified. Separate budget for community development activities and income generating programmes shall be specified.	CSR initiatives include healthcare, medical interventation, vocational skill development, clinic based consultation service, use of ongoing technology, environmental upgradation & sanitation, entrepreneurship development, promotion of education, other developmental works, development of sports activities etc. Detailed CSR plan with activities with break-up of financial commitment for the year 2016-2017 is enclosed as Annexure-9. **[Refer Section-7.9, Chapter-7 (Pages-102-111) and Annexure-9].**

	TOR POINTS	REFERRAL IN EIA REPORT
xxxi)	While formulating CSR schemes it shall be ensured that an in-built monitoring mechanism for the schemes identified are in place and mechanism for conducting annual social audit from the nearest government institute of repute in the region shall be prepared. The project proponent shall also provide Action Plan for the status of implementation of the scheme from time to time and dovetail the same with any Govt. scheme(s). CSR details done in the past should be clearly spelt out in case of expansion projects.	Beside own monitoring mechanism developed by CSR team JSW is in the process of developing a third party monitoring mechanism. Efforts will be made to incorporate local University Dept/ITI. All the CSR initiatives that are planned and designed & developed keeping in many ways to supplement/complement the existing Govt programmes/initiatives. Further, CSR programmes are designed in consideration with Block Officials & Panchayat members. CSR initiatives undertaken so far which shall be continued in next 3-5 years cycle. **[Refer Section-7.9, Chapter-7 (Pages-121-144].**
xxxii)	R&R plan, as applicable, shall be formulated wherein mechanism for protecting the rights and livelihood of the people in the region who are likely to be impacted, is taken into consideration. R&R plan shall be formulated after a detailed census of population based on socio economic surveys who were dependant on land falling in the project, as well as, population who were dependant on land not owned by them.	No land acquisition and R&R are involved as the project is situated within the land, already acquired for the Integrated Steel Plant project. However, JSW group of companies have an elaborate CSR plan. **[Refer Section-7.12, Chapter-7 (Page-143)].**
xxxiii)	Assessment of occupational health as endemic diseases of environmental origin shall be carried out and Action Plan to mitigate the same shall be prepared.	The JSWEBL operates an Occupational Health Centre, at its project site at Salboni & has served a total of 15153 patients upto 31 December, 2015. The OHC operates a pharmacy & medicine is dispensed free of cost. An ambulance is available round the clock to transfer patient to Medinipur Medical College & Hospital. **[Refer Section-7.11, Chapter-7 (Pages-141-143)].**
xxxiv)	Occupational health and safety measures for the workers including identification of work related health hazards shall be formulated. The company shall engage full time qualified doctors who are trained in occupational health. Health monitoring of the workers shall be conducted at periodic intervals and health records maintained. Awareness programme for workers due to likely adverse impact on their health due to working in non-conducive environment shall be carried out and precautionary measures like use of personal equipments etc. shall be provided. Review of impact of various health measures undertaken at intervals of two years shall be conducted with an excellent follow up plan of action wherever required.	JSWEBL has engaged one fulltime doctor, one part time doctor, one full time pharmacist, three full time paramedics and one full time in-charge. The number of patients found during the year 2013, 2014 & 2015 were 6224, 5852 & 3077 nos. A large number of workers engaged outdoor all day long in strenous activities during peak summer month at Salboni, were given ORS, twice a day. As the plant is located amidst dense vegetation, incidents of snake bite were rampant. To combat this, a basic training on initial management of snake bite has given by Dr Rajarshi Roy Chowdhury, MBBS, FAEM (accident & emergency). Dr Roychowdhury is also engaged in Labour emergency trauma care and a senior paramedic has also been appointed for it. **[Refer Section-7.11, Chapter-7 (Pages-141-143)].**
xxxv)	One complete season site specific meteorological and AAQ data (except monsoon season) as per MoEF Notification dated 16.11.2009 shall be collected and the dates of monitoring recorded. The parameters to be covered for AAQ shall include SPM, RSPM (PM 10,	Among four monitoring stations, AQ1 were placed in the upwind direction. The other three stations AQ2, AQ3 and AQ4 were selected near maximum pollutant deposition areas. The parameters monitored in the study area were PM_{10}, $PM_{2.5}$, SO_2, NO_X, O_3, Hg **[Refer Section-5.5, Chapter-5 (Pages-73-81), Annexure-7C].**

	TOR POINTS	REFERRAL IN EIA REPORT
xxxv)	(contd) PM2.5), SO2, NO, Hg and O3 (ground level). The location of the monitoring stations should be so decided so as to take into consideration the pre-dominant downwind direction, population zone, villages in the vicinity and sensitive receptors including reserved forests. There should be at least one monitoring station each in the upwind and in the pre-dominant downwind direction at a location where maximum ground level concentration is likely to occur.	
xxxvi)	A list of industries existing and proposed in the study area shall be furnished.	The list of existing & proposed industry are as follows : a) 1 x 660 MW Power Plant b) Proposed 3 MTPA Integrated Steel Plant c) 300 MW Captive Power Plant d) 2.4 MTPA Cement Plant e) Orissa Cement Ltd (4.0 km towards south) f) Salboni mint **[Refer Section-6.6.3, Chapter-6 (Pages-105-107)].**
xxxvii)	Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be well assessed. Details of the Model used and the input data used for modelling shall also be provided. The air quality contours should be plotted on a location map showing. the location of project site, habitation nearby, sensitive receptors, if any. The wind roses should also be shown on the location map as well.	Particulate matter will be the predominant pollutant during construction phase. Dust will also be generated as the soil is sandy in nature and from excavation, backfilling & hauling operations, alongwith transportational activities. Vehicular exhaust will raise in negligible rise of NO_X. During operation, the proposed project would be firing pulverised coal, its will lead to emission from coal combustion & coal firing, however dust suppression & dust extraction system, high efficiency ESP will be in operation. One single flue stack of 275 metres will also be in use for wider disposal of pollutants resulting lower ground level concentration. The Industrial Source Complex (ISC3) will be used for prediction of air quality. Data recorded on site during December, 2013-March, 2014 on wind speed, wind direction, solar radiation & temperatures will be used as meteorological input for calculating short term & long term concentration of the power plant. The stability class has been calculated as per Modified Bowen Method. **[Refer Section-6.6, Chapter-6 (Pages-104-111), Exhibits-5.2.3-5.2.6 and 6.6.1 & 6.6.2].**
xxxviii)	Radio activity and heavy metal contents of coal to be sourced shall be examined and submitted along with laboratory reports.	Radioactivity and heavy metal content of coal and fuel oil is presented in Section-4.5.2 & 4.5.3 and Annexure-4. **[Refer Section-4.5, Chapter-4 (Pages-14-17) and Annexure-4].**
xxxix)	Fuel analysis shall be provided. Details of auxillary fuel, if any, including its quantity, quality, storage etc should also be furnished.	Analyses of Heavy Fuel Oil (HFO) and Light Diesel Oil (LDO) is presented in **[Refer Section-4.5.3, Chapter-4 (Pages-15-16)]**

	TOR POINTS	REFERRAL IN EIA REPORT
xl)	Quantity of fuel required, its source and characteristics and documentary evidence to substantiate confirmed fuel linkage shall be furnished.	Imported coal is considered as main fuel from principally Indonesia and if the need arises, from Australia or South Africa. The coal grade from the prospective mines is expected to have calorific value of approximately 5030 Kcal/kg (Design coal). The Annual Coal requirement for the proposed 660 MW power plant at 85% PLF based on the Gross Plant Heat rate of 2265 kcal/kwh (as per CERC norms of design turbine Heat rate of 1850 Kcal/KwH and boiler efficiency of 87%) considering the imported coal of GCV, 5030 Kcal/kg would be 2.20 million TPA. The secondary fuel would be HFO as per IS:1593 and LDO conforming to IS:1460. LDO would be used for light up and initial warm up of units, and heavy fuel oil (HFO) during start-up and flame stabilization at low loads. During normal operation, the fuel oil requirement is expected to be about 13.46 m^3/day and annual requirement is estimated to be about 4914 m^3 at 85% PLF, considering CERC norms of 1 ml/kWhr. Fuel oil for the power plant would be made available from any of the public sector oil companies nearest to the plant location. **[Refer Section-4.5, Chapter-4 (Pages-14-17) and Annexure-5]**
xli)	Details of transportation of fuel from the source (including port handling) to the proposed plant and its impact on ambient AAQ shall be suitably assessed and submitted. If transportation entails a long distance it shall be ensured that rail transportation to the site shall be first assessed. Wagon loading at source shall preferably be through silo/ conveyor belt.	The imported coal would arrive at Haldia Port through the sea route. The Haldia Dock Complex is adequately equipped to handle this quantity of imported coal as would be evinced from the concurrent letter issued by the Deputy Chairman, Kolkata Port Trust **(Refer Annexure 3).** The coal would then be transported to the Salboni site through the Indian Railway System. The coal for the power plants will be received by train rakes at the Power Plant complex. The coal will be unloaded by wagon tippler and then conveyed and stored in the covered silos using circular stackers. The coal for the power plant will be reclaimed from this coal storage and conveyed to the bunkers at the Boiler. There shall be direct arrangement to feed coal to the boiler coal bunkers from the wagon tipplers. **[Refer Section-4.5.1, Chapter-4 (Pages-14)]**
xlii)	For proposals based on imported coal, inland transportation and port handling and rolling stocks /rail movement bottle necks shall be critically examined and details furnished.	The imported coal would arrive at Haldia Port through the sea route. The Haldia Dock Complex is adequately equipped to handle this quantity of imported coal as would be evinced from the concurrent letter issued by the Deputy Chairman, Kolkata Port Trust **(Refer Annexure 3)**. The coal would then be transported to the Salboni site through the Indian Railway System. The coal for the power plants will be received by train rakes at the Power Plant complex. The coal will be unloaded by wagon tippler and then conveyed and stored in the covered silos using circular stackers. The coal for the power plant will

	TOR POINTS	REFERRAL IN EIA REPORT
xlii)	(contd)	be reclaimed from this coal storage and conveyed to the bunkers at the Boiler. There shall be direct arrangement to feed coal to the boiler coal bunkers from the wagon tipplers. **[Refer Section-4.5.1, Chapter-4 (Pages-14) and Annexure-3]**
xliii)	Details regarding infrastructure facilities such as sanitation, fuel, restrooms, medical facilities, safety during construction phases etc to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase should be adequately catered for and details furnished.	Infrastructure facilities such as sanitation, bathing area, toilets, rest rooms, OHC facility & personal protective equipment will be provided by JSW and its contractors. Dedicated safety officer along with a team of safety supervisors will be employed to look after safety during construction. **[Refer Section-7.13, Chapter-7 (Page-144)]**
xliv)	EMP to mitigate the adverse impacts due to the project along with item – wise cost of its implementation in a time bound manner shall be specified.	The Environmental Management Plan consists of various interventions towards control of pollution during construction & operation stage, quality, environmental occupational health & safety policy, harnessing solar power, green belt development, rainwater harvesting, corporate social responsibility, infrastructural facilities & ash utilisation etc. **[Refer Chapter-7 (Pages-121-144)]**
xlv)	A Disaster Management Plan (DMP) along with risk assessment study including fire and explosion issues due to storage and use of fuel should be carried out. It should take into account the maximum inventory of storage at site at any point of time. The risk contours should be plotted on the plant layout map clearly showing which of the proposed activities would be affected in case of an accident taking place. Based on the same, proposed safeguard measures should be provided. Measures to guard against fire hazards should also be invariably provided.	The basic fuel for this project has been considered as coal. However, HFO & LDO will be required for boiler start-up & flame stabilisation purposes. The possible risk at plant area are pipelines rupture or leakage (continuous released and fuel storage / dyke fire (instantaneous release). Proper mitigative actions to prevent such damage would be taken. The project is proposed to have a well equipped fire fighting group with 4 officers, 50 workers trained in this field. Fire fighting equipments like fire tender, jeep, portable extinguishers lot, foam generator lot, static tanks lot will also be provided. **[Refer Chapters-8 & 9 (Pages-145-159)]**
xlvi)	The DMP so formulated shall include measures against likely Tsunami/ Cyclones/Storm Surges/Earthquakes etc, as applicable. It shall be ensured that DMP consists of both on-site and off-site plan, complete with details of containing likely disaster and shall specifically mention personnel identified for the task. Smaller version of the plan shall be prepared both in English and local languages.	The Disaster Management Plan will be taking into account the disaster caused due to natural calamities like flood, earthquake, cyclone, storm, cloud burst, lightning etc. **[Refer Chapter-9 (Pages-152-159)]**
xlvii)	Detailed plan for raising green belt of native species of appropriate width (50 to 100 m) and consisting of at least 3 tiers around plant boundary (except in areas not possible) with tree density of 2000 to 2500 trees per has with a good survival rate of about 80% shall be submitted. Photographic evidence must be created and submitted periodically including NRSA reports.	In the proposed plant, green belt will be developed in vacant areas, around office buildings, around stores, along the side of roads, along plant boundaries (at least 50 m wide) & around waste dump area. The species for green belt development will be selected in consultation with State Forest Department. The species suitable for planting in the area would be derived from CPCB in their publication “Guidelines for

	TOR POINTS	REFERRAL IN EIA REPORT
xlvii)	(contd)	Developing Greenbelt". Plant saplings will be planted in pits at about 2.0 metres to 30 mtrs in forests, so that the tree density is about 1500 trees per ha. **[Refer Section-7.7, Chapter-7 (Pages-98-102)]**
xlviii)	Over and above the green belt, as carbon sink, additional plantation shall be carried out in identified blocks of degraded forests, in close consultation with the District Forests Department. In pursuance to this the project proponent shall formulate time bound Action Plans along with financial allocation and shall submit status of implementation of the Ministry every six months.	Greenbelt is an important sink for air pollutant & it also absorb noise. In the proposed plant, green belt will be developed in vacant areas, around office buildings, around stores, along the side of roads, along the plant's boundaries (at least 50 m wide) and around the waste dump area. The species for green belt development will be selected in consultation with the State Forest Department. The species suitable for planting in the area would be derived from Central Pollution Control Board in their publication "Guidelines for Developing Greenbelts" (PROBES/75/1999-2000). Mainly pollution tolerant species will be planted along the road, around office buildings & around ash pond areas. Post plantation care will also be taken. **[Refer Section-7.7, Chapter-7 (Pages-128-132) and Annexure-8]**
xlix)	Corporate Environment Policy i) Does the company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA Report.	Corporate Environment Policy include quality policy, environment, occupational health & safety policy, standard operating process / procedure, the hierarchal system and reporting of non-compliance of Environmental norms. **[Refer Section-7.5, Chapter-7 (Pages-121-144), Annexure-9]**
	ii) Does the Environment Policy prescribed for standard operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms/ conditions? If so, it may be detailed in the EIA	
	iii) What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions. Details of this system may be given.	
	iv) Does the company has system of reporting of non compliances/violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large? This reporting mechanism should be detailed in the EIA Report.	
	All the above details should be adequately brought out in the EIA Report and in the presentation to the Committee.	
l)	Details of litigation pending or otherwise with respect to project in any court, tribunal etc shall invariably be furnished.	Nil

	TOR POINTS	REFERRAL IN EIA REPORT
4.	Besides the above, the following general points will be followed :	COMPLIED
	a) All documents to be properly referenced with index, page numbers and continuous page numbering.	
	b) Where data is presented in the report especially in table, the period in which the data was collected and the source should invariably be indicated.	
	c) Where the documents provided are in a language other than English, an English translation should be provided.	
	d) The Questionnaire for environmental appraisal of thermal power projects as devised earlier by the Ministry shall also be filled and submitted.	**Refer Annexure-13**
	e) The consultants involved in the preparation of EIA/EMP report after accreditation with Quality Council of India (QCI)/National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA/EMP report prepared by them and data provided by other organization/ Laboratories including their status of approvals etc. In this regard circular no. F. No. J-11013/77/2004-IA-II (1) dated 2nd December, 2009, as posted on the Ministry's website http://www.moef.nic.in may referred.	In accordance with the relevant office Memorandums of MoEF & CC, GoI, M/S JSW Energy (Bengal) limited (JSWEBL) is pleased to pledge its ownership and the correctness of the contents (factual information and data) contained in the EIA Report, to the best of our knowledge . It also states that M/S Ghosh, Bose & Associates (P) Ltd (GBPL), a duly accredited consultant of QCI/NABET were contracted to undertake the EIA study. There valid accreditation Certificate is enclosed vide **Appendix-1** In accordance with the relevant office Memorandums of MoEF & CC, GoI, M/S Ghosh, Bose & Associates (P) Ltd (GBPL) duly accredited consultants of QCI/NABET are pleased to state that, to the best of their knowledge the information and data submitted is factually correct and the compliance of all the points of the prescribed TOR of MoEF & CC vide letter no. J-13012/18/2013-IA. II(T) dated 07.01.2014 has been presented in tabular form vide **Annexure-2A.** GBPL are also pleased to state that the primary data generation has conducted through M/S Envirocheck, a NABL Accredited laboratory and that all relevant approved Functional Area Experts were involved in the study under the approved EIA Coordinator.
		GBPL confirms that all the data and documents related directly to the project itself have been provided by M/s. JSWEBL. **[Refer Sections-3.8 & 3.9, Chapter-3 (Page-10) and Appendix-I]**
	In addition to the above, information on the following may also be incorporated in the EIA Report.	

	TOR POINTS	REFERRAL IN EIA REPORT
	1. Is the project intended to have CDM-intent?	No, as the Kyoto Protocol is still being debated.
	i) If not, then why?	
	ii) If yes, then	
	a) Has PIN (Project Idea Note) for PCN (Project Concept Note) submitted to the NCA? (National CDM Authority) in the MoEF?	
	b) If not, then by when is that expected?	
	c) Has PDD (Project Design Document) been prepared?	
	d) What is the Carbon intensity? From your electricity generation projected (i.e. CO_2 Tons/MWH or Kg/KWH)	
	e) Amount of CO_2 in Tons/year expected to be reduced from the baseline data available on the CEA?s web site (www.cea.nic.in)	
	2. Notwithstanding 1(i) above, data on (d) & (e) above shall be worked out and reported.	
5.	The Environmental clearance shall be applied only after firm fuel and water linkages are obtained.	COMPLIED
6.	After preparing the Draft EIA (as per the generic structure prescribed in Appendix-III of the EIA Notification, 2005) covering the above mentioned issues, the same shall be submitted to the SPCB for conducting the public hearing as per procedure of EIA notification 2006. The issues emerged during public hearing shall be further incorporated in the Draft EIA/EMP report. The final EIA/EMP report along with public hearing report and the requisite documents (including written objections, if any) shall be submitted to the Ministry for appraisal by the Expert Appraisal Committee for consideration of awarding environmental clearance under the provisions of Environmental Impact Assessment Notification dated September 14, 2006.	COMPLIED
7.	The TORs prescribed shall be valid for a period of two years for submission of EIA/EMP reports, after public consultation.	NOTED

---------- Forwarded message ----------
From: <s.kerketta66@gov.in>
Date: Dec 17, 2016 16:57
Subject: Additional Information to PP
To: <purnendu.pandey@jsw.in>
Cc: <s.kerketta66@gov.in>, <monitoring-ec@nic.in>

Email alert to proponent, if any, Additional details are sought by concerned Member Secretary after consideration of proposal in EAC Meeting

A proposal for EC, as per the details given below has been examined by the Member Secretary

The said proposal has not been accepted on account of the Additional details sought as per the statement uploaded on the portal of Ministry. Please upload the Additionaldetails sought by Member Secretary.

1. Proposal No.	:	IA/WB/THE/19480/2013
2. File No.	:	J-13012/18/2013-IA.I(T)
3. Category of the Proposal	:	Thermal Projects
3. Name of the proposal	:	Proposed 1x660mw super- critical Power plant
4. Date of submission	:	22 Nov 2016
6. Details Sought	:	1. Point wise reply against each ToR condition is not available. Only Section no. and page no. is mentioned. A brief against each ToR condition may mentioned. 2. Page numbering may done for annexures appended to EIA. Same is to be mentioned in the Index also. 3. As per Ministry's OM dated 05.10.2011, Undertaking from Project Proponent for owning the contents may be submitted. 4. Validity of the Accreditation of the "Ghosh, Bose & Associates Pvt Ltd., Kolkata" is up to 17.11.2016. The certificate of extension may be furnished. 5. As per Ministry's OM dated 04.08.2009, a document in support of claim of being authorized signatory for the proposed project may be furnished. 6. As per Ministry's OM dated 04.08.2009, Undertaking from consultant that the prescribed ToR has been complied and the data submitted is factually correct. Name of the all experts associated with/involved in the preparation of EIA report along with functional area expert certificate from NABET may be

submitted. Name of the laboratory along with NABL Certificate and whether the laboratory is approved under E(P) Act may be mentioned. 9. Original reports of baseline data collected for one season by the laboratory may be annexed to EIA report. 10. As per ToR no.3(ii), Executive Summary is missing and may be submitted. 11. As per ToR no.3(v), approved site and ash pond location to be superimposed on toposheet and NRS satellite map with confirmed GPS readings may be submitted. 12. As per ToR no.3(vii), land requirement may be clearly indicated vis-à-vis CEA specifications. 13. As per ToR no.3(viii), land use as per revenue records may be clearly indicated which is proposed for TPP, Coal handling, pipeline laying and other facilities. 14. Legible copy of Exhibit 2.3 may be submitted. 15. No information available at page.2 regarding location of national parks, sanctuaries and other protected areas within 10 km radius of the project site. Authenticated map of CWLW may be furnished for the protected areas within 10km radius of the project, if any. 16. Detailed land use pattern for study area as well as project may be furnished specific to forest, agricultural, common property lands such as grazing, community land and water resources, 17. Quantity of ash generation and action plan for disposal as per MoEF&CC Notification may be submitted. 18. Hydro geological study carried may be furnished. 19. Rainwater harvesting plan may be furnished elaborately. How much area of the rooftop is planned and quantity of the water collected and its recharge/use may be clearly indicated. 20. Water balance diagram may be furnished along with ash pond water and action taken for zero discharge. 21. Water samples have taken only at 5 locations (3 for surface water and 2 for ground water) for the study area of 10km radius. AAQ monitoring was conducted only at 4 locations within 10 km radius. Noise monitoring conducted at 8 locations. The AAQ and Water samples collected are not representative of 10km radius. Detail scientific methodology and identification of monitoring/sampling locations may be furnished. 22. Protected forests are adjacent to plant site in the South, West, South East, North. Action plan for control of pollution and vis-à-vis impact on forest habitat and wildlife may be furnished. 23. All the baseline results may be clearly compared against relevant standards with comparative diagrams. 24. Iron in the both the ground water samples is 2.4 mg/l and 2.2 mg/l which is high against the Standard of 0.3 mg/l. Action plan and commitment as part of CSR to supply clean and safe drinking water to nearby villages may be submitted. Source of drinking water in the villages may be furnished. 25. Baseline of soil quality may be furnished which also specifically includes ash pond area. 26. Prediction of air quality modeling and incremental concentrations may be clearly explained. Hourly and daily incremental concentrations may be computed vis-à-vis baseline data. Isopleths showing incremental concentrations within 10km radius along with sensitive receptors may be furnished. 27. Public Hearing videography is not

submitted. 28. Queries raised in the Public Hearing are benefit to the locals, medical facilities, drinking water facilities, skill development activities, direct employment, education, improvement of infrastructure, recreational activites, employment to land losers, detailed compensation scheme to land losers, distribution date of Certificates of ITI & IPJC training, plantation program, extinction of high quality species of mushrooms due to deposition of flyash etc. Response/replies given by Project Proponent are qualitative with no commitment. Action plan along with timelines and financial commitment towards addressing the queries raised in PH may be furnished. When the ITI training certificates will be given should be clearly indicated. Action plan for how the mushroom species is protected from flyash may be drawn in consultation with local forest department. Detailed Compensation Scheme for land losers should be submitted. PP should clearly indicate how many permanent and temporary jobs will be given in which area.

7. Name of the Project proponent along with contact details

a) Name of the proponent	:	M/s. JSW Energy(Bengal) Limited.
b) State	:	West Bengal
c) District	:	Medinipur
d) Pincode	:	700091

ANNEXURE-2C

E-MAIL OF MoEF DATED DECEMBER 17, 2016.

	TOR POINTS	REFERRAL IN EIA REPORT
1.	Point wise reply against each ToR condition is not available. Only Section no. and page no. is mentioned. A brief against each ToR condition may be mentioned.	Refer Annexure-2A **Pages - 190 - 202**
2.	Page numbering may be done for annexures appended to EIA. Same is to be mentioned in the Index also.	Refer List of Annexures. **Page – x and Annexures 1-13 (Pages 174 to 277)**
3	As per Ministry's OM dated 05.10.2011, Undertaking from Project Proponent for owning the contents may be submitted.	Refer Annexure-2D : Undertaking by the Project Proponent, M/s. JSW Energy (Bengal) Ltd (JSWEBL) **Page - 210**
4	Validity of the Accreditation of the "Ghosh, Bose & Associates Pvt Ltd., Kolkata" is up to 17.11.2016. The certificate of extension may be furnished.	Refer Appendix-1 submitted. Vide Letter No. GBPL/B-496/357/2017 dated March 06, 2017, alongwith all supportive documents regarding accreditation.
5	As per Ministry's OM dated 04.08.2009, a document in support of claim of being authorized signatory for the proposed project may be furnished.	Refer Annexure-2E : Authorisation letter of Mr Biswadip Gupta, Director to Mr Aloke Bhattacharjee, Associate Vice President (Projects), JSWEBL as the signatory of the EIA Report of the project. **Page – 211**.
6	As per Ministry's OM dated 04.08.2009, Undertaking from consultant that the prescribed ToR has been complied and the data submitted is factually correct. Name of the all experts associated with/involved in the preparation of EIA report along with functional area expert certificate from NABET may be submitted. Name of the laboratory along with NABL Certificate and whether the laboratory is approved under E(P) Act may be mentioned.	Refer Appendix-1 submitted. Vide Letter No. GBPL/B-496/357/2017 dated March 06, 2017, alongwith all supportive documents regarding accreditation.
9	Original reports of baseline data collected for one season by the laboratory may be annexed to EIA report.	Refer Annexure-7. **Pages – 222-243** Hard copies of Baseline data on ground water quality, surface water quality, ambient air quality & ambient noise quality duly stamped & signed by Envirocheck & soil quality by Green C Laboratory Services.
10.	As per ToR no.3(ii), Executive Summary is missing and may be submitted.	Executive Summary will be submitted separately.
11	As per ToR no.3(v), approved site and ash pond location to be superimposed on toposheet and NRS satellite map with confirmed GPS readings may be submitted.	Procurement from NRSA, Hyderabad is under process.
12.	As per ToR no.3(vii), land requirement may be clearly indicated vis-à-vis CEA specifications.	The land break-up specified in Section-4.4 of Chapter-4 is well within the specification of CEA prescribed in their report on 'The Land Requirement of thermal Power Stations' of December, 2007. **[Refer Section-4.4, Chapter-4, (Page -13), Exhibit-4.1]**

	TOR POINTS	REFERRAL IN EIA REPORT
13.	As per ToR no.3(viii), land use as per revenue records may be clearly indicated which is proposed for TPP, Coal handling, pipeline laying and other facilities.	**Refer Section-5.3, Chapter-5, Exhibit-5.3.1 (Pages - 66 – 68)**
14.	Legible copy of Exhibit 2.3 may be submitted.	Enclosed.
15.	No information available at page.2 regarding location of national parks, sanctuaries and other protected areas within 10 km radius of the project site. Authenticated map of CWLW may be furnished for the protected areas within 10km radius of the project, if any.	**Refer Section-2.1 of Page - 2**. There is no National Park / Wildlife Sanctuary within 10 km radius of the project site.
16.	Detailed land use pattern for study area as well as project may be furnished specific to forest, agricultural, common property lands such as grazing, community land and water resources,	**Refer Section-5.3, Chapter-5, Exhibits-5.3.1, 5.3.2 & 5.3.3, (Pages - 66 – 68)** Present Landuse of the proposed site is 90% barren land & 10% agricultural land. The landuse in the study area comprises 19.47% forest land, 1.23% residential land, 1.95% scrubland and 77.35% is cultivated and barren land.
17.	Quantity of ash generation and action plan for disposal as per MoEF&CC Notification may be submitted	**Refer Section-4.7 and 4.8, Chapter-4 (Page-18-20).** 30 tons / hr of ash is being generated which implies a total of 0.264 MTPA of ash generation for its utilisation plan. **Refer Annexures-10A and 10B, (Pages 246-247)**.
18.	Hydro geological study carried may be furnished.	**Refer Section-5.1, Chapter-5 (Page – 27-56).** The aquifer occurs at different depths, the prominent ones are at 90 m and 120-165 m. Considering the vast area of the site about 0.5 mgd should be available on a sustainable basis.
19.	Rainwater harvesting plan may be furnished elaborately. How much area of the rooftop is planned and quantity of the water collected and its recharge/use may be clearly indicated.	About 50 acres of roof top area has been planned for collection of rainwater. 1.55 lakh litres of rainwater will be harvested annually and 10% of this will be available for surface storage & 10% will be for sub-surface recharge. **Refer Section-7.8, Chapter-7 (Page – 132)**
20.	Water balance diagram may be furnished along with ash pond water and action taken for zero discharge	Refer **Sections-4.3, Chapter-4, (Page - 20-25), Exhibits-4.3 & 4.4** From the Guard pond, the water is being led to ash handling system, CHP dust suppression, etc resulting in 'Zero Discharge' .
21.	Water samples have taken only at 5 locations (3 for surface water and 2 for ground water) for the study area of 10km radius. AAQ monitoring was conducted only at 4 locations within 10 km radius. Noise monitoring conducted at 8 locations. The AAQ and Water samples collected are not representative of 10km radius. Detail scientific methodology and identification of monitoring/sampling locations may be furnished.	The plant is designed on 'Zero discharge concept'. Since there is no recipient sink for plant discharge, the surface water quality monitoring stations were selected on open water systems (rivers / streams) and closed water systems (ponds). Thus SW1 was located on a pond near the project site and SW2 and SW3 on the Tamal river and Parang river, respectively in proximity to the plant site. Groundwater monitoring stations GW1 and GW2 were located around ash pond site & around plant site as groundwater is most likely to be affected due to the ash pond leachate phenomena.

	TOR POINTS	REFERRAL IN EIA REPORT
		GW1 and GW2 are tubewells located at villages, Chandan Kath and Balibasha respectively. **[Refer Section-5.4.1, Chapter-5 (Pages - 69)]** AQ1 was set up north of the project site in upwind as referral station, the other three stations AQ2, AQ3 & AQ4 were set up within 4-6 km from the plant site in the west, west-south-west & south-west direction in the prevalent down wind direction to represent maximum deposition of air pollutants [**Refer Section-5.5.1, Chapter-5. (Pages - 73)]** 8 ambient noise monitoring stations were selected to cover all 4 landuse zones. N1 represents industrial area, N2 commercial zone, N3 & N4 silence zones & remaining 4 stations at residential areas (Refer Section-5.9.1, Page No. 93).
22	Protected forests are adjacent to plant site in the South, West, South East, North. Action plan for control of pollution and vis-à-vis impact on forest habitat and wildlife may be furnished.	**Refer Section-6.7.2, Chapter-6 (Pages - 112-114)** The maximum resultant short-term 24 hourly concentration for SO_2 & NO_X occurs on the Forests located to the west of the plant site. These values are much lower than the prescribed ambient air quality standards for these 2 pollutants to cause any adverse impacts on the terrestrial flora & fauna. The concentration on the other forests would be even lower.
23	All the baseline results may be clearly compared against relevant standards with comparative diagrams.	**Refer Section-5.4, Chapter-5 (Pages - 69-70)** **Refer Section-5.5, Chapter-5 (Pages - 73-75) and Exhibit-5.5.1** **Refer Section-5.9, Chapter-5 (Pages - 93-94) and Exhibit 5.9.1**
24	Iron in the both the ground water samples is 2.4 mg/l and 2.2 mg/l which is high against the Standard of 0.3 mg/l. Action plan and commitment as part of CSR to supply clean and safe drinking water to nearby villages may be submitted. Source of drinking water in the villages may be furnished.	As a part of CSR commitment, JSW had installed about 10 hand pumps in 10 different villages around the plant site within the study area for collecting water from deep aquifer. Water samples have been collected randomly from 2 tubewells & tested for iron content & results showed that the iron content are within the range **(Refer Annexure-7B)**. The sources of the drinking water in the villages is underground water through open well, hand pumps & deep tubewells. **Pages 70 and 225-226**
25	Baseline of soil quality may be furnished which also specifically includes ash pond area.	**Refer Section-5.6, Chapter-5, Table-5.6.1. (Pages-82-83), Annexure-7D (Pages 239-241)** Soil Quality monitoring stations S1 & S2 were located in the ash dyke, mainly to assess, the effect of leachate release from the ash pond & its effect on soil quality and station S3 is located within the plant area. The pH of the soil samples at S1, S2 and S3 are 6.09, 5.9 & 6.3 respectively. The electrical conductivity of the soil samples at S1, S2 and S3 are 1900 µmhos/cm, 2100 µmhos/cm and 2700 µmhos/cm respectively. The moisture content of the soil samples at S1, S2 and S3 are 2.9%,

	TOR POINTS	REFERRAL IN EIA REPORT
		3.1% and 4.1% respectively. The organic carbon content at S1, S2 and S3 are 0.47%, 0.54% and 0.59% respectively. The organic matter content of the soil samples at S1, S2 and S3 are 0.81%, 0.93% and 1.02% respectively. The hard copies of the baseline data on soil quality, duly stamped & signed by Green C Laboratory Services is presented in Annexure-7D.
26	Prediction of air quality modeling and incremental concentrations may be clearly explained. Hourly and daily incremental concentrations may be computed vis-à-vis baseline data. Isopleths showing incremental concentrations within 10km radius along with sensitive receptors may be furnished.	**Refer Section-5.6, Chapter-5, (Pages - 104-111), Exhibits-6.6.1 & 6.6.2.** The maximum short-term incremental concentration due to power plant works out to 14.12 & 8.43 $\mu g/cum^3$ for SO_2 & NO_X respectively resulting in over all resultant concentrations of 51.08 & 47.61 $\mu g/m^3$ for SO_2 and NO_X after addition to the present day background levels & accounting for the proposed 3.0 MTPA Integrated Steel Plant, 300 MW Captive Power Plant & the OCL Cement Plant. It may also be noted that the modelling results depict the worst case scenario as it has been assumed that the entire sulphur has been converted into sulphur dioxide, washout due to rain has not been considered and deposition on other forms of structures as buildings, trees, etc have not been taken into account. Thus, in actuality, these pollutant concentrations are expected to be relatively lower than the predicted values.
27	Public Hearing videography is not submitted.	Attached.
28	Queries raised in the Public Hearing are benefit to the locals, medical facilities, drinking water facilities, skill development activities, direct employment, education, improvement of infrastructure, recreational activities, employment to land losers, detailed compensation scheme to land losers, distribution date of Certificates of ITI & IPJC training, plantation program, extinction of high quality species of mushrooms due to deposition of flyash etc. Response/replies given by Project Proponent are qualitative with no commitment. Action plan along with timelines and financial commitment towards addressing the queries raised in PH may be furnished. When the ITI training certificates will be given should be clearly indicated. Action plan for how the mushroom species is protected from flyash may be drawn in consultation with local forest department. Detailed Compensation Scheme for land losers should be submitted. PP should clearly indicate how many permanent and temporary jobs will be given in which area.	**Refer Chapter-11 (Pages - 167-173)** : Public Hearing proceedings & response to queries raised in public hearing) It is clearly stated that the certificates from ITI, Salboni is expected to be received by July, 2017. Scanned copy of the letter received from ITI, Salboni in this regard is enclosed in Annexure-12 **(Page-255).** Land givers will be provided jobs & compensation will be provided to the land losers on behalf of JSW as decided by the Government of West Bengal. In the context of protecting the mushroom species, it is noted that the maximum incremental concentration of SPM would be only 0.8 $\mu g/m^3$ due to the particulate emission from the power plant at a distance of about 4 kms from the stack in the downwind direction i.e. primarily west south-west side of the plant site. This is due to particulate emissions in controlled to 100 mg/Nm^3 & wide dispersal through 275 m tall stack. This negligible concentration will not cause any adverse impact on terrestrial fauna & mushrooms. **Refer Section-7.10, Chapter-7 (Pages - 140-141)**

ANNEXURE-2D

JSW Energy (Bengal) Limited
Godrej Water Side, Tower-1, 10th Floor
Unit No.: 1003, Plot DP – 5, Sector – V
Salt Lake City, Kolkata – 700 091
Phone : 033 – 4000 2020
Fax : 033 – 4000 2021
Website : www.jsw.in
CIN No. : U40300MH2010PLC199844

02/01/2017

The Member Secretary
Ministry of Environment, Forests and Climate Change
Government of India
Indira Paryavaran Bhawan
Jor Bagh Road, Jorbagh
New Delhi 110003.

Subject: **EIA Study of proposed 1x660 MW Supercritical Thermal Power Plant at Salboni, West Medinipur District, West Bengal.**
Point No: 3 of the Additional details Sought by Member Secretary - Undertaking by the Project Proponent, M/s JSW Energy (Bengal) Ltd.

Dear Sir,

In accordance with the relevant office Memorandums of MoEF & CC, GOI, M/s JSW Energy (Bengal) Limited (JSWEBL) is pleased to pledge its ownership and the correctness of the contents (factual information and data) contained in the EIA Report, to the best of our knowledge.
It also states that M/s Ghosh, Bose & Associates (P) Ltd (GBPL), a duly Accredited Consultant of QCI/NABET were contracted to undertake the EIA Study.

Thanking You,

Yours Faithfully,
For JSW Energy (Bengal) Ltd.

Aloke Bhattacharjee
(Associate Vice President – Projects)

210

Energy (Bengal) Limited
Godrej Water Side, Tower-1, 10th Floor
Unit No.: 1003, Plot DP – 5, Sector – V
Salt Lake City, Kolkata – 700 091
Phone : 033 – 4000 2020
Fax : 033 – 4000 2021
Website : www.jsw.in
CIN No. : U40300MH2010PLC199844

02/01/2017

The Member Secretary
Ministry of Environment, Forests and Climate Change
Government of India
Indira Paryavaran Bhawan
Jor Bagh Road, Jorbagh
New Delhi 110003.

Subject: **EIA Study of proposed 1x660 MW supercritical Thermal Power Plant at Salboni, West Medinipur District, West Bengal.**
Point No: 5 of the Additional details Sought by Member Secretary – Authorisation Letter of being the Authorised signatory of the Proposed Project.

Dear Sir,

I, Biswadip Gupta, Director, do hereby authorise Mr. Aloke Bhattacharjee, Associate Vice President - Projects, whose signature is attested below to sign and certify all documents in connection with the above subject on behalf of M/s JSW Energy (Bengal) Limited (JSWEBL).

Thanking You,
Yours Faithfully,
For JSW Energy (Bengal) Ltd.

Biswadip Gupta
Director

Specimen Signature of Mr Aloke Bhattacharjee
Attested

Signature: Shri Biswadip Gupta

ANNEXURE-3

एस. बालाजी अरुणकुमार, आई.आर.टी.एस
उपाध्यक्ष
S. BALAJI ARUNKUMAR, IRTS
Deputy Chairman

कोलकाता पत्तन न्यास
15, स्ट्रांड रोड
कोलकाता-700 001
दूरभाष :033-2230-9164 (दफ्तर)
फैक्स :033-2230-4901
ई-मेल :dychairman@kopt.in

Kolkata Port Trust
15, Strand Road
Kolkata-700 001
Phone : 033-2230-9164 (Office)
Fax : 033-2230-4901
E-mail : dychairman@kopt.in

No : Ad/0038/JSW Energy/1316

May 20, 2016

To
Shri Alok Bhattacharjee,
Associate Vice President,
JSW Energy (Bengal) Ltd.,
Godrej Water Side, Tower-1,
10th Floor, Unit No. 1003,
Sector-V,
Kolakta-700 091

Sub : Cargo handling capacity of imported thermal coal at Haldia Dock Complex for proposed Thermal Power Plant at Salboni, West Bengal.

Dear Sir,

This has reference to your letter dated 09.05.2016 on the above subject. We are happy to note that JSW Energy (Bengal) Ltd. have decided to set up Thermal Power Plant at Salboni, West Bengal and are intending to import coal through Haldia Dock Complex.

This is to confirm that Haldia Dock Complex has adequate capacity to handle about 2.2 million tonnes of coal proposed to be imported by JSW Energy (Bengal) Ltd. from 2021-22 onwards. It may also be informed to you that KoPT has already initiated action for setting up of additional cargo handling terminals at Haldia Dock Complex including mechanization / equipping of its existing terminals for increasing its capacity for handling additional volume of coal in particular. Moreover, with a view to address the draft constraints, we have also introduced transloading facilities by which you may be able to bring coal in fully laden vessels which after transshipment will come to Haldia by daughter vessels at available Haldia draft.

The railway handling facilities of Haldia Dock Complex is one of the best in east coast and the existing capacity is also being upgraded. The port also allots land inside the dock area to the importers for storage of cargo and

the storage areas are connected by railway sidings for easy and efficient evacuation of dry bulk cargo like coal.

We would also like to assure you that Haldia Dock Complex , Kolkata Port Trust would render all possible assistance to JSW in importing coal and addressing other logistics issues for making the proposed Thermal Power Project a successful venture.

Yours sincerely,

20/05

(S. Balaji Arunkumar)
Deputy Chairman
Kolkata Port Trust

Annexure-4

दूरभाष / Tel. : 022 - 2559 2605 (कार्या./Off.)
022 - 2550 6270 (वैक/Lab)
Grams: BARC-MUMBAI, CHEMBUR
तार : बार्क - मुंबई, चेंबुर
फैक्स / Fax : 91-22-2550 5151
91-22-2505 0313

B.R. / BR NO. : M 142 14139

ट्रॉम्बे, मुंबई - 400 085.
TROMBAY,
Mumbai - 400 085.

भारत सरकार / GOVERNMENT OF INDIA
भाभा परमाणु अनुसंधान केंद्र / BHABHA ATOMIC RESEARCH CENTRE
स्वास्थ्य भौतिकी प्रभाग / HEALTH PHYSICS DIVISION

विकिरणसक्रियता परीक्षण प्रमाणपत्र / RADIOACTIVITY TEST CERTIFICATE

Dr. P. M. Ravi
Head, ESS

Ref.: BARC: HPD: LLCL: D: 07-08: C-01-02:2016 / 493 April 13, 2016

This is regarding two samples of Coal received from Indonesia, sent for analysis vide your letter Ref. No. JSWEBL/Imported Coal/BARC/19022016 dated 19.02.2016.

The samples were analysed for Uranium-238, Radium-226, Thorium-232, Potassium-40, Cesium-137 activities. The results of the analysis were given below:

S. No.	Sample Code.	Sample Name.	Activity (Bq/kg)				
			^{238}U	^{226}Ra	^{232}Th	^{40}K	^{137}Cs
1.	D - 07_2016	Coal Sample-A	8.0 ± 0.8	8.6 ± 0.8	9.1 ± 0.9	32.5 ± 2.1	≤ 0.2
2.	D - 08_2016	Coal Sample-B	12.6 ± 1.0	11.1 ± 0.9	6.5 ± 0.8	25.6 ± 2.0	≤ 0.2

(P M Ravi)

JSW Energy (Bengal) Limited.
Godrej Water Side, Tower-1, 10th Floor,
Unit No.:1003, Plot DP – 5, Sector – V,
Salt Lake City, Kolkata – 700 091.

PT. IOL Indonesia
Menara Bidakara 2, 11th Floor
Jl. Jend. Gatot Subroto Kav. 71-73
Jakarta 12870, Indonesia
Tel : +62 21 2906 9411 (Hunting)
Fax : +62 21 2906 9412
www.inspectorate.com/indonesia

INSPECTORATE

Certificate No : IDPLAJ16000015.2 Date : February 2, 2016

CERTIFICATE OF SAMPLING AND ANALYSIS

Name of Vessel	: MV. SECRET
Shipper	: PT. BARA ALAM UTAMA JL. PEGANGSAAN BARAT, NO. 18A, MENTENG, JAKARTA 10320 INDONESIA
Port of Loading	: MUARA BANYUASIN ANCHORAGE, SOUTH SUMATRA, INDONESIA
Port of Discharge	: ANY PORT(S) IN INDIA
Description of Goods	: STEAM COAL IN BULK
Quantity	: 28,100 MT
BL Date	: JANUARY 27, 2016

THIS IS TO CERTIFY that we have performed the inspection, sampling and analysis of the coal consignment nominated above. Samples were taken in accordance with ASTM D2234/D2234M-07 during loading and analyzed as per ASTM standard methods.

The following results were obtained :

Parameter	Results	
Total Moisture (As Received Basis)	27.85	Pct
Inherent Moisture (Air Dried Basis)	14.35	Pct
Ash (Air Dried Basis)	5.14	Pct
Volatile Matter (Air Dried Basis)	40.75	Pct
Fixed Carbon (Air Dried Basis)	39.76	Pct By Difference
Total Sulphur (Air Dried Basis)	0.20	Pct
Gross Calorific Value (As Received Basis)	5030	Kcal/Kg
Hard Grove Index	55	
Size Crushed (0 x 50 mm)	91.02	% wt
Size Above 75 mm	0.00	% wt
Size Less than 2 mm	10.22	% wt

Remarks:This Certificate was issued to cover a lot of 28,100 MT being a part of 55,600 MT of cargo loaded

Issued By,
PT. IOL Indonesia at The Loading Port

Fejar Sidiq
Technical Support Manager

JKT 02021

HBBS 1509

An ISO 9001:2008 Certified Company

Min Mec R&D Laboratory

(A DIVISION OF MIN MEC CONSULTANCY PVT. LTD.)

A-121, Panyavaran Complex,IGNOU Road, New Delhi – 110 030
Phone :26534777, 26532236, 26535891; Fax : 91-11-26532566
Email : lab.minmec@gmail.com ; Visit us at: http://www.minmec.co.in

Recognised by MOEF &CC(Sl.No.97 of S.O.1150(E) dated 22/05/2012)

TEST REPORT

NAME AND ADDRESS OF CUSTOMER	SAMPLE PARTICULARS		
JSW Energy Bengal Ltd. Godrej Waterside, 10th Floor, Tower 1, Unit No. 1003, Plot-DP5 Sector V, Salt Lake City, Kolkata-700091 Contact Person: Purnendu Pandey Phone:033-40002020	Type of Sample	:	Coal
	Work Order No.	:	4900000010
	Sampling Location	:	Imported Coal From Indonesia.
	Sampling Procedure	:	-
	Sample Volume/Quantity	:	1 kg
	Sampling Team	:	By Client
	Sample Reg. No.	:	MMC/02-16/2.1-2.2
	Date of Sampling	:	18/02/2016
	Date of Receipt	:	23/02/2016
	Date of Testing	:	26/02/2016 to 03/03/2016
	Date of Report	:	03/03/2016
	Test Report No.	:	MMC/03-16/02
	Page	:	1 of 1

Sl. No.	Parameter	Unit	Protoool	Sample (A)	Sample (B)
1	Arsenic (as As)	mg/kg	USEPA METHOD 200.7	0.27	0.05
2	Mercury (as Hg)	mg/kg	USEPA METHOD 200.7	BDL	BDL
3	Cadmium (as Cd)	mg/kg	USEPA METHOD 200.7	0.01	BDL
4	Cobalt (as Co)	mg/kg	USEPA METHOD 200.7	0.51	0.42
5	Chromium (as Cr)	mg/kg	USEPA METHOD 200.7	0.59	0.39
6	Zinc (as Zn)	mg/kg	USEPA METHOD 200.7	40.52	44.46
7	Nickel (as Ni)	mg/kg	USEPA METHOD 200.7	0.24	0.21
8	Lead (as Pb)	mg/kg	USEPA METHOD 200.7	1.12	0.62

Note: BDLof Hg=0.01 ; Cd=0.05 mg/l

Checked by

Rashmi Gupta
Authorised Signatory

- end of report -

NOTES :

- *The results indicated only refer to the tested samples and listed parameters and do not endorse any product*
- *Total liability of the laboratory is limited to the invoice amount*
- *This certificate shall not be reproduced wholly or in part without prior written consent of the laboratory*
- *Unused balance of samples received shall be destroyed after one month from the date of issue of test report, unless other wise specified*
- *This report shall not be used in any advertising media or as evidence in the court of law without prior written consent of the laboratory*

ANNEXURE - 5

Equentia Natural Resources Pte Ltd

To,
JSW Bengal Steel Limited
Godrej Waterside, Tower-1,
10th Floor, Sector- V, Salt lake,
Kolkata- 700091

Subject- **Letter of Assurance**.
Date: 09th October 2015

Dear Sir,

In consideration of your request for **Letter of Assurance** requiring **3.20 MTPA** imported steam coal with GCV (ARB) of minimum 5000 Kcal/kg for JSW Bengal Steel Ltd (JSW BSL) proposed power plant of 1x300MW and 1x660 MW capacity at Salboni in West Medinipur district, West Bengal, from Indonesia / South Africa/ Australia/ other countries through Haldia (W.B) / Paradip (Odisha) Port is hereby provisionally assured on following terms and conditions -

1. Scope of Assurance-

1.1 Quantity, Grade and Source of Coal-
Subjected to satisfactory commissioning of the plant and signing of the Fuel Supply Agreement (FSA) within three (3) months thereafter, we shall endeavour to supply steam coal, as per the requirement of the Plant, **3.2 MTPA** of 5000 GCV (Min) steam coal to the JSW BSL, which shall be subjected to review and assessment of the actual coal requirement of JSW BSL by us, as well as the availability of coal from Indonesia or Australia or South Africa at Haldia or Paradip port. The sulphur content shall be restricted to 0.8 % (Max) and ash content to 12 % (Max.)
Source of coal shall be mainly from Indonesia, but if it is not available for any reason, than coal of same specification will be supplied, as received from other countries.

1.2 Price of Coal
The price of coal shall be charged at landed cost at Haldia or Paradip Port (as applicable) plus service charge. Applicable taxes and statutory levies shall be borne by JSW BSL

1.3 Change of law
In the event of an enactment, promulgation, amendment or repeal of the statute, policy, decree, notice, rule or direction by any government instrumentality that would have an impact on the coal supply terms assured hereof, we shall be free to amend or repeal this LOA without any liability or damages, whatsoever, payable to JSW BSL.

20 Peck Seah Street, #05-00 Singapore 079312
Tel: (65) 6225 2822 Fax: (65) 6227 9030
Company no: 201002330W

Equentia Natural Resources Pte Ltd

1.4 Force- Majeure affecting the Assurer

In the event that imports of coal is reasonably withheld owing to such factors as global shortage or a Force- Majeure event affecting the source of the imported coal or logistic bottlenecks faced in transportation and unloading; which are not within the control of and not caused by the negligence or fault of ours. We shall be free to amend or repeal this LOA without any liabilities or damages, whatsoever, payable to JSW BSL.

2. Validity of LOA

The LOA shall remain valid for a period of thirty-six (36) months from the date of issue of this LOA unless a formal request for extension is submitted three months prior to the LOA expire date.

3. Assignment of the LOA

JSW BSL shall not without the express prior written to us, assign to any third person the LOA, or any right, benefit, obligation or interest therein or thereunder. JSW BSL may transfer the LOA to any of the company of JSW Group, and in that case we shall have no objection.

4. End-use of coal

The total quantity of coal assured pursuant to this LOA is for use at the said Plant, and JSW BSL shall not re-sell or trade the coal assured hereof to any third party. If in the reasonable opinion of us, JSW BSL has entered into an agreement for such resale or trade upon commencement of coal supplies at any time during the validity of this LOA, the Assurer shall cancel/ withdraw this LOA without any liabilities or damages, whatsoever, payable to JSW BSL.

EQUENTIA NATURAL RESOURCES SINGAPORE

Director
Rajiv Ramnarayan

20 Peck Seah Street, #05-00 Singapore 079312
Tel: (65) 6225 2822 Fax: (65) 6227 9030
Company no: 201002330W

Government of West Bengal
Irrigation & Waterways Department
Jalasampad Bhavan, 1st Floor, Western Block
Bidhannagar, Salt Lake City, Kolkata 700091

No. 1484 - SIW
I-4M-20/2011

Dated, Kolkata, the 12th December, 2011

From: Shri A.K Chatterjee
Secretary

To: Shri Biswadip Gupta
JMD & CEO
JSW Bengal Steel Limited
Tower-A, 3rd Floor, DLF IT Park
08, Major Arterial Road, Block-AF
New Town, Kolkata 700 156

Sub: Allocation of 82 cusec (approx. 45 MGD) of Water from River Rupnarayan and permission for drawal of surface water of Rupnarayan at Chhatinda, P.S.Panskura, Dist.-Purba Medinipur in favour of JSW Bengal Steel Limited for the purpose of setting up of their 3 MTPA Integrated Steel Plant at Salboni, District Paschim Medinipur.

Ref: Your letter no. NIL dated, 1st November 2011 addressed to this Department.

Dear Sir,

Apropos above, I am to state that in- principle concurrence of the 'Inter-Departmental Secretary Level- Committee' on water allocation has already been communicated to you vide this Departments' No.588-SIW dated 8th July 2011.

In continuation to above, I am to hereby say that the Irrigation & Waterways Department, Government of West Bengal being the appropriate Department regarding allocation of such surface water from River Rupnarayan hereby accords permission in your favour for drawal of 82 cusecs (approx. 45 Million Gallon per Day) of raw water from River Rupnarayan at Chhatinda point in P.S.-Panskura, Dist.-Purba Medinipur for the purpose of setting up of a 3 MTPA Integrated Steel Plant at Salboni, District Paschim Medinipur.

You may now initiate necessary actions for development of infrastructure required for drawal of water at intake point, and setting up of transmission lines for carrying the same to your proposed Steel plant site after necessary interaction with the concerned authorities and offices.

1

The initial allocation is made for 60(Sixty) months from the date of issue of this letter. The allocation is being made on making payment of water rates @Rs.5.20 (Rupees Five and paisa twenty) only per one thousand Gallon drawal of raw surface water at intake point from the date of commencement of actual drawal.

You are requested to execute a '***Water Supply Agreement***' with the Irrigation & Waterways Department, Government of West Bengal, well ahead of the expiry of the 60(Sixty) months allocation period prior to commencing of actual drawal of water.

You shall however keep the Department informed of the progresses made in regard to construction of intake structures/transmission pipelines etc. once in every 6(six) month.

The allocation will remain valid even after expiry of the initial period of 60 (Sixty) months provided the Irrigation & Waterways Department is satisfied regarding the progresses made by JSW Bengal Steel Limited towards building of necessary infrastructure for drawal of water as well as setting up of the proposed Integrated Steel Plant. However the water rates and related terms and conditions will be reviewed by the Government in the Irrigation & Waterways Department or the appropriate Government in the State of West Bengal after the initial period of 60 (Sixty) months in congruity with the conditions and policies of the State Government prevalent at that time.

Yours faithfully,

(A.K.Chatterjee)
Secretary

No.1484 -1(2)/SIW

Dated, Kolkata, the 12th December, 2011

Copy forwarded for information to the:-

1. PS to Minister- in-Charge, Irrigation & Waterways Department, Govt. of W.B, Jalasampad - Bhavan, Kolkata-700 091.
2. PS to Minister- in-Charge, Commerce & Industries Department, Govt. of West Bengal, Writers' Buildings, Kolkata-7000 01.

(A.K.Chatterjee)
Secretary

No. 1484-2(6)/SIW Dated, Kolkata, the 12th December, 2011

Copy forwarded for information to the:-

1. Additional Chief Secretary, Commerce & Industries Department, Government of West Bengal, 4 Camac Street, Kolkata- 7000 16.

2. Managing Director, West Bengal Industrial Development Corporation Limited 'Protiti', 23 Camac Street, Kolkata 700 017

3. Chief Engineer-I, Irrigation & Waterways Directorate, Government of West Bengal, Jalasampad Bhavan, Kolkata- 700 091.

4. Chief Engineer-II, Irrigation & Waterways Directorate, Government of West Bengal Jalasampad Bhavan, Kolkata-700 091.

5. Chief Engineer (Design & Research), Irrigation & Waterways Directorate, Government of West Bengal, Jalasampad Bhavan, Kolkata-700 091.

6. District Magistrate & Collector, Purba Medinipur.

7. District Magistrate & Collector, Paschim Medinipur.

(A.K.Chatterjee)
Secretary

ENVIROCHECK
House of Environmental Pollution Monitoring and Analysis
H.O. : 63/B, Rastraguru Avenue, Kolkata - 700028
Laboratory : 189 & 190 Rastraguru Avenue, Kolkata - 700028

Phone : 2579-2889/2891/2549-7490/6459-1174
Fax : 2529-9141
E-mail : envcheck@cal2.vsnl.net.in
Website : www.envirocheck.org

GROUND WATER ANALYSIS REPORT

JSW ENERGY (BENGAL) LIMITED
SALBONI, WEST BENGAL

MONITORED BY :
Envirocheck
189, Rastraguru Avenue,
Calcutta - 700 028

ASSIGNED BY :
Ghosh Bose & Associates Pvt. Ltd.
8, Harrington Mansion
8, Ho Chi Minn Sarani, Kol - 71

LOCATION OF SAMPLING :
GW1 : Tubewell - Chondonkath (150 ft)
GW2 : Tubewell - Balibhasha (260 ft)

Date of sampling : 19.02.2014

No.	Parameters	GW1	GW2
1	Colour (Hazen)	1	1
2	Temperature (^{0}C)	14.5	16
3	Turbidity (NTU)	5.2	5.6
4	Total Dissolved Solid (mg/l)	175	53
5	pH	5.96	5.16
6	Alkalinity (mg/l)	54.6	21
7	Total Hardness (mg/l)	48	24
8	Residual Chlorine (mg/l)	<0.01	<0.01
9	Nitrate (mg/l)	2.8	1.2
10	Fluoride (mg/l)	<0.02	<0.02
11	Phenol (mg/l)	<0.001	<0.001
12	Total Nitrogen (mg/l)	4.12	2.32
13	Boron (mg/l)	<0.1	<0.1
14	Chloride (mg/l)	37.82	9.0
15	Sulphate (mg/l)	11.25	<0.1
16	Cyanide (mg/l)	<0.05	<0.05
17	Calcium (mg/l)	11.22	6.41

contd. Sheet. 2 of 2

222

No.	Parameters	GW1	GW2
18	Magnesium (mg/l)	4.8	1.92
19	Manganese (mg/l)	<0.03	<0.03
20	Zinc (mg/l)	0.15	0.29
21	Aluminium (mg/l)	<0.006	<0.006
22	Iron (mg/L)	2.44	2.2
23	Chromium (VI) (mg/l)	<0.01	<0.01
24	Copper (mg/l)	<0.05	<0.05
25	Mercury (mg/l)	<0.0001	<0.0001
26	Cadmium (mg/l)	<0.01	<0.01
27	Sodium (mg/l)	26.5	8.5
28	Arsenic (mg/l)	<0.01	<0.01
29	Lead (mg/l)	<0.03	<0.03
30	Total Coliform / 100 ml.	<1, <10,<100	<1, <10,<100
31	Fecal Coliform /100 ml.	<1, <10,<100	<1, <10,<100

<1 indicate No Colony developed in 1 ml. Sample.; <10 indicate No Colony developed in 0.1 ml. Sample.
<100 indicate No Colony developed in 0.01 ml. Sample.

Compiled by : (Signature)

Name : Dr. AJOY PAUL

For ENVIROCHECK
Date of Issue : 02.04.2014
Place : Calcutta

Certified by : (Signature)

Name : DR. SUMIT CHOWDHURY

Seal :

223

ENVIROCHECK
House of Environmental Pollution Monitoring and Analysis
H.O. : 63/B, Rastraguru Avenue, Kolkata - 700028
Laboratory : 189 & 190 Rastraguru Avenue, Kolkata - 700028

Phone : 2579-2889/2891/2549-7490/6459-1174
Fax : 2529-9141
E-mail : envcheck@cal2.vsnl.net.in
Website : www.envirocheck.org

SURFACE WATER ANALYSIS REPORT
JSW ENERGY (BENGAL) LIMITED
SALBONI, WEST BENGAL

MONITORED BY :
Envirocheck
189, Rastraguru Avenue,
Calcutta - 700 028

ASSIGNED BY :
Ghosh Bose & Associates Pvt. Ltd.
8, Harrington Mansion
8, Ho Chi Minn Sarani, Kolkata - 700071

LOCATION OF SAMPLING :
SW1 : Pond - JSW project site
SW2: Tamal River
SW3: Parang River

Date of sampling: 19.02.2014

No.	Parameters	Sample (SW1)	Sample (SW2)	Sample (SW3)
1	Temperature (0C)	18.5	18.5	16
2	pH	7.1	7.1	7.08
3	Total Dissolved Solid (mg./l)	120	78	283
4	Total Hardness (mg/l)	30	32	140
5	Dissolved Oxygen (mg/l)	6.4	6	5.6
6	BOD , 3 days at 27^{0}C (mg./l)	3	5	12
7	COD (mg./l)	9.8	19.6	39.2
8	Oil & Grease (mg./l)	<1.0	<1.0	<1.0
9	Kjeldahl Nitrogen (mg/l)	5.2	6.5	9.2
10	Chloride (mg/l)	23.41	14.41	19.81
11	Sulphates as SO4 (mg/l)	25	10.25	17.5
12	Phosphate (mg/l)	0.69	0.51	0.69
13	Calcium (mg/l)	6.01	8.02	33.67
14	Magnesium (mg/l)	3.6	2.88	13.44
15	Sodium (mg/l)	26.5	16.5	43
16	Manganese (mg/l)	<0.03	<0.03	<0.03
17	Zinc (mg/l)	0.1	0.12	0.15
18	Iron (mg/l)	9.23	1.38	2.09
19	Chromium (Total) (mg/l)	<0.2081	<0.2081	<0.2081
20	Chromium (VI) (mg/l)	<0.01	<0.01	<0.01

Compiled by : (Signature)

Name : Dr. AJOY PAUL

For ENVIROCHECK
Date of Issue : 02.04.2014
Place : Calcutta

Certified by : (Signature)

Name : DR. SUMIT CHOWDHURY

Seal :

224

ABASH SARADAMAYEE UNNAYAN PARISHAD

P.O.- ABASH, MEDINIPUR, WEST BENGAL (INDIA) ★ Pin - 721102Ph.: 03222-273157

An association of voluntary Organisation affiliated to Ramkrishna Mission Loka Siksha Parishad, Narendrapur, Kolkata

Water quality testing under Public Health Engineering Department Government of W.B.
Water sample collection and testing record

PART - 1

1. Name District ..... PASCHIM MEDINIPUR .....
2. Name of Block ..... SALBONI .....
3. Name of Gram Panchayat ..... 9 NO. KASHIJORA .....
4. Name of Village (Mouza) ..... PALAIBONI ..... JLNo. [ ][ ][ ]
5. Name of Habitation ..... PALAIBONI .....
6. Location of tubewell ..... NEAR PRIMARY SCHOOL .....
7. Owner of the tubewell (A) Govt. [✓] Private [ ]
8. If private, name of owner .....
9. Type of pump (A) Ordinary HP [✓] (B) DWP [ ] (C) T.W. [ ] (D) WELL [ ]
   (E) PURIFIER [ ] (F) SUB-MARSIBLE [ ]

PART - II

1. Date of receiving the sample in the laboratory [2 5] [0 1] [1 7]
2. Date of testing [2 5] [0 1] [1 7]
3. **RESULT Of TESTING**

(A) Chemical Analysis

	Parameters	Result obtained	Desirable limit	Permissible limit
a)	pH	6.26	6.5	8.5
b)	Iron	0.2061 mg/lit	0.3mg/lit	0.3mg/lit
c)	Total Handness	44 mg/lit	300mg/lit	600mg/lit
d)	Turbidity	3.75 NTU	1NTU	5NTU

(B) Bacteriologic Analysis

	Parameters	Result obtained	Desirable limit	Permissible limit
a)	Total coliform	0 MPN/100ml	0 MPN/100ml	0 MPN/100ml
b)	Faecal Coliform	0 MPN/100ml	0 MPN/100ml	0 MPN/100ml

30/6/17

Signature of Collector of Water Sample

Signature of the Secretary
Abash Saradamayee Unnayan Parishad

Signature of the Bacteriologist
Abash Saradamayee Unnayan Parishad

Signature of the Chemist
Abash Saradamayee Unnayan Parishad

ABASH SARADAMAYEE UNNAYAN PARISHAD

P.O.- ABASH, MEDINIPUR, WEST BENGAL (INDIA) ★ Pin - 721102Ph.: 03222-273157

An association of voluntary Organisation affiliated to Ramkrishna Mission Loka Siksha Parishad, Narendrapur, Kolkata

Water quality testing under Public Health Engineering Department Government of W.B.
Water sample collection and testing record

Estd.- 1995

PART - 1

1. Name District ..... PASCHIM MEDINIPUR .....
2. Name of Block ..... SALBONI .....
3. Name of Gram Panchayat ..... 4 NO. BANKIBANDH .....
4. Name of Village (Mouza) ..... BALIBASHA ..... JLNo. [ ][ ][ ]
5. Name of Habitation ..... BALIBASHA .....
6. Location of tubewell ..... NEAR PRIMARY SCHOOL .....
7. Owner of the tubewell (A) Govt. [✓] Private [ ]
8. If private, name of owner .....
9. Type of pump (A) Ordinary HP [✓] (B) DWP [ ] (C) T.W. [ ] (D) WELL [ ]
   (E) PURIFIER [ ] (F) SUB-MARSIBLE [ ]

PART - II

1. Date of receiving the sample in the laboratory [2][5] [0][1] [1][7]
2. Date of testing [2][5] [0][1] [1][7]
3. **RESULT Of TESTING**

(A) Chemical Analysis

	Parameters	Result obtained	Desirable limit	Permissible limit
a)	pH	6·28	6.5	8.5
b)	Iron	0·5323 mg/lit	0.3mg/lit	0.3mg/lit
c)	Total Handness	56 mg/lit	300mg/lit	600mg/lit
d)	Turbidity	5·62 NTU	1NTU	5NTU

(B) Bacteriologic Analysis

	Parameters	Result obtained	Desirable limit	Permissible limit
a)	Total coliform	0 MPN/100ml	0 MPN/100ml	0 MPN/100ml
b)	Faecal Coliform	0 MPN/100ml	0 MPN/100ml	0 MPN/100ml

Signature of Collector of Water Sample	Signature of the Secretary	Signature of the Bacteriologist	Signature of the Chemist
24/1/17	24.1.17	24.01.17	24.01.17
	Abash Saradamayee Unnayan Parishad	Abash Saradamayee Unnayan Parishad	Abash Saradamayee Unnayan Parishad

ENVIROCHECK
House of Environmental Pollution Monitoring and Analysis
H.O. : 63/B, Rastraguru Avenue, Kolkata - 700028
Laboratory : 189 & 190 Rastraguru Avenue, Kolkata - 700028

Phone : 2579-2889/2891/2549-7490/6459-1174
Fax : 2529-9141
E-mail : envcheck@cal2.vsnl.net.in
Website : www.envirocheck.org

Report No. EC/GB/JSW/A1/13-14
sheet 1 of 3

REPORT ON AMBIENT AIR QUALITY MONITORING

FIELD MONITORING WORK
JSW ENERGY (BENGAL) LIMITED
SALBONI, WEST BENGAL

MONITORING MONTH & YEAR : DEC'13 - MAR'14

MONITORED BY :

Envirocheck
189, Rastraguru Avenue,
Calcutta - 700 028

STATION TYPE : Fixed
STATION CODE : AQ1

ASSIGNED BY :

Ghosh Bose & Associates Pvt. Ltd.
8, Harrington Mansion
8, Ho Chi Minn Sarani
Kolkata - 700 071

LOCATION Dhansol Village

Date of sampling	Pollutants level in µg/m^3					
	$PM_{2.5}$	PM_{10}	SO_2	Nox	Mercury	Ozone
10.12.13 to 11.12.13	32.5	78.2	<6.94	<20		
14.12.13 to 15.12.13	30.2	67.5	<6.94	<20		
18.12.13 to 19.12.13	26.8	58.2	<6.94	<20	<0.069	<10
22.12.13 to 23.12.13	31.5	76.5	<6.94	<20		

227

Date of sampling	Pollutants level in µg/m^3					
	$PM_{2.5}$	PM_{10}	SO_2	NOx	Mercury	Ozone
26.12.13 to 27.12.13	26.8	62.8	<6.94	<20		
30.12.13 to 31.12.13	23.5	63.5	<6.94	<20		
03.01.14 to 04.01.14	25.2	61.2	<6.94	<20		
07.01.14 to 08.01.14	26.8	65.2	<6.94	<20		
11.01.14 to 12.01.14	32.5	71.5	<6.94	<20	<0.069	<10
15.01.14 to 16.01.14	23.5	61.8	<6.94	<20		
19.01.14 to 20.01.14	26.8	73.2	<6.94	<20		
23.01.14 to 24.01.14	25.8	62.5	<6.94	<20		
27.01.14 to 28.01.14	23.6	61.8	<6.94	<20	<0.069	<10
31.01.14 to 01.02.14	28.5	68.2	<6.94	<20		
04.02.14 to 05.02.14	31.5	65.8	<6.94	<20		

228

Date of sampling	Pollutants level in µg/m^3					
	$PM_{2.5}$	PM_{10}	SO_2	NOx	Mercury	Ozone
08.02.14 to 09.02.14	28.5	61.2	<6.94	<20	<0.069	<10
12.02.14 to 13.02.14	21.8	62.8	<6.94	<20		
16.02.14 to 17.02.14	18.5	53.2	<6.94	<20		
20.02.14 to 21.02.14	25.6	63.5	<6.94	<20	<0.069	<10
24.02.14 to 25.02.14	23.8	61.2	<6.94	<20		
28.02.14 to 29.02.14	20.5	58.6	<6.94	<20		
04.03.14 to 05.03.14	26.3	65.2	<6.94	<20		
08.03.14 to 09.03.14	21.5	61.8	<6.94	<20	<0.069	<10
12.03.14 to 13.03.14	23.5	68.2	<6.94	<20		

Compiled by : (Signature)

Name : Dr. AJOY PAUL

For ENVIROCHECK
Date of Issue : 02.04.2014
Place : Calcutta

Certified by : (Signature)

Name : DR. SUMIT CHOWDHURY

Seal :

229

ENVIROCHECK
House of Environmental Pollution Monitoring and Analysis
H.O. : 63/B, Rastraguru Avenue, Kolkata - 700028
Laboratory : 189 & 190 Rastraguru Avenue, Kolkata - 700028

Phone : 2579-2889/2891/2549-7490/6459-1174
Fax : 2529-9141
E-mail : envcheck@cal2.vsnl.net.in
Website : www.envirocheck.org

REPORT ON AMBIENT AIR QUALITY MONITORING

FIELD MONITORING WORK
JSW ENERGY (BENGAL) LIMITED
SALBONI, WEST BENGAL

MONITORING MONTH & YEAR : DEC'13 - MAR'14

MONITORED BY :

Envirocheck
189, Rastraguru Avenue,
Calcutta - 700 028

STATION TYPE : Fixed
STATION CODE : AQ2

ASSIGNED BY :

Ghosh Bose & Associates Pvt. Ltd.
8, Harrington Mansion
8, Ho Chi Minn Sarani
Kolkata - 700 071

LOCATION : Bursha Village

Date of sampling	Pollutants level in µg/m^3					
	$PM_{2.5}$	PM_{10}	SO_2	NOx	Mercury	Ozone
12.12.13 to 13.12.13	26.20	61.50	<6.94	<20		
16.12.13 to 17.12.13	26.50	63.20	<6.94	<20		
20.12.13 to 21.12.13	31.80	71.50	<6.94	<20	<0.069	<10
24.12.13 to 25.12.13	32.80	73.80	<6.94	<20		

230

Date of sampling	Pollutants level in µg/m^3					
	$PM_{2.5}$	PM_{10}	SO_2	NOx	Mercury	Ozone
28.12.13 to 29.12.13	28.60	72.50	<6.94	<20		
01.01.14 to 02.01.14	31.20	62.50	<6.94	<20		
05.01.14 to 06.01.14	25.20	58.20	<6.94	<20	<0.069	<10
09.01.14 to 10.01.14	23.60	61.78	<6.94	<20		
13.01.14 to 14.01.14	26.50	63.50	<6.94	<20		
17.01.14 to 18.01.14	21.78	56.20	<6.94	<20		
21.01.14 to 22.01.14	23.50	52.78	<6.94	<20		
25.01.14 to 26.01.14	26.50	71.50	<6.94	<20	<0.069	<10
29.01.14 to 30.01.14	23.30	62.78	<6.94	<20		
02.02.14 to 03.02.14	31.20	76.50	<6.94	<20		
06.02.14 to 07.02.14	28.60	71.26	<6.94	<20	<0.069	<10

231

Date of sampling	Pollutants level in µg/m^3					
	$PM_{2.5}$	PM_{10}	SO_2	NOx	Mercury	Ozone
10.02.14 to 11.02.14	23.60	61.50	<6.94	<20		
14.02.14 to 15.02.14	21.50	58.23	<6.94	<20		
18.02.14 to 19.02.14	23.60	56.20	<6.94	<20		
22.02.14 to 23.02.14	21.30	52.80	<6.94	<20		
26.02.14 to 27.02.14	24.30	58.12	<6.94	<20	<0.069	<10
02.03.14 to 03.03.14	32.50	73.50	<6.94	<20		
06.03.14 to 07.03.14	26.30	61.58	<6.94	<20		
10.03.14 to 11.03.14	23.80	58.20	<6.94	<20	<0.069	<10
14.03.14 to 15.03.14	21.50	62.18	<6.94	<20		

Compiled by : (Signature)

Name : Dr. AJOY PAUL

For ENVIROCHECK
Date of Issue : 02.04.2014
Place : Calcutta

Certified by : (Signature)

Name : DR. SUMIT CHOWDHURY

Seal :

232

ENVIROCHECK
House of Environmental Pollution Monitoring and Analysis
H.O. : 63/B, Rastraguru Avenue, Kolkata - 700028
Laboratory : 189 & 190 Rastraguru Avenue, Kolkata - 700028

Phone : 2579-2889/2891/2549-7490/6459-1174
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Website : www.envirocheck.org

REPORT ON AMBIENT AIR QUALITY MONITORING

FIELD MONITORING WORK
JSW ENERGY (BENGAL) LIMITED
SALBONI, WEST BENGAL

MONITORING MONTH & YEAR : DEC'13 - MAR'14

MONITORED BY :
Envirocheck
189, Rastraguru Avenue,
Calcutta - 700 028

STATION TYPE : Fixed
STATION CODE : AQ3

ASSIGNED BY :
Ghosh Bose & Associates Pvt. Ltd.
8, Harrington Mansion
8, Ho Chi Minn Sarani
Kolkata - 700 071

LOCATION : Kashijora Village

Date of sampling	Pollutants level in µg/m^3					
	$PM_{2.5}$	PM_{10}	SO_2	NOx	Mercury	Ozone
12.12.13 to 13.12.13	23.50	61.20	<6.94	<20		
16.12.13 to 17.12.13	21.38	53.20	<6.94	<20		
20.12.13 to 21.12.13	20.10	51.89	<6.94	<20	<0.069	<10
24.12.13 to 25.12.13	21.78	53.60	<6.94	<20		

233

Date of sampling	Pollutants level in µg/m^3					
	$PM_{2.5}$	PM_{10}	SO_2	NOx	Mercury	Ozone
28.12.13 to 29.12.13	26.50	58.12	<6.94	<20		
01.01.14 to 02.01.14	28.36	56.28	<6.94	<20		
05.01.14 to 06.01.14	23.78	51.23	<6.94	<20	<0.069	<10
09.01.14 to 10.01.14	26.50	56.80	<6.94	<20		
13.01.14 to 14.01.14	21.50	53.68	<6.94	<20		
17.01.14 to 18.01.14	25.10	56.80	<6.94	<20		
21.01.14 to 22.01.14	23.50	52.60	<6.94	<20		
25.01.14 to 26.01.14	28.23	56.78	<6.94	<20	<0.069	<10
29.01.14 to 30.01.14	23.80	53.28	<6.94	<20		
02.02.14 to 03.02.14	23.80	58.23	<6.94	<20		
06.02.14 to 07.02.14	21.80	51.20	<6.94	<20	<0.069	<10

234

Date of sampling	Pollutants level in µg/m^3					
	$PM_{2.5}$	PM_{10}	SO_2	NOx	Mercury	Ozone
10.02.14 to 11.02.14	23.60	52.80	<6.94	<20		
14.02.14 to 15.02.14	28.60	56.18	<6.94	<20		
18.02.14 to 19.02.14	22.80	52.12	<6.94	<20		
22.02.14 to 23.02.14	26.10	53.68	<6.94	<20		
26.02.14 to 27.02.14	22.80	52.18	<6.94	<20	<0.069	<10
02.03.14 to 03.03.14	21.50	56.12	<6.94	<20		
06.03.14 to 07.03.14	23.80	52.80	<6.94	<20		
10.03.14 to 11.03.14	21.50	51.23	<6.94	<20	<0.069	<10
14.03.14 to 15.03.14	26.50	58.23	<6.94	<20		

Compiled by : (Signature)

Name : Dr. AJOY PAUL

For ENVIROCHECK
Date of Issue : 02.04.2014
Place : Calcutta

Certified by : (Signature)

Name : DR. SUMIT CHOWDHURY

Seal : ENVIROCHECK Kolkata 700 028 189, Rashbehari Avenue

235

ENVIROCHECK
House of Environmental Pollution Monitoring and Analysis
H.O. : 63/B, Rastraguru Avenue, Kolkata - 700028
Laboratory : 189 & 190 Rastraguru Avenue, Kolkata - 700028

Phone : 2579-2889/2891/2549-7490/6459-1174
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E-mail : envcheck@cal2.vsnl.net.in
Website : www.envirocheck.org

Report No. EC/GB/JSW/A4/13-14
sheet 1 of 3

REPORT ON AMBIENT AIR QUALITY MONITORING

FIELD MONITORING WORK
JSW ENERGY (BENGAL) LIMITED
SALBONI, WEST BENGAL

MONITORING MONTH & YEAR : DEC'13 - MAR'14

MONITORED BY :

Envirocheck
189, Rastraguru Avenue,
Calcutta - 700 028

STATION TYPE : Fixed
STATION CODE : AQ4

ASSIGNED BY :

Ghosh Bose & Associates Pvt. Ltd.
8, Harrington Mansion
8, Ho Chi Minn Sarani
Kolkata - 700 071

LOCATION : Tangrashole Village

Date of sampling	Pollutants level in $\mu g/m^3$					
	$PM_{2.5}$	PM_{10}	SO_2	NOx	Mercury	Ozone
10.12.13 to 11.12.13	23.60	52.80	<6.94	<20		
14.12.13 to 15.12.13	28.50	56.20	<6.94	<20		
18.12.13 to 19.12.13	26.12	58.23	<6.94	<20	<0.069	<10
22.12.13 to 23.12.13	31.50	62.50	<6.94	<20		

236

Date of sampling	Pollutants level in µg/m³					
	$PM_{2.5}$	PM_{10}	SO_2	NOx	Mercury	Ozone
26.12.13 to 27.12.13	32.80	61.28	<6.94	<20		
30.12.13 to 31.12.13	36.20	68.20	<6.94	<20		
03.01.14 to 04.01.14	28.50	68.20	<6.94	<20		
07.01.14 to 08.01.14	23.60	62.18	<6.94	<20		
11.01.14 to 12.01.14	22.80	63.12	<6.94	<20	<0.069	<10
15.01.14 to 16.01.14	16.50	41.20	<6.94	<20		
19.01.14 to 20.01.14	22.18	60.10	<6.94	<20		
23.01.14 to 24.01.14	21.60	56.28	<6.94	<20		
27.01.14 to 28.01.14	26.50	52.78	<6.94	<20	<0.069	<10
31.01.14 to 01.02.14	21.80	51.80	<6.94	<20		
04.02.14 to 05.02.14	26.58	56.20	<6.94	<20		

237

Date of sampling	Pollutants level in µg/m³					
	$PM_{2.5}$	PM_{10}	SO_2	NOx	Mercury	Ozone
08.02.14 to 09.02.14	20.10	51.23	<6.94	<20	<0.069	<10
12.02.14 to 13.02.14	21.58	52.80	<6.94	<20		
16.02.14 to 17.02.14	23.50	53.68	<6.94	<20		
20.02.14 to 21.02.14	21.80	56.20	<6.94	<20	<0.069	<10
24.02.14 to 25.02.14	22.50	58.60	<6.94	<20		
28.02.14 to 29.02.14	21.80	53.12	<6.94	<20		
04.03.14 to 05.03.14	20.50	51.28	<6.94	<20		
08.03.14 to 09.03.14	21.80	52.78	<6.94	<20	<0.069	<10
12.03.14 to 13.03.14	26.50	58.12	<6.94	<20		

Compiled by : (Signature)

Name : Dr. AJOY PAUL

For ENVIROCHECK
Date of Issue : 02.04.2014
Place : Calcutta

Certified by : (Signature)

Name : DR. SUMIT CHOWDHURY

Seal : ENVIROCHECK Kolkata 700 028

238

ANNEXURE-7D

GREENC LABORATORY SERVICES

(A NABL Accreditated Laboratory)
605-606, Level-5, Shopprix Mall, Sector-5, Vaishali,
Ghaziabad-201010 Telefax: 0120-4111527,
Email: lab.greenc@gmail.com; information@greencindia.com;

No : 16-17/GLS/STPP/125/17115
Date : 13/01/17

TEST REPORT

Soil Quality Analysis

Issued to 1X660 MW Supercritical Thermal Power Project, Salboni, West Midnapur, West Bengal

Sample Details

Sample Description	:	Soil Quality
Sampling drawn by	:	Ghosh, Bose & Associates Pvt. Ltd.
Sampling Location	:	S1
Sampling Plan & Procedure	:	As per SOP

RESULTS

S. No.	Parameters	Method	Results	Unit
1	pH	IS2720- Part 26, 1987 by pH meter	6.09	-
2	Electrical Conductivity	Department of agriculture & Cooperation, Page No. 81-82:2011	1900	µmhos /cm
3	Moisture	Department of agriculture & Cooperation, Page No. 76-77 :2011	2.9	%
4	Organic Carbon	IS2720- Part 22, 1972, Reaffirmed 2001	0.47	%
5	Organic matter	IS2720- Part 22, 1972, Reaffirmed 2001 (By Calculation)	0.81	%

End of Report

Note:

1. The results given above are related to the tested sample, for various parameters as analyzed. The customer asked for the above tests only.
2. This test will not be generated again, either wholly or in part, without written permission of the laboratory.
3. The samples will be disposed off after one month from the date of issue of test report, unless until specified / requested by the customer.

GreenC Laboratory Services GLS

13/1/17

Authorised Signatory

Page 1 of 1

239

GREENC LABORATORY SERVICES

(A NABL Accreditated Laboratory)
605-606, Level-5, Shopprix Mall, Sector-5, Vaishali,
Ghaziabad-201010 Telefax: 0120-4111527,
Email: lab.greenc@gmail.com; information@greencindia.com;

No : 16 - 17 / GLS / STPP / 125 / 1716

Date : 13 / 01 / 17

TEST REPORT

Soil Quality Analysis

Issued to **1X660 MW Supercritical Thermal Power Project, Salboni, West Midnapur, West Bengal**

Sample Details

Sample Description	:	**Soil Quality**
Sampling drawn by	:	**Ghosh, Bose & Associates Pvt. Ltd.**
Sampling Location	:	S2
Sampling Plan & Procedure	:	As per SOP

RESULTS

S. No.	Parameters	Method	Results	Unit
1	pH	IS2720- Part 26, 1987 by pH meter	5.9	-
2	Electrical Conductivity	Department of agriculture & Cooperation, Page No. 81-82:2011	2100	µmhos /cm
3	Moisture	Department of agriculture & Cooperation, Page No. 76-77 :2011	3.1	%
4	Organic Carbon	IS2720- Part 22, 1972, Reaffirmed 2001	0.54	%
5	Organic matter	IS2720- Part 22, 1972, Reaffirmed 2001 (By Calculation)	0.93	%

End of Report

Note:

1. The results given above are related to the tested sample, for various parameters as analyzed. The customer asked for the above tests only.
2. This test will not be generated again, either wholly or in part, without written permission of the laboratory.
3. The samples will be disposed off after one month from the date of issue of test report, unless until specified / requested by the customer.

GreenC Laboratory Services GLS

Mujammil Khan 13/1/17

Authorised Signatory

Page 1 of 1

240

GREENC LABORATORY SERVICES

(A NABL Accreditated Laboratory)
605-606, Level-5, Shopprix Mall, Sector-5, Vaishali,
Ghaziabad-201010 Telefax: 0120-4111527,
Email: lab.greenc@gmail.com; information@greencindia.com;

No : 16-17/GLS/STPP/125/1717
Date : 13/01/17

TEST REPORT

Soil Quality Analysis

Issued to 1X660 MW Thermal Power Project, Salboni, West Midnapur, West Bengal

Sample Details

Sample Description	:	Soil Quality
Sampling drawn by	:	Ghosh, Bose & Associates Pvt. Ltd.
Sampling Location	:	S3
Sampling Plan & Procedure	:	As per SOP

RESULTS

S. No.	Parameters	Method	Results	Unit
1	pH	IS2720- Part 26, 1987 by pH meter	6.3	-
2	Electrical Conductivity	Department of agriculture & Cooperation, Page No. 81-82:2011	2700	µmhos /cm
3	Moisture	Department of agriculture & Cooperation, Page No. 76-77 :2011	4.1	%
4	Organic Carbon	IS2720- Part 22, 1972, Reaffirmed 2001	0.59	%
5	Organic matter	IS2720- Part 22, 1972, Reaffirmed 2001 (By Calculation)	1.02	%

End of Report

Note:

1. The results given above are related to the tested sample, for various parameters as analyzed. The customer asked for the above tests only.
2. This test will not be generated again, either wholly or in part, without written permission of the laboratory.
3. The samples will be disposed off after one month from the date of issue of test report, unless until specified / requested by the customer.

Greenc Laboratory Services GLS

Mohammad Khan
13/1/17

Authorised Signatory

ENVIROCHECK
House of Environmental Pollution Monitoring and Analysis
H.O. : 63/B, Rastraguru Avenue, Kolkata - 700028
Laboratory : 189 & 190 Rastraguru Avenue, Kolkata - 700028

Phone : 2579-2889/2891/2549-7490/6459-1174
Fax : 2529-9141
E-mail : envcheck@cal2.vsnl.net.in
Website : www.envirocheck.org

REPORT ON SAMPLE SURVEY FOR NOISE LEVEL

FIELD MONITORING WORK

JSW ENERGY (BENGAL) LIMITED

FOR PROPOSED 1 X 660 MW THERMAL POWER PLANT SALBONI, WEST BENGAL

MONITORED BY :

ENVIROCHECK
189, Rastraguru Avenue,
Kolkata - 700 028

ASSIGNED BY :

Ghosh Bose & Associates Pvt. Ltd.
8, Harrington Mansion
8 Ho Chi Minn Sarani
Kolkata – 700 071

DAY TIME

Date	Time (am)	Station code	Station location	Ambient Noise Level dB(A)		
				L_{min}	L_{max}	L_{eq}
17.01.14	09:00	N1	Project site (JSW)	46.2	61.5	53.28
19.01.14	09:30	N2	Goda Piyashal Bazar	43.8	52.8	48.20
15.01.14	10:00	N3	Dhansol JSM Vidyalaya	45.2	52.6	50.18
17.01.14	10:30	N4	Shalboni Hospital	46.3	53.8	50.26
26.12.13	11:00	N5	Dhansol Village	48.2	52.3	50.10
16.01.14	11:30	N6	Tangasol village	42.8	48.6	46.12
30.12.13	10:30	N7	Kashijara village	48.2	53.6	50.28
05.01.14	11:00	N8	Bhusara village	46.2	52.8	51.23

L_{min} : Minimum Noise level L_{max} :Maximum Noise level L_{eq} :Equivalent sound energy

Contd. Sheet 2 of 2

242

REPORT ON SAMPLE SURVEY FOR NOISE LEVEL

FIELD MONITORING WORK

JSW ENERGY (BENGAL) LIMITED

FOR PROPOSED 1 X 660 MW THERMAL POWER PLANT
SALBONI, WEST BENGAL

MONITORED BY :

ENVIROCHECK
189, Rastraguru Avenue,
Kolkata - 700 028

ASSIGNED BY :

Ghosh Bose & Associates Pvt. Ltd.
8, Harrington Mansion
8 Ho Chi Minn Sarani
Kolkata – 700 071

NIGHT TIME

Date	Time (am)	Station code	Station location	Ambient Noise Level dB(A)		
				L_{min}	L_{max}	L_{eq}
17.01.14	09:00	N1	Project site (JSW)	43.5	53.8	51.23
19.01.14	09:30	N2	Goda Piyashal Bazar	40.1	46.3	42.58
15.01.14	10:00	N3	Dhansol JSM Vidyalaya	36.2	42.5	40.18
17.01.14	10:30	N4	Shalboni Hospital	42.8	48.5	43.28
26.12.13	11:00	N5	Dhansol Village	43.6	48.2	45.23
16.01.14	11:30	N6	Tangasol village	42.8	51.2	45.28
30.12.13	10:30	N7	Kashijara village	41.6	46.8	42.18
05.01.14	11:00	N8	Bhusara village	38.5	42.6	40.12

L_{min} : Minimum Noise level L_{max} :Maximum Noise level L_{eq} :Equivalent sound energy

Compiled by : (Signature)

Name : Dr. AJOY PAUL

For ENVIROCHECK
Date of Issue : 02.04.2014
Place : Calcutta

Certified by : (Signature)

Name : DR. SUMIT CHOWDHURY

Seal : ENVIROCHECK Kolkata 700 028 189, Rashtraguru Avenue

243

JSW Energy (Bengal) Limited

Tower-A, 3rd Floor, DLF IT Park
08, Major Arterial Road, Block - AF
New Town, Kolkata - 700 156
Phone : 033 - 4000 2020
Fax : 033 - 4000 2021
Website : www.jsw.in

To
The Divisional Forest Officer, Midnapore
Midnapore, Distt. – Paschim Medinipur,
Pin – 721101

Date: 28th January, 2014

Subject: Development of additional plantation on identified blocks of degraded forest.

Sir,

We are planning to set up a 1 x 660MW super-critical power plant at our project site, located at Salboni, Paschim Medinipur. The work on the project is likely to commence from FY 2014-15. The Ministry of Environment and Forests (MoEF) has advised, through their letter dated 7th January, 2014, prescribing the 'Terms of Reference' for the project, to carry-out plantation on identified blocks of degraded forests, over and above the green belt, in consultation with District Forest Department.

In deference to this advice, JSWEBL is committed to undertake development of additional plantation in stages and we would request you to indicate the degraded forest lands / degraded Govt. lands unsuitable for cultivation in close proximity to our project site for this purpose.

Detailed modalities of this activity will be determined suitably as per the prevalent rules and regulations in this regard.

Thanking you,
Yours faithfully,
For JSW Energy (Bengal) Limited

Biswadip Gupta
Director

Part of O. P. Jindal Group

Regd. Office : JSW Centre
Bandra Kurla Complex
Bandra (East)
Mumbai - 400 051
Phone : 022-4286 1000
Fax : 022-4286 3000

ANNEXURE-9

Detailed CSR Plan with activities wise break up of financial commitment for the year 2016-2017

Ser	Sector	Activities	Goals	Details of Activities	Cost Implication	No/qty	Total Exp (in lacs)	Remarks
1	Promotion of Education	1. Tuition Classes for slow learners	To assist slow learners to develop understanding, better performance and lower drop out rate	At 2 schools. Maths and English classes extra tuition	17,000 for 6 teachers at 2 schools per month	30 children	2.0	School infrastructure will be used
2		2. Assist marginalised tribal children access to quality education.	To bring tribal children to mainstream	Hostel and coaching facility to 61 tribal children of Primitive Tribal Group at Vivekananda Seva Samiti	1 lac per mth	62 children	12.0	Through weekenende Seva samiti
6	Healthcare	1. Intervention	Primary healthcare	Mobile and static health centres	4.5 lacs/month	23 villages	54.0	JSV innovations
7		2. Awareness	Preventive healthcare	Awareness campaigns		23 villages		JSV innovations, Thoughtshop fdn
8		3. Healthcard	Mapping of health data	Issue of health cards at DIZ		23 villages		JSV innovations
11	Vocational Skills enhancing employment	1. ITI Jhargram	Provide skill for job opportunity	Develop in PPP mode			2.0	
12		2. Skill development youth	Provide skill for job opportunity	Training in Carpentry, masonery, welding		3 clusters	6.0	
15	Eradication of hunger & poverty	Support destitutes and ostracised old persons	Provide shelter, food and warmth(in winter) to poor and destitutes and homless persons in DIZ		3.0 lacs per centre for upto 20 persons	two centres	6.0	
16	Gender equality - Empowering women	Awareness of rights and privileges	Awareness on social ills through campaigns	Street plays at schools / community centres. 2. Organising workshops on dramatics from local students	30 lacs for 4 days session per month	12 campaigns/ workshop per yr	3.6	In coord with Dist Info and Cultural office
							85.6	

248

ANNEXURE : 9

JSW Energy (Bengal) Limited

Godrej Water Side, Tower-1, 10th Floor
Unit No. : 1003, Plot DP - 5, Sector - V
Salt Lake City, Kolkata - 700 091
Phone : 033 - 4000 2020
Fax : 033 - 4000 2021
Website : www.jsw.in

CIN No.
U40300MH2010PLC199844

13/05/2014

Mr. J.K.Jain
Dy. Executive Director (Commercial)
OCL Bengal Cement Works
(A Unit of OCL India Ltd.)
Godapiasal, Pascim Medinipur
West Bengal

Dear Sir,

Sub: Delivery of dry Fly Ash generated at 1 X 660MW JSWEBL Power Plant at Salboni, Paschim Medinipur.

This has reference to your discussions with our Mr. Aloke Bhattacharjee on the captioned subject.

As per discussions, it is hereby confirmed that JSW Energy (Bengal) Limited (JSWEBL) desires to supply 0.20 MTPA of dry Fly Ash, generated at it's up-coming 1 x 660 MW Power Plant at Salboni, Pascim Medinipur, West Bengal to OCL Bengal Cement Works (OBCW) and OBCW has also agreed to take the aforesaid dry Fly Ash from JSWEBL depending upon its business requirement and also subject to the quality parameters meet the requirement of its manufacturing process and product.

We have agreed that the detailed terms and conditions of the supply will be worked out and agreed upon at the earliest convenience of both parties during signing of the definitive agreement.

Kindly return us duplicate copy this letter duly signed by you in token of your acceptance of the above arrangement.

Yours sincerely,
For **JSW Energy (Bengal) Ltd.**

BISWADIP GUPTA
Director

We Accept/Not Accept
For OCL Bengal Cement Works
(A Unit of OCL India Ltd.)

J.K.JAIN
Dy. Executive Director (Commercial)

JSW Cement Limited
Site Office : Ankur Complex, Via-Salboni,
Jambedia, P.O-Sayedpur, Paschim Medinipur,
Pin – 721147, West Bengal

28th Dec 2016
JSWCL/Salboni/

To,
JSW Energy Bengal Ltd (JSWEBL),
Kolkata,

Subject: Fly Ash consumption

Dear Sir,

We will use fly ash as available from JSWEBL's Power Plant in our cement plant at Salboni based on market condition.

Thanking You,
Yours Faithfully

For JSW Cement Limited.

M.E Pawar
Project In-Charge

Part of O.P Jindal Group,

Regd. Office : JSW Centre,
BandraKuria Complex,
Bandra (East), Mumbai - 400 051
CIN.: U26957MH2006PLC16083
Phone : +91 22- 4286 100
Fax : +9122- 4286 3000
Website : www.jsw.in

ANNEXURE : 10

PROCEEDINGS OF THE PUBLIC HEARING FOR THE PROPOSED 1X660 MW SUPER CRITICAL POWER PLANT AT SALBONI, WEST MEDINIPUR, WEST BENGAL, PROPOSED BY M/S JSW ENERGY (BENGAL) LIMITED, HELD ON 26.08.2014 AT 12:00 HRS AT THE SALBONI PANCHAYAT SAMITY COMMUNITY HALL (NEAR DURGA MANDIR), PO & PS – SALBONI, DIST – WEST MEDINIPUR, WEST BENGAL.

M/s JSW Energy (Bengal) Limited submitted an application to West Bengal Pollution Control Board for conducting a Public Hearing for the proposed 1X660 MW Super Critical Power Plant at Salboni, Dist – West Medinipur, West Bengal. As per the EIA Notification S.O. 1533 dated 14th September, 2006 of the Ministry of Environment & Forest, Govt. of India, Environment Clearance for the said project is required to be obtained from the MoEF, Govt. of India after conducting the Public Hearing.

Accordingly, West Bengal Pollution Control Board after observing all formalities, held the Public Hearing on 26.08.2014 at 12:00 Hrs at the Salboni Panchayat Samity Community Hall (Near Durga Mandir), PO & PS – Salboni, Dist – West Medinipur, West Bengal. All the panel members were present in the hearing. Sri R.Arjun, IAS, Additional District Magistrate (General)), Dist. –West Medinipur presided over the hearing. List of the panel members and the others present in the public hearing is enclosed.

The hearing started with a welcome note from Sri S.Ganguly, Environmental Engineer, West Bengal Pollution Control Board. He explained about the provisions of the above stated MoEF notification and also informed the audience about the draft proposal of M/s JSW Energy (Bengal) Limited for the proposed 1X660 MW Super Critical Power Plant at Salboni, Dist – West Medinipur, West Bengal.

Sri R.Arjun, IAS, Additional District Magistrate (General)), Dist. –West Medinipur welcomed the audience and gave a brief introduction about the proposed project and its probable impact on the environment. He then requested the project proponent to explain in details about the proposed project, giving emphasis on the environmental aspects in particular, for discussion among the panel members and others present in the hearing.

Mr. Aloke Bhattacharjee, Associate Vice President (Projects), representative of M/s JSW Bengal Steel Limited narrated the project details and the proposed pollution control measures considered, through a Power Point Presentation. He explained the location details of the project, raw material required, basic requirements like land, water, fuel etc. for the projects, environmental impacts arising out of the same as well as the mitigative measures proposed by JSW to combat the effects. He mentioned about the baseline status of Air, Water & Noise Quality of the area which are well within the standards. He further elaborated on the steps to be taken for developing the society through activities under Corporate Social Responsibility of the company and also about the disaster management plan of the company.

Sri. Nepal Singh, Sabhapati, Salboni Panchayat Samity addresses the public hearing. Sri Singh stated that the Hearing has been conducted to let the local people know about the Power project proposed by JSW at Salboni. He also stated that the economic condition of the people around the proposed project site is in general very deplorable and it is expected that the implementation of the project would definitely generate income and employment to the local people and contribute towards the overall socio-economic development of the area. He categorically mentioned that the land givers of the project have great expectations from JSW but the proposed JSW Steel Project at Salboni is being delayed for so many reasons causing concern to the local people. He urged that the proposed Power project should be implemented as early as possible to meet the aspiration of the local people.

During the discussion the panel members and the others present in the public hearing made queries / suggestions with respect to the proposed project, which are noted below:

1

Sri.Chandan Manna of Vill - Jambedia stated that the villagers are helping and shall continue to help in future but the benefits from the proposed project specifically for the local people should be explained to them.

Sri.Deepak Mahato of Vill - Asnasuli demanded further improvements of medical facilities extended to villagers under CSR Programmes of the Company. He further requested the project proponent to fulfil other commitments like skill development for local unemployed youth, supply of potable water to the local villages, improvement of road conditions and sanitation facilities of the area, extend help to the local schools etc. He further requested the JSW authorities to ensure that proper rehabilitation is provided to the land losers.

Sri Tanmoy Saha of Vill – Jambedia expressed his grievances about non-fulfillment of commitments made long back regarding issues related to local developments He requested the JSW authorities to initiate efforts immediately for providing better medical facilities for the local villagers, generate employment for the local residents, supply of potable water to the local villages and improvement of road conditions of the area; Sri Saha also requested the project proponent to start activities like starting football camps to improve overall sporting environment for the local youth.

Sri Parishkar Mahato of Vill - Asnasuli stated that many people had given their land with the belief that they will get job, but due to the delay in the project the people are distressed. He also wanted to know about the detailed compensation scheme to be provided to the land losers. He also urged for improvement of medical facilities.

Sri Ganeshwar Mahato of Vill - Asnasuli wanted to know when the certificates of training conducted through ITI and OPJC would be distributed to those trainees who had completed their training under CSR programmes conducted by the JSW. He expressed his grievance regarding such delay in distribution of certificates and failure to provide jobs by the JSW authorities to the trainees who have undergone such training. He urged the project proponent to address the issue at the earliest.

Sri Taraknath Modak of Vill - Salboni enquired about the distribution of training certificates, generation of local employment and improvement of medical assistance. He requested the JSW authorities to maintain good relation with the local villagers. He further requested the project proponent to ensure that the local agricultural activities are not disturbed as a result of their upcoming project.

Sri Manobilas Mahato of Vill - Asnasuli wanted to know the timeframe within which the land losers will be provided with permanent jobs by the JSW authorities.

Sri Shambhunath Mahato of Vill - Asnasuli urged that the priority should be given to maintain environment by reducing the pollution hazards while implementing the project. He further stated that extensive plantation program should be initiated in the locality to prevent environmental degradation of the area due to industrial activities.

Sri Shyamal Ghosh of Vill – Baragarh expressed his disappointment about non-fulfillment of commitments regarding creation of direct and indirect employment for the local people. He requested the JSW authorities to take the local people in confidence by organizing meetings at village level involving the representatives of local administration regarding issues like compensation to land losers, providing local employment and fulfillment of different CSR commitments.

Sri Salil Kanti Saha of Salboni spoke about loss of valuable cultivable land and the increasing rate of Global Warming due to industrialization. He also expressed his concern about forest depletion and deposition of fly ash may lead to the extinction of very high quality local species of mushrooms in the neighbouring jungles. He expressed his concern over proper installation of pollution control measures in the proposed project. He requested the WBPCB to keep proper vigil on the existing and upcoming

industries of the locality. He expressed his hope about cooperation of the local villagers to the project proponent provided they fulfill the commitments regarding proper pollution control measures, generation of employment and CSR activities.

Sri Sambhunath Soren of Vill - Ramraidihi, raised concern about the delay for implementation of the project as they being the land losers, are eagerly waiting for employment.

Sri Chandan Ghosh, Krishi Karmadhakkhya of Salboni Panchayat Samity requested the project proponent to take the poor people of the area into confidence by fulfilling their commitments. He expressed his hope that local villagers will welcome the project as it will generate local employment and contribute to overall socio-economic development of the backward villages of the area.

Janab Syed Toiab Ali Sijua of Vill – Salboni told that the project will be welcome by the local people and they will help the project proponent in all respects as there will be overall development of the backward area if the project materializes.

Sri R.Arjun, IAS, Additional District Magistrate (General)), Dist. –West Medinipur requested the project proponent to address the issues raised by the local residents.

Mr. Aloke Bhattacharjee answered the queries raised by the people gathered at the venue. He assured that all pollution control measures will be implemented and pollutant levels will be maintained within the prescribed limits. He further assured that the project will generate direct and indirect jobs to local people. It will also give people with entrepreneurial skills to start small businesses. Sri Bhattacharjee stated that as agreed with govt. of WB, JSW will provide the promised jobs to land givers as and when the project starts functioning. He further promised that all local issues including medical facility and other CSR activities will be improved through dialogues with local authorities, keeping in view the requirements of the local community.

Sri S.Barua, Environmental Engineer, Haldia Regional Office of the West Bengal Pollution Control Board assured that they will keep a strong vigil on the industries of the area in order to provide a pollution free environment to the local residents.

In general, local people present in the hearing welcomed the project provided that the project proponent will implement all the commitments made during public hearing.

Finally as desired by Sri R.Arjun, IAS, Additional District Magistrate (General) West Medinipur, Sri S. Ganguly, Environmental Engineer, WBPCB expressed his gratitude to the audience for their active participation in this public hearing and concluded the session.

Barua. 26/8/14

S.Barua
Environmental Engineer
West Bengal Pollution Control Board

26-08-2014

R.Arjun (IAS)
Additional District Magistrate (General)
West Medinipur

Statement of attendance of the Panel Members of The Public Hearing for the proposed 1x660 MW Super Critical Power Plant at Salboni, Dist- west Medinipur west Bengal, by M/s JSW Energy (Bengal) Limited.

Public Hearing held on 26.08.2014 at 12:00 Hrs, at the Salboni Panchayet Samity Community Hall (Near Durga Mandir), PO- & PS- Salboni Dist- West Medinipur, West Bengal.

Sl NO.	Name of the Panel Members	Signature
01.	Sri R. Arjun, IAS A.D.M (Dev.), Paschim Medinipur.	26-08-2014
02.	Sri S. Ganguly, Environmental Engineer, ESM Cell, W.B.P.C.B.	S. Ganguly 26.08.14.
03.	Sri G. Bhattacharyya. Dy. Magistrate & Dy. Director, Paschim Medinip	26/8/14
04.	Sri. K. Sahoo. Asst. Environmental Engineer, W.B.P.C.B.	26.08.14
05.	Sri Nepal Singh, Sabhapati, Salboni Panchayet Samity	Nepal Singh
06.		26/8/14

Other Persons & Govt officials Present in The Public Hearing on 26.08.2014 at 12:00 Hrs.

SL NO.	Name of the Persons with Address	Signature
1.	Kashinath Mahato, Bokiband	[Bengali signature]
2.	Romesh Chalok, Kulpani	Ramesh Chalak
3.	Lakhikanto Mana, Kalagram	Lakshmi Kanta Mana
4.	Dasarath Mahata, Minga	Dasarath Mahata
5.	Samir Mahato, Asnasuli	Samir Mahata
6.	Aditya Mahato Asnasuli	Aditya Mahata
7.	Pariskar Mahato, Asnasuli	Pariskar Mahato
8.	Dipak Mahato, Srikrishnapur	Deepak Mahata
9.	Monobilash Mahato, Asnasuli	Manobilas Mahata
10.	Jagonath Mahato, Asnasuli	Jaganath Mahata
11.	Chandan Kayorali, Salboni	Chandan Kayali
12.	Soumokanti Saha, Salboni	Saumya Kanti Saha
13.	Shambu Charan, Ramraidhi	Shambhu Soren
14.	Tarapada Mahato, Srikrishna Pur	[Bengali signature]
15.	Amit Banerjee, Salboni	Amit Banerjee
16.	Sudha Roy, Bhadutola	[Bengali signature]
17.	Gautam Karmakar, Khandi band	[Bengali signature]
18.	Lakhan Das, Khandi band,	Lakhan Das.
19.	Dipankar Pan, Chandavila	Dipankar Pan
20.	Dayal Ch. Mahato, Asnasuli	Dayal Ch. Mahato
21.	Chandan Saha, Jambedia	Chandan Saha
22.	Saku Sing, Baskopra,	Sakhi Singh
23.	Shaymal Pal, Anandapur,	Shyamal Pal.
24.	Chandan Mana, Jambedia	Chandan Mana
25.	Raju Sheet, Jambedia	Raju Shit
26.	Thaneswar Mahato, Asnasuli	Thaneswar Mahato
27.	Nisith Mahato, Pachagoa	Nisith Mahato
28.	Chaton Mahato, Asnasuli	Chetan Mahata
29.	Bolanath Halder, Arabari	Bholanath Halder
30.	Mongal Saren, Dandghuta	[Bengali signature]
31.	Indra Hasda, Bhabar Kala beria	[Bengali signature]
32.	Baidhyanath Murmu, Natundhi	Baidyanath murmu

Other Persons & Govt officials Present in the Public Hearing on 26.08.2014 at 12:00 Hrs.

SL NO	Name of the Persons with Address.	Signature
33.	Panchanan Hembrom, Boskopra.	[Bengali signature]
34.	Subash Ray, Ranraidhi	Subhas Roy
35.	Ajit Mahato, Sri Krishnapur.	AjitMahata
36.	Chetan Mahato, Asnasuli	Chetan Mahato
37.	Nisith Mahato, Paitapua	Nisith Mahato
38.	Dhaneswar Mahato, Asnasuli	Dhaneswar Mahato
39.	Binoy Santra, Asnasuli	Binoy Santra
[illegible]	Ramakanto Ghosh, Dainmari	Ramakanta Ghosh
41.	Biswarup Ghosh, Dainmari	BISWARUP GHOSH
42.	Lakhikanto Bhuiya, Metal,	Lakhi Kanta Bhuiya
43.	Kousik Bhattacharya Salboni.	K. Bhattacharjee
44.	Sandip Singha, Salboni	Sandip Singha
45.	Karmu Hasda, Bandhghuta	Karmu Hasda
46.	Kousik Dolui, Bakibandh	Kousik Dolai
47.	Mrinal Kayorhi, Salboni	Mrinal Kayoree
48.	Raghunath Acharya, Sitadhi	Raghunath Acharya
49.	Jagannath Dutta, Sitadhi	[Bengali signature]
[illegible]	Sanjay Acharya, Sitadhi	Sanjoy Acharya
[illegible]	Arun Roy, Sitadhi	ARUN ROY
52.	Swapan Pal, Sitadhi	Swapan Pal
53.	Sudip Mana, Jambedia	Sudip Mana
54.	Lalta Kaji, Kotka	Lalta Kaji
55.	Sankar Thakur, Kalkata	[Bengali signature]
56.	Avijit Gorai, Borakuli	Avijit Gorai
57.	Shiba Prasad Mahata	Shiba Prasad Mahata
58.	Laxmi Kanta Dutta.	Laxmi Kanta Dutta
59.	Sanitha Acharya, Srirampur	S. Acharya
60.	Krishna Patra, Karnagar.	Krishna Patra
61.	Sahadeb Mahato/Asnasuli	[illegible]
62.	Amit Kumar Mahato (Asnasuli).	[illegible]
63.	Sujit Dolai, Pattra Juri	Pattra Juri S. Dolai
64	[Bengali text]	[Bengali signature]

Other Persons & Govt officials Preasent in the Public Hearing on. 26.08.2014 at 12:00 Hrs.

Sl NO.	Name of the Persons with Address	Signature
65	Satyen Mahata, Asnasule	Satyen Mahata
66.	[illegible] [illegible]	[illegible]
67.	[illegible] [illegible]	[illegible]
68.	[illegible] [illegible]	[illegible]
69.	Bablu Hansda - Bandh Ghutu	Bablu Hansda
70.	[illegible] - [illegible]	[illegible]
71.	[illegible] - Khairisole	[illegible]
72.	[illegible] Chapadar	[illegible]
73.	[illegible] [illegible]	[illegible]
74.	Dulal Bhunia - Banskopna	Dulal Bhunia
75.	Chunilal Murmu Banskopra	Chunilal Murmu
76.	[illegible] [illegible]	[illegible]
77.	[illegible] [illegible]	[illegible]
78	[illegible] [illegible]	[illegible]
79.	Iswar Hansda Arabari	Hsda
80.	[illegible] [illegible]	[illegible]
81.	~~Iaaruk~~ ~~[illegible]~~ mod. Salboni	[illegible]
82.	Jyotip Prasad Mahato - Kuldiha to - Pirakata	[illegible]
83.		
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सत्यमेव जयते

Salboni Pvt. Industrial Training Institute

Affiliated to : NCVT Govt. of India, DIT Govt. of West Bengal
Vill.-Bankibandh, P.O.-Seyedpur, P.S.-Salboni, Dist.- Pschim Medinipur, PIN-721 147
Contact- 9679243570 / 9735226161 / 09830022065
Email-salboni.itc@rediffmail.com Website : www.salbonipiti.org
AN ISO : 9001 - 2008 Certified Organization

Ref. : SPITI- 980 */2017* *Date -* 20/1/2017

To
The Project Manager
JSW BENGAL STEEL LTD.
Salboni Project
Salboni, Paschim Medinipur

Subject: Handing over of Pending Training Certificate

Kind Atten. Mr. Aloke Bhattacharya
Sir,

We had received worked order as per your P.O No-4800000200 Dated-21/02/2013 from you to impart technical training in Bascic Welding Arc(FAB 102), Turning (MAN 101), Milling (MAN 103) trades, these 3 courses are approved by NCVT(National Council of Vocational Training) & Conducted by DGE&T (The Director of General of Employment & Training) Govt. of India.

Total 33 nos of trainees took the above training and were given due certificate. However certificate of 11 trainees for Basic Welding Arc (FAB 102) course could not be handed over due to certain administrative problem beyond our control.

We expect to resolve this issue very shortly and handover the certificate by July 2017after this 11 nos of trainees complete this course as fresh.

Thanking You

Yours ever

Sudhin Chakraborti 20/1/17

SUDHIN CHAKRABORTI
(SUPERINTENDENT, SALBONI PVT. ITI)

Estd-2011 Salboni

Superintendent
Salboni Pvt. ITI
Bankibandh, Salboni, Paschim Medinipur
for Director
Salboni Pvt. Industrial Training Institute
Vill.- Bankibandh, P.O.- Sayedpur, P.S.- Salboni
Dist.- Paschim Medinipur, Pin - 721149, W.B.

QUESTIONNAIRE FOR ENVIRONMENTAL APPRAISAL
(THERMAL POWER SECTOR PROJECTS)

Note 1: All information given in the form of annexures should be part of this file itself. Annexures as separate files will not be accepted.

Note 2: Please enter x in appropriate box where answer is Yes/No

I. General Information

A. Name of the Project : Supercritical Thermal Power Project at Salboni
B. Generation capacity (MW) : 1 x 660
C. Location :

Village	Tehsil	District	State
Salboni		West Medinipur	West Bengal

D. Geographical Information

1. Latitude : 22°33'22.87" to $22^0$34'47.16"N
2. Longitude : 87°17' 59.49" to $87^0$19'11.47" E
3. Elevation above Mean Sea Level (metres) : 39 to 58 m
4. Total Area envisaged for setting up of project (in ha.) : 144
5. Nature of terrain (hilly, valley, plains, Coastal plains etc.) : Elevated Plateau
6. Nature of Soil (sandy, clayey, silty loam etc. with permeability in cm/sec) : Predominantly Clayey
7. Permeability (cm/sec) (Coefficient of Permeability) : -

E. Alternate sites considered : 1.
2.
3.

F. Reasons for selecting the proposed site on comparative evaluation on environmental consideration. : The Power Plant would be set up within the identified land of 4335 acres (1755 hectares) for the 3.0 MTPA ISP and 300MW CCP, which have been accorded environmental clearance by MoEF, GOI

II. Current land usage of the proposed project site Area (in hectares)

A. Notified Industrial Area/Estate :

	B. Agricultural		
	1. Irrigated 2. Unirrigated }	: :	14.4
	C. Homestead	:	
	D. Forest	:	
	E. Grazing	:	
	F. Fallow	:	129.6
	G. Mangroves	:	
	H. Marshes	:	
	I. Others (please specify)	:	
	Total	:	144
III.	**Is the proposed site located in a low-lying area**	**:**	Yes [ ] No [X]
	If yes,		
	A. Level before filling (above MSL, in. metres)	:	-
	B. Level after filling (above MSL in metres)		Quantity of Fill materials required: - ; Source: -
	C. Does the project involve land preparation/reclamation	:	Yes [ ] No [X]
	If yes provide details	:	-
IV.	**Please indicate area earmarked for each of the following (in ha.)**		
	A. Plant Facilities	:	27.2
	B. Ash Disposal	:	34.0
	C. Storage (Fuel)	:	6.4
	D. Storage (Water)	:	17.6
	E. Storage (Hazardous Waste)	:	-
	F. Storage (Hazardous Chemicals)	:	-
	G. Storage (Others)	:	-
	H. Approach Road(s)	:	-
	I. Township	:	12.0
	J. Green Belt	:	16.8
	K. Others (Please specify)	:	30.0
	Total	:	144.0

V. Proximity to sea/water bodies :

	Sea	Other Water bodies like River/creek/lake etc.(Please specify)
Distance of site* boundary (in m)	-	4.6 km from Parang River
Distance of plant facilities (in m)	-	-

* *From highest flood line/high tide line*

VI. Whether any of the following exist within 7 km. of the periphery of the project site. If so, please indicate aerial distance and the name of the eco-system as given under the Table. :

S.No		Name	Area falling within 7 km periphery of project (ha.)	Aerial Distance (in km.)
1.	National Park/Wildlife Sanctuary	-	-	-
2.	Tiger Reserve/Elephant Reserve/Turtle Nesting ground	-	-	-
3.	Core Zone of Biosphere Reserve	-	-	-
4	Habitat for migratory birds	-	-	-
5	Lakes/Reservoir/Dams	-	-	-
6	Stream/Rivers	Parang River	-	4.6 km
7	Estuary/Sea	-	-	-
8	Mangroves	-	-	-
9	Mountains/Hills	-	-	-
10	Notified Archaeological sites	-	-	-
11	Any other Archaeological sites	-	-	-
12	Industries/Thermal Power Plants	Orissa Cement Ltd & Salboni Mint	-	4.0 km
13	Defence Installation	-	-	-
14	Airports	-	-	-

If located within limits of municipal bodies, please confirm.
From National/ State Highways and railway lines, distance of 0.5 km should be maintained.
If located in the landing funnel of the airport, clearance from Airports Authority of India should be obtained.

VII. Description of the flora/vegetation within 7 km under following headings

A.	Agricultural crops	:	Phanerophytes, Therophytes, Hydrophytes, Hemicryptophytes and Geophytes
B.	Commercial crops	:	
C.	Plantation	:	
D.	Natural Vegetation/Forest Type	:	*Acacia Arabica* (Babul), *Arotocarpus integrifolia* (Kathal), *Azadir achta indica* (Neem)' *Butea frondosa* (Palas), *Casearia tonensa* (Beri), *Albizzia lebbek (*Siris).
E.	Grass Lands	:	-
F.	Endangered species	:	-
G.	Endemic species	:	-
H.	Others (Please specify)	:	-

VIII. Description of fauna (non-domesticated) within 7 km under the following headings

A.	Total listing of faunal elements	:	Domestic Animals, Mammals (elephant, monkey) and reptiles present
B.	Endemic fauna species	:	-
C.	Endangered species	:	-
D.	Migratory species	:	-
E.	Route of migratory species of birds and mammals	:	-
F.	Details of aquatic fauna (if applicable)	:	45 species of phyto and zooplankton species are present

IX. Meteorological Parameters

A. Seasonal – Monitoring Data (continuous monitoring for one full season except monsoon should be carried out) : December, 2013 – March, 2014

1. Temperature (in ^{0}C)

a)	Maximum	:	28.56
b)	Minimum	:	18.87
c)	Mean	:	23.72

2. Rain fall (in mm) :

a)	Maximum	:	0
b)	Minimum	:	0
c)	Mean	:	0

3. Mean value of humidity (in %) : 77.56

4. Inversion occurrence

a)	In percentage	:	
b)	Height in meters		

5. Seasonal wind-rose pattern (16 points on compass scale) : Refer Exhibits-5.2.3 to 5.2.6, Section-5.2, Chapter 5 of EIA Report.

B. Hourly Mean Meteorological data (based on postmonsoon season data collected at site required as input for air quality modelling). : Date: 27.01.2014 To 28.01.2014

Time(Hr.)	WS (m/sec.)	WD	Temp. [^{0}C]	RH [%]	RAIN [mm]
10:00	3.10	27	19.5	81	0
11:00	2.90	18	20.5	81	0
12:00	3.30	24	22.0	74	0
13:00	3.00	21	23.0	71	0
14:00	3.20	30	24.5	64	0
15:00	3.10	24	24.5	64	0
16:00	2.60	18	24.0	60	0

Time(Hr.)	WS (m/sec.)	WD	Temp. [^{0}C]	RH [%]	RAIN [mm]
17:00	2.10	15	22.5	66	0
18:00	C	-	20.5	73	0
19:00	C	-	19.0	81	0
20:00	C	-	17.0	85	0
21:00	C	-	16.0	84	0
22:00	C	-	15.5	78	0
23:00	C	-	15.5	78	0
00:00	1.60	21	15.0	78	0
01:00	1.30	15	15.0	78	0
02:00	C	-	14.0	83	0
03:00	C	-	13.5	88	0
04:00	C	-	13.5	88	0
05:00	C	-	12.5	88	0
06:00	1.60	15	13.0	88	0
07:00	2.10	18	13.0	88	0
08:00	3.10	24	13.5	88	0
09:00	3.30	21	16.0	79	0

X. Ambient Air Quality Data
[Frequency of Monitoring should be as per guidelines of CPCB and monitoring should cover one full season (excluding monsoon)]

A. Season and period for which monitoring has been carried out : December, 2013 to March 2014

B. Frequency of sampling : The monitoring was carried out for a three month period (December, 2013 – March, 2014) at a frequency of twice a weak at each station adopting a continuous 24 hour schedule.

C. Number of samples collected at each site :

Date, Time & Location	Wind direction & Speed	24 hourly concentration as monitored (in $\mu g/m^3$.) (Average)		Permissible Standard(As per EPA/SPCB consent) ($\mu g/m^3$)	Remarks (Name of the instrument and sensitivity)
December, 2013 to March,2014	-	PM_{10}	55-66	100	Respirable Dust Sampler APM 460 of Envirotech Instruments.
		$PM_{2.5}$	24-26	60	
		SO_2	<6.94	80	
		NO_x	<20	80	
		O_3	<10	100	
		Mercury	<0.069	-	

	D..	24 hourly concentrations (in : $\mu g/m^3$)				
		Pollutant(s)	Maximum	Minimum	Mean	98%
		$PM_{2.5}$	36	20	25	33
		PM_{10}	78	51	60	77
		SO_2	BDL	BDL	BDL	BDL
		NO_x	BDL	BDL	BDL	BDL
		CO	BDL	BDL	BDL	BDL
	E.	Specific air pollution issues in the project area. :	i) Orissa Cement Ltd. ii) Salboni Mint iii) Vehicular Traffic			

XI. Water Requirements (cum/day)

Purpose	Avg Demand	Peak Demand	Source	Type Treated/ Untreated/Fresh/ Recycled	Remarks
A. Project					
1. Process	-	1935		-	
2. Cooling Water	-	43440	Rupnarayan River	-	
3. DM Water	-	1032		-	
4. Dust suppression	-	-	-	-	-
5. Drinking	-	8	-	-	-
6. Green belt	-	850	-	-	-
7. Fire Service					
8. Others (Pl. specify)	-	-	-	-	-
B. Township					
1. Green Belt	-	105	-	-	-
2. Drinking	-	150			
3. Others (pl. specify)	-	-	-	-	-
C. Total	-	47520			

XII. Source of Raw Water Supply :

S.No	Source	Cu.m./hr	Cu.m./day
1	Sea		
2	River	1980	47520
3	Groundwater		
4	Other surface water bodies (Please specify)		

XIII. **Lean Season flow in case of surface water source (cusecs/cumecs)** : The water requirement of the plant is 10.5 MGD, whereas water allocation of 45 MGD from River Rupnarayan has been received from Irrigation and waterways Department, GoWB

XIV. **Groundwater**

A. Recharge Rate : -

B. Withdrawal rate : Nil

C. Ground water level (metres)

1. Premonsoon : 3-5 m bgl
2. Postmonsoon : 1-2 m bgl

XV. **Competing Users of the Water Source** : **-**

S.No	Usage	Present Consumption (cu.m/day)		Addition Proposed as per local plan (cu.m./day)		Total (cu.m./day)	
		Surface	Ground	Surface	Ground	Surface	Ground
1	Irrigation			-			
2	Industry						
3	Drinking			-			
4	Others (Please specify)	-		-		-	
Total							

XVI. **Physico chemical analysis of Raw Water at intake point** : -

XVII. **Physico chemical analysis of treated water to be used in project/township.** : Would conform to the Boiler Standards and Drinking Water Quality Standards

XVIII. **Waste Water Management**

A. Description of waste water treatment plan with flow chart

1. Coal storage : 1. Settling/Sedimentation Basins
2. Other than coal storage : 2. Neutralisation pit for pH adjustment
   3. Sewage treatment plant
   4. Oil Separators
   5. Central Monitoring Basin

B. Composition/characteristics of discharge stream(s) before and after treatment :

S.No.	Item	Characteristics	
		Before Treatment	After Treatment
1.	DM Plant Waste	Wide variation in pH	Neutral pH
2.	Boiler Blowdown	Slightly alkaline	Neutral pH
3.	Coal Handling Plant Waste	Excess suspended solids	Suspended solids less than 100 mg/l

S.No.	Item	Characteristics	
		Before Treatment	After Treatment
4.	Ash Handling Plant Waste	Excess suspended solids	Suspended solids less than 100 mg/l
5.	Sanitary Waste	High BOD content	BOD less than 30 mg/l

C. Daily discharge (cu.m./day) from different sources

1.	Cooling	:	} NIL
2.	Processing	:	
3.	D.M. Plant effluent	:	
4.	Domestic	:	
5.	Others (specify)	:	
6.	Total	:	

D. Quantity of Water recycled

1.	In %	:	15.66	} Wastewater
2.	In cum/day	:	7440	

E. Details of recycling mechanism : All treated water will be collected in the guard pond for further use. From the guard pond part of water would be reused for coal handling system, ash handling system, plant washing and the remaining water would be supplied to effluent treatment plant and consequently reclaimed water will be recycled to the raw water reservoir.

F. Mode of final discharge/ disposal of treated effluent : Not Applicable as the plant is based on 'Zero Discharge Concept'

S.No	Mode	Length (in m)	Quantity (in cum/day)
1	Open Channel	N.A	N.A
2	Pipeline	N.A	N.A
3	Others (Please specify)	N.A	N.A
Total			

G. Point of final discharge: :

S.No.	Final Point	Quantity (in cu.m/day)
1.	Green belt within the plant/township	-
2.	Agricultural land	-
3.	Fallow Land	-
4.	Forest Land	-
5.	River/Stream : River Ganga	-
6.	Lake	-
7.	Estuary	-
8.	Sea	-
Total		-

	I.	Lean season flow rate in case of discharge in a river/stream (cusecs/cumecs)	:	
		1. Human	:	
		2. Irrigation	:	
		3. Industry	:	
		4. Others (pl. specify)	:	Not Applicable
	K.	Analysis of river water 100 metres upstream of discharge point and 100 metres downstream of discharge point (except in rainy/ monsoon season) along with details of aquatic life.	:	Not Applicable
	L.	What is the predicted impact on water quality of the receiving body due to discharge? (Briefly state the prediction tool adopted)	:	As the Plant is based on 'Zero Discharge Concept', no impacts on surface water quality and aquatic ecology are anticipated

XIX. Quantity of fly ash/residue produced per day (tonnes) :

			Dry	Wet
A.	Fly Ash	:	576	
B.	Bottom Ash	:	144	
C.	Others, pl. specify	:	-	-
Total		:	720	

XX. Solid Waste Management

A. Details : -

			Source	Qty (TPM)	Form
1.	Raw Water treatment Plant	:			
2.	ETP				
3.	Process				
4.	Others (pl. specify)				

B.	If waste(s) contain any hazardous/toxic substance/ radioactive materials or heavy metals, provide data and proposed precautionary measures	:	The wastes do not contain any hazardous or toxic substances.
C.	What are the possibilities of recovery and recycling of wastes?	:	The fly ash would be made available to the user industries.

	D. Possible users of Solid Waste (s).	:	OCL India Ltd, a cement manufacturing plant has agreed to utilize the dry fly ash.
XXI.	**Method of disposal of solid waste(s)**		
	Method		Quantity (TPM)
	A. Landfill	:	21,600
	B. Incineration	:	-
	C. Recovery	:	-
	D. Downstream users		-
XXII.	**Please indicate the methods used for handling ash**		
	A. Collection	:	The ash is proposed to be evacuated and stored in silos in dry form.
	B. Transport	:	Fly ash will be transported from fly ash silo to ash mound area located inside the plant boundary by covered trucks with conditioned ash
	C. Disposal	:	The ash would be disposed in the ash disposed site, about 450 m away from the plant.
XXIII.	**Utilisation of Ash (tonnes per day)**		
	A. Proposed Use	:	-
	1. Bricks	:	
	2. Cement	:	X
	3. Road Construction	:	
	4. Landfill	:	
	5. Soil amendment	:	
	6. Others specify	:	
	B. In case of landfill	:	
	1 Is solid amenable for landfill?		Yes [X] No [ ]
	2. Dimensions of landfill	:	800m x 500m
	3. Life of landfill (years)	:	30 years
	4. Proposed precautionary and mitigation measures along with design features.	:	All necessary safety precautions covering stability, drainage, foundation treatment, etc would be adopted during the design and construction stage and regular inspection and maintenance would be carried out in the operation stage
	C. Indicate the phased programme for utilisation of fly ash (Number of years for full utilisation, area etc)	:	4 Years

XXIV. Noise Pollution Control and Management

A.	Source	:	Turbines generators, Compressors, Pumps, Fans, Coal Handling Plants.
B.	Level at source (dB)	:	90 dB(A)
C.	Level at project boundary(dB)	:	35 dB(A)
D.	Abatement measures (give source-wise details)	:	Acoustic enclosures as designated area, silencers for air intake systems and exhaust stacks and personal protection equipments such as helmets, ear plugs for workers would be provided.

XXV. Fuel Requirements

A. Details of Fuel used :

S. No.	Fuel	Daily Consumption (TPD)		Calorific value	% Ash (Max)	% Sulphur (Max)
		Existing	Proposed	(Kcal/kg)		
1.	Gas	-	-	-	-	-
2.	Naptha	-	-	-	-	-
3.	HSD	-	-	-	-	-
4.	Fuel Oil	-	-	-	-	-
5.	Coal	-	6027	5030	12	0.8
6.	Lignite	-	-	-	-	-
7.	Other (Please specify)	-	-	-	-	-

B. Source of fuel (distance in km) :

1. Port :
2. Mine : Imported Coal principally from Indonesia.
3. Refinery :
4. Storage Depot/ Terminal :

C. Mode of Transportation of fuel to site :

1. Trucks (numbers/day) :
2. Pipeline (length in km) :
3. Railway wagons (numbers/day) : X

XXVI. Coal handling and dust suppression : Give details of dust suppression/collection equipment for reducing pollution from coal fines and other fugitive emissions from coal handling

A.	Wagon tippling	:	Dust suppression and extraction systems would be installed at all fugitive dust generation points in the plant.
B.	Conveyer transfer points	:	
C.	Storage	:	
D.	Crushing mills	:	
E.	Bunker filling	:	
F.	Other (pl. specify)		

XXVII. Emissions and Stack details

A. Flue gas characteristics : (SPM, SO_2, NO_x) (For one 660 MW Module)

S.No	Pollutant	Source of Emission	Emission rate kg/hr	Concentration in flue gas(g/m^3)
1	SPM	Coal Burning	226.77	0.07
2	RPM	-	-	-
3	SO_2	Coal Burning	4018	1.263
4	NO_x	Coal Burning	2400	0.754

B. Size distribution of SPM at the top of the stack :

S.No.	Range	% by weight
1	Micron	-
2	1-10 Micron	-
3	10-20 Micron	-
4	<20 Micron	-

C. Stack emission details

- Frequency of stack emission monitoring as per CPCB guidelines : Not applicable.

- Emission rate for each pollutant (kg/hr) (For one 660 MW Module)

S. No	Stack Attached to	Stack Height (m)	Stack Internal diameter (m)	Temp. of exhaust gases (deg K)	Exit Velocity (m/sec)	SPM (Kg/hr)	SO_2 (Kg/hr)	NO_X (Kg/hr)	Heat emission rate (in kcal/hour)
		275	7.50 m at flue top	418	20	226.77	4018	2400	1.86×10^8

Equipment used for stack monitoring should be indicated : Not applicable.

XXVIII. Predicted impact on air quality : (as per CPCB Guidelines for conducting the air quality modeling)

Impact Assessment (Maximum Resultant Concentration) :

Parameter	Baseline (98% le)	Increment (Max)	Resultant
SO_2	6.94	44.14	51.08
NO_x	20.0	27.61	47.61

Impacts : Air Quality (Monitored Locations) : Resultant Concentrations ug/m^3 due to Incremental Ground Level Concentrations (Sulphur Dioxide)

Location	98-Percentile AAQ Concentration	Incremental Concentrations	Resultant Concentrations
AQ1	6.94	44.14	51.08
AQ2	6.94	44.14	51.08
AQ3	6.94	44.14	51.08
AQ4	6.94	44.14	51.08

On 24 hourly basis, in ug/m^3

Impacts : Air Quality (Monitored Locations) : Resultant Concentrations ug/m^3 due to Incremental Ground Level Concentrations (Nitrogen Oxide)

Location	98-Percentile AAQ Concentration	Incremental Concentrations	Resultant Concentrations
AQ1	20.0	27.61	47.61
AQ2	20.0	27.61	47.61
AQ3	20.0	27.61	47.61
AQ4	20.0	27.61	47.61

On 24 hourly basis, in ug/m^3

Impacts : Air Quality (Monitored Locations) : Resultant Concentrations ug/m^3 due to Incremental Ground Level Concentrations (Suspended Particulate Matter) : -

Location	98-Percentile AAQ Concentration	Incremental Concentrations	Resultant Concentrations
AQ1	-	-	-
AQ2	-	-	-
AQ3	-	-	-
AQ4	-	-	-

On 24 hourly basis, in ug/m^3

XXIX. Storage of chemicals : (inflammable/explosive/hazardous/toxic substances)

S. No	Name	Number of Storages	Capacity (TPD)	Physical and Chemical Compos-tion	Consump-tion (in TPD)	Maximum Quantity of storage at any point of time	Source of Supply	Means of transport-ation
1	HFO	2	1500 m^3 each	-	13.46	3000 m^3	Public Sector Oil Company	By road through Tankers
2	LFO	1	1000 m^3	-		1000 m^3		

XXX.	**Occupational Health and Industrial Hygiene.**		
	A. What are the major occupational health and safety hazards anticipated. (Explain briefly).	:	Heat exposure, exposure to dust, snake bites & dengue are the occupational health & safety hazard.
	B. What provisions have been made/proposed to be made to conform to health/safety requirements. (Explain briefly).	:	The JSWEBL operates an occupational health centre at its project site at Salboni to cater for the health needs of its employees and workforce engaged in project development service. The OHC has served already a total of 18153 patients. The OHC operates a pharmacy and medicine is disposed free of cost.
	C. Details of personal protective equipment provided/to be provided to the workers	:	Adequate personnel protection equipment (helmets, ear plugs etc) would be provided.
	D. Details of proposed measures for control of fugitive emission/odour nuisance from different sources.	:	Dust suppression and dust extraction systems would be installed at strategic location for control of fugitive emission.
	E. Details of fire protection and safety measures envisaged to take care of fire and explosion hazards	:	All necessary fire protection equipments would be installed at appropriate locations.
XXXI.	**Green Belt Plan**		
	A. Total area of project/ township (in ha.)	:	132/12
	B. Area already afforested (for existing projects), in ha	:	N.A.
	C. Area proposed to be afforested (in ha.)	:	16.8 ha (33% of Main Plant Area) 50 M wide green belt with plant sampling pits at about 2.0 m to 3.0 m intervals will be developed along the periphery of the project boundary. Tree density will be 1500 trees per ha.
	D. Plant species proposed		
	1. Indigenous 2. Exotic	: :	*Arotopcarpus heterophyllus* (Kathal), *Azarichata Indian* (Neem), *Butea sp* (Palas), *Syzygium cumini* (Jamun), *Magnifera indica* (Mango), *Polyalthia longifolia* (Ashok)
	E. Width of green belt (minimum, in metres)		
	1. Along plant boundary 2. Roads and avenues within the plant 3. Ash Dike 4. Township 5. Other ornamental, garden spaces, commercial plantation etc	: : : : :	50 - - - -

	F. Trees planted & Proposed			Nos	Survival Rate
	1.	Planted	:	N.A	N.A
	2.	Proposed	:	41,000	
	3.	List of species planted	:	**Scientific Name**	**Common Name**
				Acacia mangium	Mangium
				Albizzia Lebbek	Siris
				Artocarpus heterophyllus	Kathal
				Azadriachta indica	Neem
				Butea sp	Palas
				Dalvergia sisoo	Shisham
				Leucaena leucocephala	Subabool
				Pithecolonium dulce	Junglee jilebi
				Polyalthia longifolia	Drupping Ashok
				Pongamia pinnata	Karani
				Syzygium cuminii	Jamun
				Tectona grandis	Teak
XXXII	**Construction Phase**				
	A.	Estimated duration of construction in months	:	42	
	B.	Number of persons to be employed for construction			
	1.	Peak	:	Several thousand.	
	2.	Average	:	-	
	C.	What provision has been made for the sewage treatment for the construction workers?	:	The labour colonies would be provided with suitable infrastructure facilities.	
	D.	How the fuel (kerosene/ wood, etc.) requirement of labour force will be met to avoid cutting of trees from the adjoining areas	:	Fuel would be provided to the labour force.	
	E.	Proposed Health care Measures with emphasis on protection from endemic diseases.	:	Provision of free healthcare services to the rural people of Salboni was started by JSW with start of the project and has continued uninterrupted through challenging circumstances. To avoid endemic disease easy access to potable water was one of the needs of the community, identified by CSR team. The company has taken initiatives to install a number of hand pumps in neighbouring villages to ensure availability of safe drinking water. The onus of repair of these hand pumps is on the local community. Besides, toilets were constructed at local schools as a part of sanitation programme	

F. Educational and other social welfare measures proposed. : JSW is supporting social and community initiatives including providing monetary and financial support to Hostels in the neighboring villages. 56 boys and girls from Primitive groups are lodged at three hostels run by Yogacharya Vivekananda Seva Samiti. The students are showing remarkably good results with most of them obtaining A, A+ grading at school examinations

: Interaction with village communities and Gram Panchyats by PR/CSR team members has highlighted the scarcity of qualified teachers to teach three subjects viz. Mathematics, Science and English for 8-10th standard students. The local children, mostly from the backward community, need additional coaching to grasp these subjects. The Company is providing 'Tuition Classes' two to three times a week for 8th- 12th standard on elementary English, and 8th- 10th standard for Mathematics. About 240 students are availing this facility

XXXIII. Human Settlement (year 2011 Population)

	Aerial distance from the periphery of the site		
	Upto 500m from periphery	500 m to 3000 m from the periphery	3000 m to 7000 m from the periphery
Population	274	9,601	43,890
Number of Houses	52	1,820	8,321
Present Occupational Pattern	Cultivation and agricultural	Cultivation and agriculture	Cultivation and agriculture.

XXXIV Rehabilitation & Resettlement : Plan (Wherever applicable)

A. Village(s) affected by the project : No land acquisitioin and R&R are involved as the project is situated within the land, already acquired for the Integrated Steel Plant Project

S.No.	Village (Tribal/Others)	Population	Occupation	Average Income per annum

B. Population to be displaced :

S.No.	Name of Village	Population		
		Land oustees only	Homestead Oustees only	Land and Homestead oustees

C. Salient features of Rehabilitation Plan for oustees :

1. Site where the people are proposed to be resettled : NA

	2.	Facilities proposed at the resettlement site	: NA
	3.	Compensation package	: JSW has already provided compensation packages to the farmers as approved by GoWB,who have given land for the project
	4.	Agency/Authority responsible for their resettlement	: NA

XXXV. Pollution Control Aspects :

A. Details of Pollution Control System :

S.No	Control system for	Existing	Proposed to be installed
1	Air	N.A.	a) 1 No. 275 m tall stacks b) Space provision for FGD system c) High efficiency ESPs d) DS & DE systems e) Greenbelt
2	Water	N.A	a) Cooling towers b) Neutralisation pit c) STP d) Oil & grease separators e) Ash water recirculation f) Sludge treatment & disposal systems
3	Noise	NA	a) Acoustic enclosures and personnel protection equipments
4	Solid Waste	NA	a) Disposal of bottom ash and fly ash in the form of slurry into ash pond.

B. Efficiency of each pollution control equipment/system installed for the existing units :

S.No	**Name of the System/ Equipment**	Design Efficiency %	Present Working efficiency %
1	ESPs	99.98	N.A

XXXVI. Expenditure on Environmental Measures

A. Capital cost of the project (as proposed to be approved by the funding agency/ financial institutions) (Rs. Lakhs) : Rs. 4,60,000

B. Cost of environmental protection measures (Rs. Lakhs) : Rs. 32,200

S.No		Recurring Cost per annum	Capital Cost
1	Air Pollution Control		
2	Water Pollution Control		
3	Noise Pollution Control		
4	Environment Monitoring and Management		
5	Reclamation borrow/mined area		
6	Occupational Health		
7	Green Belt		
8	Others (Pl. Specify) (Ash management, control of fire and explosion, rehabilitation & resettlement).		

C. Details of organizational set up/cell for environmental management and monitoring : An Environmental Monitoring Group (EMG) would be established at the project, consisting of chemists, scientists, field assistants, with a fullfledged laboratory to carry out the environmental monitoring programme. (Refer Chapter-10 of EIA Report).

D. Details of community welfare/peripheral development programmes envisaged/being undertaken by the project proponent : JSW has carried out Socio-economic Study and Skill Mapping Survey of the neighboring villages with a view to ascertain the actual developmental requirements of the people in the area which covered 26 villages / hamlets in and around the project area covering a population of approximately 25000 people.

Another Baseline survey was conducted to assess the needs of the persons in Project affected area (PAA) conducted by Rural Development Authority, Midnapore, based on which the following thrust areas have been selected by the Company to drive benefit activities which shall be implemented in a phased manner :-

Environment - Drinking Water Supply, and Sanitation
Health Services- primary healthcare intervention, and preventive measures (by awareness campaigns).
Education- Supplement govt. education schemes at local schools
Education- Supplement govt. education schemes at local schools
Livelihood generation.
Developmental activities like village roads, drainage, culverts, and rainwater management

XXXVII. Public Hearing Details :

A. Date of Advertisement : 25^{th} July,2014

B. Newspapers in which the advertisement appeared (with copies) : The Telegraph & Anandabazar Patrika

C. Date of Hearing : 26^{th} August, 2014

D. Panel Present :
1. Sri R Arjun, IAS, Additional District Magistrate, West Medinipur
2. Sri S Ganguly, Environmental Engineer, WBPCB

3. Sri Aloke Bhattacharje, Associate Vice Prresident, Projects, JSW
4. Sri Nepal Singh, Sabhapati, Salboni Panchayet Samity
5. Sri S Barman, Environmental Engineer, Haldia Regional Office, WBPCB
6. Sri K Sahoo, Environmental Engineer, WBPCB.

E. List of public project along with address and occupation : About 80 residents of neighbouring villages

F. Summary/details of public hearing report :

Sl. No.	Name and address of the public present	Questions raised/ suggestions/ agenda	Response / Replies of Project Proponent
1.	Sri Chandan Manna, Village Jambedia	Stated that the villagers are helping and shall continue to help in future but the benefits from the proposed project specifically for the local people should be explained to them.	It was assured that the project will generate direct and indirect jobs to local people. It will also impart entrepreneural skills to start small businesses. JSW will provide the promised jobs to landgivers as and when the project starts functioning. All local issues as medical facility and other CSR activities will be implemented through dialogues with the local authorities keeping in view the needs of the community.
2.	Sri Deepak Mahato, Village Asnasuli	Demanded further improvements of medical facilities extended to villagers under CSR Programmes of the Company. He further requested the project proponent to fulfil other commitments like skill development for local unemployed youth, supply of potable water to the local villages, improvement of road conditions and sanitation facilities of the area, extend help to the local schools etc. He further requested the JSW authorities to ensure that proper rehabilitation is provided to the land losers.	This point has already been responded to earlier.
3.	Sri Tanmoy Saha, Village Jambedia	Expressed his grievances about no of commitments made long back regarding issues related to local developments. He reques-ted the JSW authorities to initiate efforts immediately for providing better medical facilities for the local villagers,	It was assured that the project will generate direct and indirect jobs to local people. It will also impart entrepreneural skills to start small businesses. JSW will provide the promised jobs to landgivers as and when the project starts functioning. All local issues as medical facility

	Sl. No.	Name and address of the public present	Questions raised/ suggestions/ agenda	Response / Replies of Project Proponent
			generate employment for the local residents, supply of potable water to the local villages and improvement of road conditions of the area; Sri Saha also requested the project proponent to start activities like football camps to improve overall sporting environment for the local youth.	and other CSR activities will be implemented through dialogues with the local authorities keeping in view the needs of the community. The CSR activities would also include training on sports and sociocultural activities.
	4.	Sri Parishkar Mahato, Village – Asnasuli	Stated that many people had given their land with the belief that they will get jobs, but due to the delay in the project the people are distressed. He also wanted to know about the detailed compensation scheme to be provided to the land losers. He also urged for improvement of medical facilities.	This point has already been responded to earlier.
	5.	Sri Ganeshwar Mahato, Village Asnasuli	Wanted to know when the certificates of training conducted through ITI and OPJC would be distributed to those trainees who had completed their training under CSR programmes conducted by the JSW. He expressed his grievance regarding such delay in distribution of certificates and failure to provide jobs by the JSW authorities to the trainees who have undergone such training. He urged the project proponent to address the issue at the earliest.	It was assured that the certificates would be distributed at the earliest opportunity. JSW will provide the promised jobs to landgivers as and when the project starts functioning.
	6	Sri Taraknath Modak, Village Salboni	Enquired about the distribution of training certificates, generation of local employment and improvement of medical assistance. He requested the JSW authorities to maintain good relation with the local villagers. He further requested the project proponent to ensure that the local agricultural activities are not disturbed as a result of their upcoming project	It was assured that the certificates would be distributed at the earliest opportunity. JSW will provide the promised jobs to landgivers as and when the project starts functioning. It was assured that the project activities would not hamper agriculture.

Sl. No.	Name and address of the public present	Questions raised / suggestions / agenda	Response / Replies of Project Proponent
7.	Sri Manobilas Mahato, Village Asnasuli	Wanted to know the timeframe within which the land losers will be provided with permanent jobs by the JSW authorities.	JSW will provide the promised jobs to landgivers as and when the project starts functioning.
8.	Sri Shambhunath Mahato, Village Asnasuli	Urged that the priority should be given to maintain environment by reducing the pollution hazards while implementing the project. He further stated that extensive plantation program should be initiated in the locality to prevent environmental degradation of the area due to industrial activities.	It was assured that all pollution control measures will be implemented and pollutant levels would be maintained within prescribed limits. Green verge and extensive plantations would be undertaken in the plant and ash disposal areas.
9.	Sri Shyamal Ghosh, Village, Baragarh	Expressed his disappointment about non-fulfillment of commitments regarding creation of direct and indirect employment for the local people. He requested the JSW authorities to take the local people into confidence by organizing meetings at village level involving the representatives of local administration regarding issues like compensation to land losers, providing local employment and fulfillment of different CSR commitments.	This point has already been responded to earlier.
10.	Sri Salil Kanti Saha, Village Salboni	Spoke about loss of valuable cultivable land and the increasing rate of Global Warming due to industrialization. He also expressed his concern about forest depletion and deposition of fly ash may lead to the extinction of very high quality local species of mushrooms in the neighbouring jungles. He expressed his concern over proper installation of pollution control measures in the proposed project. He requested the WBPCB to keep proper vigil on the existing and upcoming industries of the locality. He expressed his hope about cooperation of the local villagers to the project proponent provided they	It was assured that all pollution control measures will be implemented and pollutant levels would be maintained within prescribed limits. Green verge and extensive plantations would be undertaken in the plant and ash disposal areas. WBPCB Officials stated that they will maintain strong vigil on the industries of the area to provide a pollution free environment to the local residents.

		Sl. No.	Name and address of the public present	Questions raised/ suggestions/agenda	Response / Replies of Project Proponent
		10.	(contd)	fulfill the commitments regarding proper pollution control measures, generation of employment and CSR activities.	
		11.	Sri Sambhunath Soren, Village - Ramraidihi	Raised concern about the delay for implementation of the project as they being the land losers, are eagerly waiting for employment.	The point was noted.
		12.	Sri Chandan Ghosh, Krishi Karmadhakkhya of Salboni Panchayat Samity	Requested the project proponent to take the poor people of the area into confidence by fulfilling their commitments. He expressed his hope that local villagers will welcome the project as it will generate local employment and contribute to overall socio-economic development of the backward villages of the area.	The point was noted.
		13.	Janab Syed Toiab Ali Sijua, Village Salboni	Said that the project will be welcomed by the local people and they will help the project proponent in all respects as there will be overall development of the backward area if the project materializes.	The point was noted.

In conclusion, the local people present in the hearing welcomed the project, provided that the project proponent implements all the commitments made during the Public Hearing.

The data and information given in this Proforma are true to the best of my knowledge and belief.

Date :

Signature of the Applicant with
Full name & address.

Place :

Given under the seal of organisation
on behalf of whom the applicant
is signing

APPENDIX

Ref : GBPL/B-496/357/2016

March 6, 2017

The Member Secretary
Thermal Power Projects
Ministry of Environment, Forests and Climate Change
Indira Paryavaran Bhavan
Jorbagh Road
New Delhi 110 003.

Dear Sir,

Re : Requisite Declaration for EIA Report of the Proposed 1 x 660 MW Supercritical Thermal Power Project at Salboni, West Medinipur District, West Bengal

This is to certify that the following timelines were followed for the project :

a) Public Hearing conducted on 26th August, 2014 (details already submitted).

b) Submission of related documents for Public Hearing to Project Proponent including complete Draft EIA Report vide letter no. GBPL/B-496/396/2014 dated June 30, 2014 (copy attached for ready reference).

c) The Scope of Accreditation of NABET applicable at this time for the study, as per NABET directives, is attached for ready reference (Refer NABET letter NABET/EIA/RA008/004 dated April 28, 2014). All the studies in the cardinal, relevant environmental disciplines were carried out from October, 2013 – March, 2014 and the primary data generation was conducted during December, 2013-March, 2014.

d) The current Accreditation Certificate of NABET which was valid till November 17, 2016 and thereafter duly extended till May 17, 2017 vide letter no. QCI/NABET/EIA/ACO/16/11/0208 dated November 17, 2016 are submitted for ready reference.

This is to certify that the following team members in the respective capacities contributed in developing the above project documents :

Name of EIA Coordinator : Mr Sutanu Ghosh

Functional Area Experts for this Sector in accordance with NABET directives (Copy of Annexure-IIA of Scheme attached for ready reference) :

Sl. No.	Functional Area	Name of the Expert
1.	Landuse (LU)	Ms Shakuntala Ghosh
2.	Air Pollution Monitoring, Prevention and Control (A P)	Mr Sutanu Ghosh
3.	Meteorology, Air Quality Modelling and Prediction (A Q)	Mr Sutanu Ghosh
4.	Water Pollution Monitoring, Prevention and Control (W P)	Mr Pradeep Chakrabarti

5	Ecology and Biodiversity (E B)	Dr Satyam Kundu
6	Noise	Mr Sutanu Ghosh
7.	Socioeconomics (S E)	Dr Sukla Sen
8.	Risk Assessment and Hazard Management(RH)	Mr Sushil Kumar Banerjee
9.	Industrial Solid Waste (ISW)	Mr Sutanu Ghosh

I, Mr Sutanu Ghosh, hereby confirm that the above mentioned Experts were involved in preparation of the EIA Report of the Thermal Power Project. The primary data generation for monitoring of meteorology, ambient air quality, water quality and noise has been carried out through M/s. Envirocheck, a NABL Accredited Laboratory. The additional data subsequently requested to be generated for soil quality has been conducted through Green C Laboratory Services, also a NABL Accredited Laboratory. The Certificate, Scope of Accreditation and the MoU for both the Laboratories are enclosed for ready reference. I would also state that the data and information presented by us is factually correct to the best of my knowledge. The compliance to the points contained in the ToR of MoEF&CC vide letter no. J-13012/18/2013-IA.II(T) dated 07-01-2014 and extended vide letter no. J-13012/18/2013-IA.I(T) dated 20-01-2016 is presented vide Annexure-2A (Pages-190 - 202) of the EIA Report.

Thanking you,

Yours faithfully,

Signature :

Name : Sutanu Ghosh
Designation : Managing Director and Chief Executive Officer
Name of the EIA Consultant Organisation : Ghosh, Bose & Associates Pvt Ltd

Enclo : as stated

Ref : GBPL/B-496/396/2014

June 30, 2014

Mr Aloke Bhattacharjee
In-Charge, Salboni Project
JSW Energy (Bengal) Limited
Tower-A, 3rd Floor
DLF IT Park
08 Major Arterial Road
Block – AF
New Town
Kolkata 700 156.

Dear Sir,

Sub : EIA Report of Proposed 1 x 660 MW Capacity Super Critical Thermal Power Plant at Salboni, West Midnapur, West Bengal – Public Hearing Purposes.

We are pleased to forward the following documents in connection with the above subject :

1. Draft EIA/EMP Report – 16 Hard Copies and 16 CDs (1 Set each is for your record).
2. Executive Summary both in English and Bengali – 16 Hard Copies and 16 CDs (1 set each is for your record).
3. Form 1 and Executive Summary in English – 1 CD.
4. Form 1 – 1 Hard Copy.
5. Copy of Prescribed TOR of MOEF, GOI – 1 Hard Copy.

The above documents, along with the attached Letter of ours addressed to you and the Letter of transmittal to Member Secretary, WBPCB (Draft attached) may please be submitted to the office of WBPCB.

Thanking you,

Yours faithfully,
for Ghosh, Bose & Associates Pvt Ltd

Sutanu Ghosh
Managing Director.

Enclo : As above.

RECEIVED
01 JUL 2014
JSW Bengal Steel Ltd.

280

Ref : GBPL/B-496/397/2014

June 30, 2014

Mr Aloke Bhattacharjee
In-Charge, Salboni Project
JSW Energy (Bengal) Limited
Tower-A, 3rd Floor
DLF IT Park
08 Major Arterial Road
Block – AF
New Town
Kolkata 700 156.

Dear Sir,

Sub : EIA Report of Proposed 1 x 660 MW Capacity Super Critical Thermal Power Plant at Salboni, West Midnapur, West Bengal.

We would state that we are duly Accredited Consultants of QCI/NABET having successfully achieved the initial Accreditation, Surveillance Assessment and the Re-Accreditation of our company. Our valid Accreditation Certificate, which covers the Sector of `Thermal Power Plants' (Category `A') has been duly incorporated in the draft EIA/EMP Report as Appendix-1.

We would also state that the data and information presented by us is factually correct to the best of our knowledge. The primary data generation has been carried out through M/s. ENVIROCHECK, a NABL Accredited Laboratory. All relevant Functional Area Experts have participated in the study along with the EIA Coordinator. Such a certification has been duly incorporated in the Draft EIA/EMP Report (Refer Section 3.9, Chapter-3, Page 10). It would be observed that compliance to the points contained in the approved TOR of MOEF vide Letter No. J-13012/18/2013-IA II(T) dated 07.01.2014 has been presented in Annexure-2 (Refer Section 3.9, Chapter-3, Page 10).

Thanking you,

Yours faithfully,
for Ghosh, Bose & Associates Pvt Ltd

Sutanu Ghosh
Managing Director.

281

DRAFT

Ref :

Date :

The Member Secretary
West Bengal Pollution Control Board
Paribesh Bhawan
10A, Block – LA
Sector – III
Bidhannagar
Kolkata 700 098.

Dear Sir,

Sub : EIA Report of Proposed 1 x 660 MW Capacity Super Critical Thermal Power Plant at Salboni, West Midnapur, West Bengal – Public Hearing Purposes.

We are pleased to forward the following documents in connection with the above subject :

1. Draft EIA/EMP Report – 15 Hard Copies and 15 CDs.
2. Executive Summary both in English and Bengali – 15 Hard Copies and 15 CDs.
3. Form 1 and Executive Summary in English – 1 CD.
4. Form 1 – 1 Hard Copy.
5. Copy of Prescribed TOR of MOEF, GOI – 1 Hard Copy.

In accordance with the relevant Office Memorandums of MOEF, GOI, we would be happy to undertake Ownership of the correctness and factual information/data of the contents contained in the EIA Report. Such an undertaking has been provided in the Draft EIA/EMP Report (Refer Section 3.8, Chapter-3, Page 10).

We appointed M/s. Ghosh, Bose & Associates Pvt Ltd, duly Accredited Consultants, for undertaking the EIA/EMP Study. Their Accreditation Certificate is presented vide Appendix-1 of the Draft EIA/EMP Report. Their Certification on other issues has been presented vide their attached letter no. GBPL/B-496/397/2014 dated June 30, 2014 and also contained in the Draft EIA/EMP Report (Refer Section 3.9, Chapter-3, Page 10).

We would request you to please organize to carry out Public Hearing of this important project at your earliest convenience.

Thanking you,

Yours faithfully,
for JSW Energy (Bengal) Limited
.....

Enclo : As above.

282

National Accreditation Board
for Education and Training

NABET

NABET/EIA/RA008/004

April 28, 2014

Managing Director
Ghosh, Bose & Associates Pvt. Ltd.
8 Harrington Mansion,
8 Ho Chi Minh Sarani, Kolkata 700 071
(Kind Attention: **Mr Sutanu Ghosh**)

Dear Sir,

Sub: Re-Accreditation

This has reference to your application to QCI-NABET for re-accreditation (RA) as EIA Consultant Organization and the assessment carried for same in your organization from November 18-20, 2013.

We are pleased to inform you that based on the document and office assessments during RA, the Accreditation Committee has approved renewal of accreditation w.e.f. November 20, 2013 for a period of three years. The accreditation given to your organization is subject to coverage of balance Functional areas and specific response to NCs/Obs./Alerts issued (Refer Annexure III) with the following details:

1. Annexure I - Scope of accreditation
2. Annexure II - List of experts with approved sectors/ functional areas
3. Annexure III - Non-Conformances/ Observations/ Alerts (NCs/ Obs./ Alerts)
4. Annexure IV - Observations on Quality Management System (QMS)
5. Annexure V - Terms and conditions of accreditation
6. Annexure VI - Result of assessment
7. Annexure VII - Guidelines for addressing Major Non-Conformances/ Observations/ Alerts
8. Annexure VIII - Format to be followed for mentioning the names of the experts involved in EIA reports prepared by Ghose, Bose & Associates Pvt. Ltd..

Result of RA including Non-Conformances/ Observations/ Alerts (NCs/ Obs./ Alerts) applicable to your organization as per RA are also posted on QCI website vide minutes of the Accreditation Committee meeting dated November 29, 2013 & January 10, 2014.

You are requested to take necessary actions to close the NCs/ Obs. as per guidelines and timeframe mentioned in Annexure VII of this letter.

You are required to make all payments to NABET as applicable, within one month from the date of invoice sent to you. Continuation of this accreditation of your organization is subject to the clearance of all dues by your organization, satisfactory compliance to Annexure III and V.

With best regards,

Yours sincerely,

(Vipin Sahni)
C.E.O.

Institution of Engineers Building, 2nd Floor, Bahadur Shah Zafar Marg, New Delhi - 110 002, India
Tel. : +91-11-2337 9321, 2337 8057 Fax : +91-11-2332 3415 e-mail : nabet@qcin.org Website : www.qcin.org

283

Scope of Accreditation **Annexure I**

NAME OF THE CONSULTANT ORGANIZATION: **Ghosh, Bose & Associates Pvt Ltd**
8 Harrington Mansion,
8 Ho Chi Minh Sarani, Kolkata 700 071

Sl. No.	Sector number		Name of Sector	Category A/B
	As per MoEF Notification	As per NABET Scheme		
1.	1 (a) (i)	1	Mining of minerals including Opencast/ underground mining	A
2.	1 (d)	4	Thermal Power Plants	A
3.	3 (a)	8	Metallurgical industries (ferrous & non ferrous) – both primary and secondary	A
4.	7 (c)	31	Industrial estates/ parks/ complexes/ areas, export processing zones (EPZs), special economic zones (SEZs), Biotech parks, Leather complexes	A
5.	7 (e)	33	Ports, harbours, jetties, marine terminals, break waters and dredging	A
6.	7 (f)	34	Highways, railways, transport terminals, mass rapid transport systems	A
7.	7 (i)	37	Common Municipal Solid Waste Management Facility (CMSWMF)	B
8.	8 (a)	38	Building and large construction projects including shopping malls, multiplexes, commercial complexes, housing estates, hospitals, institutions	B
9.	8 (b)	39	Townships and Area development projects	B
Total = 09 Sectors *Individual EIA Coordinators approved for different sectors are mentioned in Annexure II*				

(Vipin Sahni)
C.E.O

284

List of Experts Annexure II

1. List of experts with sectors/ functional areas

1.1 EIA Coordinators - approved earlier and assessed as per RA norms*

Sl. No.	Name	Sectors approved in SA or subsequently		Status of sectors approved after RA		Remarks
		Sector	Cat.	Status	Cat.	
In-house						
1	Sutanu Ghosh	38	B	Approval Renewed	B	-
2	Shakuntala Ghosh	39	B	Approval Renewed	B	-

* Further to point C (iv) of RA process dated Aug. 23, 2013 uploaded on QCI website, it may be noted that candidates approved (ECs/ FAEs) during earlier assessment/s will be assessed as per RA norms. However, in case a candidate was not involved in any EIA project during the period after SA and before RA, s/he would be assessed as per Initial Assessment norms.

1.2 EIA Coordinators – assessed as per IA norms*

Sl. No.	Name	Sectors			Cat	Remarks
		Applied	Recommended	Approved		
In- house						
1	Sutanu Ghosh	1	Yes	Yes	A	-
		4	Yes	Yes	A	
		8	Yes	Yes	A	
		31	Yes	Yes	A	
2	Pradeep Chakrabarti	36	No	No	-	Not recommended for sector 36 due to inadequate experience
3	Sukla Sen	34	Yes	Yes	A	-
Empanelled						
4	Chinmoy Chakrabarti	3	No	No	-	Not recommended due to lack of experience of EIA and assignment of Sector 3
		33	Yes	Yes	A	
		37	Yes	Yes	B	

* Further to point C (iv) of RA process dated Aug. 23, 2013 uploaded on QCI website, it may be noted that candidates approved (ECs/ FAEs) during earlier assessment/s will be assessed as per RA norms. However, in case a candidate was not involved in any EIA project during the period after SA and before RA, s/he would be assessed as per Initial Assessment norms.

1.3 Functional Area Experts - approved earlier and assessed as per RA norms*

Sl. No.	Name	FAs approved in SA/ subsequently		Approval Status after RA		Remarks
		FA	Cat.	Status	Cat.	
In-house						
1	Sutanu Ghosh	AP	A	Approval Renewed	A	-
		NV	A	Approval Renewed	A	
		SHW	A	Approval Renewed	A	
2	Shakuntala Ghosh	LU	A	Approval Renewed	A	-
3	Pranab Sen	LU	A	Approval Not Renewed	-	Absent. Out of country.
4	Pradeep Kumar Chakravarti	WP	A	Approval Renewed	A	-
5	Paramita Chakravarti	LU	B	Approval Renewed	B	-
6	Sukla Sen	SE	A	Approval Renewed	A	-
7	Satyam Kumar Kundu	EB	A	Approval Renewed	B	It is important that EB expert should have been actively involved in the field work himself and not merely be associated even when an external specialized agency is requested to amplify special aspect of EB. A justification needs to be given by ACO as to why an outside agency was requested and in what way the inputs provided by the external agency have improved

Sl. No.	Name	FAs approved in SA/ subsequently		Approval Status after RA		Remarks
		FA	Cat.	Status	Cat.	
						the EIA and EMP. Cat. changed from A to B on performance grounds
8	Sushil Kumar Banerjee	RH	A	Approval Renewed	A	-
Empanelled						
9	Chinmoy Chakrabarti	HG	A	Approval Renewed	A	-
		GEO	A	Approval Renewed	A	

*Further to point C (iv) of RA process dated Aug. 23, 2013 uploaded on QCI website, it may be noted that candidates approved (ECs/ FAEs) during earlier assessment/s will be assessed as per RA norms. However, in case a candidate was not involved in any EIA project during the period after SA and before RA, s/he would be assessed as per Initial Assessment norms.

1.4 **Functional Area Experts - assessed as per IA norms***

Sl. No.	Name	Functional Areas			Cat	Remarks
		Applied	Recommended	Approved		
In- house						
1	Sutanu Ghosh	AQ	Yes	Yes	A	-
2	Goutam Bhattacharya	SC	No	No	-	Not recommended for SC on qualification grounds

*Further to point C (iv) of RA process dated Aug. 23, 2013 uploaded on QCI website, it may be noted that candidates approved (ECs/ FAEs) during earlier assessment/s will be assessed as per RA norms. However, in case a candidate was not involved in any EIA project during the period after SA and before RA, s/he would be assessed as per Initial Assessment norms.

2. **Covering balance functional areas:**

The ACO is required to induct experts in under mentioned areas at the earliest but not later than three months from the date of this letter.

- For SC– In-house/ empanelled expert/s

Final accreditation is subject to the fulfillment of the above requirements.

(Vipin Sahni)
C.E.O.

Non-Conformances/ Observations/ Alerts

Annexure III

Based on Re-accreditation Assessment (RA) and Decisions of Accreditation Committee

Name of ACO - Ghosh, Bose & Associates Pvt Ltd.

Date of RA AC Meeting	Date of intimation of NCs/ Obs./ Alerts by NABET to ACO	Last date for submission of closure actions of NCs/ Obs./ Alerts	Date of submission of closure actions (to be filled in by the ACO)
November 29, 2013 & January 10, 2014	April 23, 2014 (vide e.mail)	July 23, 2014	

Kindly submit the response to the stated NCs/ Obs./ Alerts within stipulated timeframe in the format given below.

- Case of GBA was discussed earlier in RA AC meeting dated Nov. 29, 2013 and kept on hold for a) over dues of NABET fees by AO b) pending further details on employment status of Dr. Satyam K Kundu. Response of GBA on above aspects was received and considered.
- Closure action taken by Ghosh, Bose & Associates Pvt Ltd on NCs and Obs. raised in SA was verified.
- **RA assessment:**

  The ACO has overall obtained more than 60% and therefore qualifies for Cat. A. However, in respect of Organizational Evaluation, the marks are less than 60 % indicating scope of improvement vide points mentioned below in relevant sections.

Sl. No.	NC/ Observation/ Alert	Response of ACO (root cause analysis/ corrective & preventive action plans) *May use additional enclosures*	Closure by Assessors
	Observation		
1	**Field Investigation and Laboratory Arrangements** a. EC/ FAEs were unable to produce documents including field notes etc though claim to have visited the sites. b. No evidence produced to confirm involvement in selection of sampling locations and ensuring quality of data c. Log books not available for field		

Sl. No.	NC/ Observation/ Alert	Response of ACO (root cause analysis/ corrective & preventive action plans) *May use additional enclosures*	Closure by Assessors
	work done on Biotic Environment.		
2	**Quality Management System** a. **Control of records and documents** – No clear procedures for document control. b. **Performance Measurement Review** – Staff assessment review done but not for all staff. No documented KRAs, internal audit, management review feedbacks etc. It is done during board meetings only once in 3 months. c. **Actions taken to address Non-Conformities** – Addressed verbally in internal meetings. No documented procedures. d. **Identification, retention and assessment of performance of empanelled experts** – No documents available to confirm its implementation. e. **Collection and generation of primary data** – Documentation of the procedure is poor. No evidences available to confirm implementation. f. **Collation, synthesis and interpretation of secondary data** – Procedure too generic and is partially covered. No evidences available to confirm implementation. g. **Work outsourced** – No documents available to indicate reasons for outsourcing and evaluating validity of data and quality of outsourced study.		
3	**EIAs assessed during Re-Accreditation**		

Sl. No.	NC/ Observation/ Alert	Response of ACO (root cause analysis/ corrective & preventive action plans) *May use additional enclosures*	Closure by Assessors
	EIA – Proposed Residential Project, Utalika a. Impacts are partially identified and impacts identified for MSW are generic in nature. b. Impacts identified on ecology are generic in nature.		
4	System for assessing performance of experts/ lab technicians in place, however, the documents to verify implementation not produced.		
5	Documents to verify the implementation of system for training need identification not produced.		
6	No system to have advisers / specialized institutions for necessary guidance of EIA Team and library to track recent developments in EIA.		
7	No formal system of grooming prospective ECs and FAEs.		
8	System for preparing activity chart (with milestones) from start to completion for the EIA projects not followed.		

*Refer Annexure VII of the letter for guidelines for closing NCs and Observations

Abbreviations used:

ACO: Accredited Consultant Organization

MNC: Major Non Conformance

NC: Non Conformance

Obs.: Observations

Name of the C.E.O. of ACO/ designated Authority:

Signature:

Date:

Observations on Quality Management System (QMS) Annexure –IV

Sl. No.	Procedures	Remarks
I	Control of records and documents	No clear procedures for document control.
II	Performance Measurement Review	Staff assessment review done but not for all staff. No documented KRAs, internal audit, management review feedbacks etc. It is done during board meetings only once in 3 months.
III	Actions taken to address Non-Conformities	Addressed verbally in internal meetings. No documented procedures.
IV	Identification, retention and assessment of performance of empanelled experts	No documents available to confirm its implementation.
V	Collection and generation of primary data	Documentation of the procedure is poor. No evidences available to confirm implementation.
VI	Collation, synthesis and interpretation of secondary data	Procedure too generic and is partially covered. No evidences available to confirm implementation.
VII	Work outsourced	No documents available to indicate reasons for outsourcing and evaluating validity of data and quality of outsourced study.

Terms and Conditions

Annexure –V

Renewal of provisional accreditation given to **Ghosh, Bose & Associates Pvt. Ltd.** as an Accredited EIA Consultant Organization (ACO) is subject to compliance to the requirements of QCI – NABET Scheme and the following terms and conditions:

1. The ACO must have access to all 5 core functional areas (FAs) during the entire period of accreditation. FAs - AP, WP, SHW must be covered by in-house (IH) experts. SE and EB may be covered by IH/ empanelled experts. If these two FAs (SE, EB) are covered by empanelled experts then they are to be supported by IH Associate experts. The balance FAs may be covered by IH/Empanelled experts.
2. For empanelled experts MoUs are to be signed between the ACO and concerned experts giving the name of expert, scope, terms and period of engagement. The ACO must ensure that the empanelled experts approved for/proposed by them are not associated with more than 4 other EIA Consultant Organizations (kindly refer explanatory notes 1 dated Oct. 19, 2012 uploaded on QCI website)
3. If an ACO is accredited only for sector 38 (Building and large Construction), it may have approved empanelled experts for SE and EB and they need not be backed up by in-house Associate FAEs.
4. In case any FA falls vacant during the period of accreditation due to any approved expert leaving the organization, the ACO must inform NABET the same within one month, proposing an alternate candidate meeting the qualification norms and having equivalent or higher experience.
   Following should be considered while proposing candidates for covering these areas:
   i. Propose candidates as per relevant MoM for 'balance functional areas' only.
   ii. Ensure that proposed candidates meet the qualification/experience requirements as specified in the Scheme.
   iii. Submit the proposal for covering balance area/s in one go submitting the relevant documentary evidences and also bringing the same to QCI during assessment.
5. During the entire period of accreditation, minimum 3 approved IH experts (1 EC and 2 other FAEs) must be available with the ACO. Should this number fall below three at any point of time, NABET must be informed and the shortfall made up within one month.
6. Field investigation and Laboratory work:
   a. The EC and relevant FAEs must visit the project site for appropriate duration, both prior to and during the process of collection of primary data and ground verification of secondary data. They must also be involved in selection of sampling locations and type and collection of samples. For selection of Ambient Air Quality stations, the EIA team of the ACO must carry out necessary home work including running dummy dispersion modeling prior to visiting the site. All experts must maintain field logbooks for work carried out during the site visits. Documentary evidence like travel/ hotel bills should also be maintained for inspection by NABET assessors.
   b. An ACO must use NABL accredited/ MoEF recognized laboratories only for collection of baseline data.

c. If the laboratory is an external one, a MoU is to be signed with the laboratory specifying name of the laboratory, scope of work including parameters covered and sampling methodologies etc., period of association and financial terms. The MoU should be signed by the CEOs/ authorized signatories of the two organizations.

d. The ACO must have a written down protocol for ensuring that the baseline data collection work by the external laboratory covers the scope of work envisaged and meets with the requirements of the Scheme.

e. ACO using internal NABL accredited/ MoEF recognized laboratories should have protocols for selection of sampling locations, collection, preservation, transportation, testing and analysis of samples and calibration of equipment/ instruments/ glass wares.

f. The work carried out by the laboratory for each project must be documented and signed by the authorized signatory on behalf of the laboratory. Such documents must be available with the ACO for inspection by NABET assessors.

g. The name of laboratory and analysis result signed by head of the laboratory must be included in all EIA reports prepared by the ACO.

h. Biotic Environment and Socio- Economic data: As a part of Quality Management System (QMS), the ACO must have written down methodologies for collection of primary data on Biotic (Ecology and Biodiversity) and Socio Economic environment including field equipments, accessories, questionnaire, interview formats etc. to be used for studies/ surveys and ground truthing of secondary data.

7. NCs/ Obs/ Alerts issued after RA Assessment must be closed within the time frame and as per the guidelines mentioned in Annexure VII. Recurrence of similar NC/ Obs./ Alerts in the previous assessment shall make accreditation liable to be cancelled.
8. Systems/ procedures documented in the Quality Manual of the ACO to meet the requirements of the Scheme must be implemented in letter and spirit.
9. The approved ECs, FAEs and AFAEs are required to follow the 'Broad guidelines on the expected functions of EIA Coordinators, Functional Area Experts and Associate functional Area Experts' posted on QCI website vie explanatory notes II dt. May 23, 2013.
10. All payments to experts, both in-house and empanelled and to the external laboratories shall be made by cheque/ bank transfer and the relevant records are to be maintained by the ACO.
11. Payments to be made to NABET by the ACO within one month after receiving invoice failing which accreditation may be liable to be cancelled.
12. An ACO is required to take up EIA assignments in the accredited sectors only and for the category accredited for. Any deviation viz, taking up EIAs in unapproved sector or category, using an un-approved EC/FAE shall be considered as a Non-Conformance and a show cause would be issued to the ACO as to why accreditation/ approval for the concerned sector/ expert/ ACO should not be cancelled.
13. The name of EIA Coordinators and FAEs involved shall be recorded in all EIA reports as per format attached (Annexure VIII) at the beginning of the report. These reports should contain original

signatures (not scan) of the EIA Coordinator and the FAEs involved. This should be also authenticated by the head of the consultant organization as per the attached format.

14. Maintaining a register of attendance of employees involved in EIA assignments.
15. Keeping records of the experts being involved for various EIA projects handled during this period.
16. Intimation of Changes – In case of any change in the organization related to systems, procedures, laboratory and other facilities, the same shall be intimated to NABET within one month of such change. Such changes shall be audited by NABET in the next surveillance assessment or as deemed fit by the NABET Accreditation Committee.
17. The ACO shall strictly follow the requirements pertaining to conditions for suspension or cancellation of Accreditation and Code of Conduct (Section 13.3 of the Scheme). NABET may suspend or cancel an accreditation in case of violation of any of the following, but not to be limited to using fraudulent practices by the accredited consultant in respect of its submission/ interaction with NABET which would include deliberate concealment and/ or submission of false or mis-leading information, suppression of information, falsification of records or data, unauthorized use of logo or accreditation, non reporting of completed EIAs to NABET and non-payment of requisite fees.
18. Keeping in view the extensive involvement of the EIA Coordinator in preparing EIAs as envisaged in the Scheme, the maximum number of EIAs that an EC may be able to coordinate in a year will be as follows:
    a) For Category A projects – 6 Nos*
    b) For Category B projects – 10 Nos*
    c) In combination of Category A and B projects – 10 Nos

    *The above will not be applicable for 'EIAs' prepared for Sector 38 – Building and Large Constructions and EIAs for very small mining leases (less than 5 ha) including river bed mining. For these sectors, the maximum number of 'EIAs' that an EC may carry out in a year, will be 15.

    If an EC carries out more than above number of EIAs, s/he will need to justify her/his involvement in the EIAs during Surveillance Assessment supported by Field logbooks.

(Vipin Sahni)
C.E.O.

Result of Re-accreditation Assessment

Annexure VI

EIA Consultant Organization	**Ghosh, Bose & Associates Pvt Ltd**
Contact Person	Mr. Sutanu Ghosh
Date of RA Assessment	November 18-20, 2013.

The ACO has overall obtained more than 60% and therefore qualifies for Cat. A. However, in respect of Organizational Evaluation, the marks are less than 60 % indicating scope of improvement vide points mentioned below in relevant sections.

Sl. No.	Aspect	Marks Scored/ Assessment
1	Quality of personnel	
	i. EIA Coordinator/ s (Avg. of Approved & Fresh Experts)	14.00/20
	ii. Functional Area Expert/ s (Avg. of Approved & Fresh Experts)	12.43/20
2	Development of & conformance to Quality Manual	08.10/15
3	Field Investigation and Laboratory Work	13.50/20
4	Completeness & quality of EIAs prepared by Applicant	06.20/10
5	Organizational evaluation	06.30/15 **ALERT**
	TOTAL	**60.53/100**

Guidelines for addressing Non-Conformances/ Observations/ Alerts — Annexure VII

A. **Non-conformance/ Observations/ Alerts:**

S.No.	Aspect	Guidelines
1.	Non-compliance to the conditions of Accreditation in respect of - Timely intimation to NABET of resignation of approved experts, requisite replacements and changes in laboratory arrangements - Inclusion of statement in prescribed format of ECs and FAEs involved in preparation of EIA countersigned by CEO of ACO - Timely payments to NABET - Maintenance of documentary evidence in case an EC has carried out more than stipulated number of EIAs (6/10/15 of Oct. 19, 2012 clarification)	- Root cause analysis of the shortfall - Corrective and preventive action - Compliance report/closure action to NABET within 3 months of issuance of Alert/ NC/ Obs. - A signed undertaking by the Chief Executive Officer of the ACO stating that if the shortfall recurs, the accreditation shall be withdrawn by NABET, to be submitted with reply to NC/ Obs/ Alert.
2.	In respect of field investigation and laboratory analysis- implementation and improvements in of systems and procedures to ensure data integrity	
3.	Improvements wrt respect of quality assurance – organizational systems and procedures to meet Scheme's requirements	
4.	Improvements in respect of content and quality of EIAs	
5.	Improvements in respect of public consultation and due diligence on outcome giving action plan	

S.No.	Aspect	Guidelines
6.	Improvements in respect of organizational evaluation	
7.	In respect of performance of approved experts and any improvements , if any	ACO to submit an action plan for addressing the shortfall in the performance of the concerned expert/s.

Annexure VIII

Declaration by Experts contributing to the EIA----------

I, hereby, certify that I was a part of the EIA team in the following capacity that developed the above EIA.

EIA Coordinator:
Name:
Signature & Date:
Period of involvement:
Contact information:

Functional Area Experts:

S. No.	Functional Areas	Name of the expert/s	Involvement (Period & Task**)	Signature & Date
1	AP*			
2	WP*			
3	SHW*			
4	SE*			
5	EB*			
6	HG*			
7	GEO*			
8	SC*			
9	AQ*			
10	NV*			
11	LU*			
12	RH*			

**Please attach additional sheet if required

Declaration by the Head of the Accredited Consultant Organization/ authorized person

I, ----------, hereby, confirm that the above mentioned experts prepared the EIA----------. I also confirm that the consultant organization shall be fully accountable for any mis-leading information mentioned in this statement.

Signature:
Name:
Designation:
Name of the EIA Consultant Organization:
NABET Certificate No. & Issue Date:

S. No.	Functional Area Code	Complete name of the Functional Areas
1.	AP	Air Pollution Prevention, Monitoring & Control
2.	WP	Water Pollution Prevention, Control & Prediction of Impacts
3.	SHW	Solid Waste and Hazardous Waste Management
4.	SE	Socio-Economics
5.	EB	Ecology and Biodiversity
6.	HG	Hydrology, Ground Water & Water Conservation
7.	GEO	Geology
8.	SC	Soil Conservation
9.	AQ	Meteorology, Air Quality Modeling & Prediction
10.	NV	Noise/ Vibration
11.	LU	Land Use
12.	RH	Risk Assessment & Hazard Management

Quality Council of India
National Accreditation Board for Education & Training

CERTIFICATE OF ACCREDITATION

This is to certify that

Ghosh, Bose & Associates Pvt Ltd, Kolkata

is hereby accorded accreditation under the QCI-NABET Scheme for Accreditation of EIA Consultant Organizations (Version 3)

Scope of Accreditation

Sl.No.	Name of the Sector	Cat.
1.	Mining of minerals including Open cast/ underground mining	A
2.	Thermal power plants	A
3.	Metallurgical industries(ferrous & nonferrous) - both primary & secondary	A
4.	Industrial estates/ parks/ complexes/Areas, export processing Zones(EPZs), Special economic zones(SEZs), Biotech Parks, Leather Complexes	A
5.	Ports, harbours, jetties, marine terminals, break waters and dredging	A
6.	Highways, Railways, transport terminals, mass rapid transport systems	A
7.	Common municipal solid waste management facility (CMSWMF)	B
8.	Building and large construction projects including shopping malls, multiplexes, commercial complexes, housing estates, hospitals, institutions	B
9.	Townships and Area development Projects	B

Name of approved EIA Coordinators and Functional Area Experts are mentioned in SAAC minutes published on website dated Jan 20, 2016.

Accreditation to the above is subject to the EIA reports being prepared by the experts (EIA Coordinators and Functional area Expert) mentioned in the above minutes and compliance to the Terms and Conditions of Accreditation.

Certificate No: NABET/ EIA/1316 / SA 0010

Valid Up to: November 17, 2016

(Subject to continual compliance to NABET scheme)

C.E.O
NABET

National Accreditation Board
for Education and Training
(Member of International Accreditation Forum
and Pacific Accreditation Cooperation)

QCI/NABET/EIA/ACO/16/11/0208 17 November, 2016

Ghosh, Bose & Associates Pvt Ltd
8 Ho Chi Minh Sarani
Kolkata- 700 071
(Kind Attention: Mr. Sutanu Ghosh)

Sub: Validity of Accreditation as EIA Consultant organisation- Ghosh, Bose & Associates Pvt Ltd, Kolkata.

Dear Sir,

This has reference to the accreditation given to your organisation and its validity under QCI-NABET EIA Scheme.

The process of re-accreditation has already been initiated for **Ghosh, Bose & Associates Pvt Ltd.** The accreditation of **M/s Ghosh Bose & Associate Pvt. Ltd.,Kolkata** is hereby extended by 6 months i.e till May 17, 2017 or till re-accreditation whichever is earlier.

The above extension is subject to the submission of required information documents related to re-accreditation to NABET on time.

You are requested not to use this letter after expiry of the stated date.

With best regards,

17/11/2016

A.K Jha

Senior Director

Institute of Town Planners India, 6th Floor, 4-A, Ring Road, I.P Estate, New Delhi-110 002, India
Telefax : +91-11-233 23 416, 417, 418, 419, 420 E-mail : ceo.nabet@qcin.org Fax : +91-11-233 23 415 Website : www.qcin.org

Annexure – IIA

Sector wise requirements of functional areas

Sectors have been clubbed in 7 groups rationalizing the requirements of the Functional Area Experts (FAEs). For each group, some functional areas (FAs) have been identified as 'core' which are crucial for the sectors in the group. The core FAs are to be covered by in-house experts. In addition, to theses these core FAs, for each group some functional areas have been identified as 'significant' whose inputs are also required but these can be covered by empanelled experts. This has been done to ensure that expertise in all required functional area available with the consultant, without unduly loading it.

Group No	Sector group	Sector No as per Annexure II	Core functional areas (In-house)	Significant functional areas (In-house/ empanelled)
1	Manufacturing industries	8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 40 (I, ii, iii, v)	AP, AQ, WP	LU, Noise, EB, SE, HG, HW, ISW, RH
2	Power, Cement	4, 9, 40 (iv)	AP,AQ	LU, WP, EB, SE, Noise, ISW, RH
3	Mining, River valley	1, 3	WP, SE, EB	LU, AP, AQ, NV, Geo, HG, SC, HW, ISW, RH
4	Coal washery, Mineral beneficiation	6, 7	AP, WP, ISW	LU, AQ, EB, Geo, SE, RH, HW
5	Infrastructure, Oil & gas exploration (off-shore, on-shore)	2, 27, 29, 31, 33, 34, 35	WP, EB, SE	LU, AP, AQ, NV, SC, SHW, HG, RH
6	Infrastructure services	28, 30, 32, 36, 37	SHW, WP	LU, AP, AQ, EB, SE, Geo, HG, RH
7	Building and large construction, township and area development	38, 39	WP, MSW	LU, AP, Noise, EB, SE, HG, SC

Note: *1. For EIAs related to captive townships, MSW will be a significant FA*
2. For Cat B2 projects, EB and SE can be empanelled

302

November 26, 2015

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding is entered into by and between M/s. Ghosh, Bose & Associates Pvt Ltd, an Accredited EIA Consultant of NABET/QCI (Registration Certificate No. NABET/EIA/1013/014), with its Registered Office at 8 Harrington Mansion, 8 Ho Chi Minh Sarani, Kolkata 700 071 (**FIRST PARTY**) and M/s. Envirocheck a NABL Accredited Laboratory (Registration Certificate No. T-1751), with its Registered Office at 189 & 190 Rastraguru Avenue, Kolkata 700 028 (**SECOND PARTY**), wherein both parties have agreed that the Baseline Data Generation in relevant Environmental Disciplines for the various EIA Studies to be conducted by the First Party would be undertaken by the Second Party.

This MoU shall be valid for a period of 3 (Three) Years, i.e. upto 25.11.2018

Signed on behalf of
M/s. Ghosh, Bose & Associates Pvt Ltd

Sutanu Ghosh
Managing Director.

GHOSH BOSE & ASSOCIATES (P) LTD. Calcutta

Signed on behalf of
M/s. Envirocheck

Dr S B Chowdhury

ENVIROCHECK Kolkata 700 028 189 Rashtraguru Avenue

NABL

National Accreditation Board for Testing and Calibration Laboratories

(An Autonomous Body under Department of Science & Technology, Govt. of India)

CERTIFICATE OF ACCREDITATION

ENVIROCHECK

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2005

"General Requirements for the Competence of Testing & Calibration Laboratories"

for its facilities at

189 & 190, Rastraguru Avenue, Kolkata, West Bengal

in the discipline of

CHEMICAL TESTING

(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Certificate Number T-1751

Issue Date 03/02/2015

Valid Until 02/02/2017

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the additional requirements of NABL.

Signed for and on behalf of NABL

N. Venkateswaran	Anil Relia	Prof. Ashutosh Sharma
Program Manager	Director	Chairman

NABL

SCOPE OF ACCREDITATION

Laboratory	Envirocheck, 189 & 190, Rastraguru Avenue, Kolkata, West Bengal		
Accreditation Standard	ISO/IEC 17025: 2005		
Discipline	Chemical Testing	Issue Date	03.02.2015
Certificate Number	T-1751	Valid Until	02.02.2017
Last Amended on	-	Page	1 of 8

S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
I.	**AIR, GASES & ATMOSPHERE**			
1.	**Ambient Air**	Suspended Particulate Matter	IS 5182 (Part 4): 1999 (RA 2005) ASTM D 4096: 91 RA 2009 : Sec XI Vol 11.07: 2011	10 $\mu g/m^3$ to 1000 $\mu g/m^3$
		Carbon monoxide	IS 5182 (Part 10): 1999 (RA 2003) ASTM D 3162: 94 (RA 2005): Sec XI Vol 11.07: 2011	0.1 mg/m^3 to 100 mg/m^3
		Sulphur dioxide	IS 5182 (Part 2): 2001 (RA 2007) ASTM D 2914: 01: Sec XI Vol. 11.07 : 2011	4.0 $\mu g/m^3$ to 350 $\mu g/m^3$
		Nitrogen oxide	IS 5182 (Part 6): 2006 (RA 2005) ASTM D 1607: 91: Sec 11 Vol. 11.07: 2011	6.5 $\mu g/m^3$ to 1000 $\mu g/m^3$
		Respirable Suspended Particulate Matter or (PM 10)	IS 5182 (Part 23): 2006	10 $\mu g/m^3$ to 1000 $\mu g/m^3$
		Respirable Particulate Matter or (PM 2.5)	Lab SOP No 01 (Based on CPCB Guidelines and USEPA 1997a, 40 CFR Part 50, Appendix L)	10 $\mu g/m^3$ to 1000 $\mu g/m^3$
		Ozone	IS 5182 (Part 9): 1974	10 $\mu g/m^3$ to 1960 $\mu g/m^3$
		Benzene	IS 5182 (Part 11): 2006 (RA 2007) ASTM D 5466: 01: Sec XI Vol. 11.07: 2011	0.74 $\mu g/m^3$ to 7.4 $\mu g/m^3$
		Benzo(a)Pyrene	IS 5182 (Part 12): 2004 (RA 2004) ASTM D 6209: 98: Sec XI Vol. 11.07: 2011	0.36 ng/m^3 to 3.6 ng/m^3

Sumit Sundriyal
Convenor

N. Venkateswaran
Program Manager

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SCOPE OF ACCREDITATION

Laboratory	Envirocheck, 189 & 190, Rastraguru Avenue, Kolkata, West Bengal		
Accreditation Standard	ISO/IEC 17025: 2005		
Discipline	Chemical Testing	Issue Date	03.02.2015
Certificate Number	T-1751	Valid Until	02.02.2017
Last Amended on	-	Page	2 of 8

S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
	Ambient Air	Nickel	IS 5182 (Part 22): 2004 ASTM D 4185: 06: Sec XI Vol. 11.07: 2011	0.02 ng/m^3 to 10 ng/m^3
		Arsenic	IS 5182 (Part 22): 2004 ASTM D 4185: 06: Sec XI Vol. 11.07: 2011	0.01 ng/m^3 to 10 ng/m^3
		Lead	IS 5182 (Part 22): 2004 ASTM D 4185: 06: Sec XI Vol. 11.07: 2011	0.01 µg/m^3 to 10 µg/m^3
		Ammonia	NIOSH Manual of Analytical Method, (4th Edition): 1994, Method 6015 Issue 2	0.15 mg/m^3 to 320 mg/m^3
2.	Micro Meteorological	Wind Speed	ASTM D 5096: 02 (RA 2007): Sec XI Vol. 11.07: 2011	0.5 Kmph to 180 Kmph
		Wind Direction	ASTM D 5096: 02 (RA 2007): Sec XI Vol. 11.07: 2011	Upto 360 °C
		Temperature	ASTM E 337: 02 (RA 2007): Sec XI Vol. 11.07: 2011	3 °C to 50 °C
		Humidity	ASTM E 337: 02 (RA 2007): Sec XI Vol. 11.07: 2011	10 % to 100 %
		Rainfall	IS: 5235 & Specification of Surface Meteorological Instrument, IMD, Govt. of India.	Qualitative

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Convenor

N. Venkateswaran
Program Manager

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Certificate Number	T-1751	Valid Until	02.02.2017
Last Amended on	-	Page	3 of 8

S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
3.	**Stack Emission Monitoring**	Particulate Matter	IS 11255 (Part 1): 1985 (RA 2003) ASTM D 3685/ D3685M: 98 (RA 2005): Sec XI Vol.11.07: 2011	5 mg/m^3 to1000 mg/m^3
		Carbon dioxide (by ORSAT App.)	IS 13270: 1992 (RA 2003)	0.2 % to 25 %
		Nitrogen oxide	IS 11255 (Part 7): 2005 (RA 2009) ASTM D 1608: 98: Sec 11 Vol. 11.07: 2011	2 mg/m^3 to 800 mg/m^3
		Sulfur di oxide	IS 11255 (Part 2): 1985 (RA 2003)	0.1 mg/m^3 to 80000 mg/m^3
		Carbon monoxide (by ORSAT App.)	IS 13270 1992: (RA 2003)	1.0 % to 5 %
		Fluoride	IS 11255 (Part 5): 1990	0.02 mg/m^3 to5.0 mg/m^3
4.	**Fugitive Emission**	Suspended Particulate Matter	IS 5182 (Part 4): 1999 (RA 2005) ASTM D 4096: 91 (RA 2009): Sec XI (Vol11.07): 2011	10 $\mu g/m^3$ to1000 $\mu g/m^3$
II.	**WATER**			
1.	**Drinking Water**	Colour	APHA (22nd Edition) 2120-B: 2012	1 Hazen to 500 Hazen Units
		Turbidity	APHA (22nd Edition) 2130-B: 2012	1 NTU to1000 NTU
		pH	APHA (22nd Edition) 4500-H^+ B: 2012	1 to13.6
		Total Hardness	APHA (22nd Edition) 2340-C: 2012	2 mg/l to 1000 mg/l

Sumit Sundriyal
Convenor

N. Venkateswaran
Program Manager

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Last Amended on	-	Page	4 of 8

S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
	Drinking Water	Sulfate	APHA (22nd Edition) 4500-SO_4^{2-} E: 2012	1 mg/l to 400 mg/l
		Chloride	APHA (22nd Edition)4500-Cl^- B/D: 2012	0.15 mg/l to 1000 mg/l
		Fluoride	APHA (22nd Edition) 4500-F^- D: 2012	0.1 mg/l to10 mg/l
		Nitrate	APHA (22nd Edition) 4500-NO_3^- E: 2012	0.01 mg/l to1 mg/l
		Dissolved Solid	APHA (22nd Edition) 2540-C: 2012	1 mg/l to 4000 mg/l
		Residual Chlorine	APHA (22nd Edition) 4500–Cl^- B: 2012	1 mg/l to 10 mg/l
		Phosphate	APHA (22nd Edition) 4500–PE/D: 2012	0.01 mg/l to 6 mg/l
		Alkalinity	APHA (22nd Edition) 2320-B: 2012	2 mg/l to 1000 mg/l
		Copper	APHA (22nd Edition) 3111-B: 2012	0.04 mg/l to 5 mg/l
		Manganese	APHA (22nd Edition) 3111-B: 2012	0.1 mg/l to 5 mg/l
		Arsenic	APHA (22nd Edition) 3114-B: 2012	0.01 mg/l to 5 mg/l
		Zinc	APHA (22nd Edition) 3111-B: 2012	0.01 mg/l to 5 mg/l
		Hexavalent Chromium	APHA (22nd Edition) 3500-Cr^-B: 2012	0.1 mg/l to 5 mg/l
		Total Chromium	APHA (22nd Edition) 3111-Cr^-B: 2012	0.06 mg/l to 5 mg/l

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Convenor

N. Venkateswaran
Program Manager

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Last Amended on	-	Page	5 of 8

S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
	Drinking Water	Boron	APHA (22nd Edition) 4500–B C: 2012	0.1 mg/l to 5 mg/l
		Lead	APHA (22nd Edition) 3111-B: 2012	0.2 mg/l to 5 mg/l
		Cadmium	APHA (22nd Edition) 3111-B: 2012	0.01 mg/l to 5 mg/l
		Iron	APHA (22nd Edition) 3111-B: 2012	0.05 mg/l to 20 mg/l
		Mercury	APHA (22nd Edition) 3112-B: 2012	0.001 mg/l to 1 mg/l
		Phenols	APHA (22nd Edition) 5530-Phenols D: 2012	0.1 mg/l to 5 mg/l
		Calcium	APHA (22nd Edition) 3500-Ca B: 2012	5 mg/l to 2000 mg/l
		Magnesium	APHA (22nd Edition) 3500-Mg B: 2012	1 mg/l to 2000 mg/l
		Sodium	APHA (22nd Edition) 3500-Na: 2012	1 mg/l to 10 mg/l
		Potassium	APHA (22nd Edition) 3500-K: 2012	1 mg/l to 10 mg/l
		Conductivity	APHA (22nd Edition) 2510-B: 2012	1 µs/cm to 20000 µs/cm
		Aluminium	APHA (22nd Edition) 3500-Al B: 2012	0.02 mg/l to 0.3 mg/l
		Cyanide	APHA (22nd Edition) D/E/F: 2012	0.05 mg/l to 2 mg/l
		Selenium	APHA (22nd Edition) 3111-D: 2012	0.1 mg/l to5 mg/l

Sumit Sundriyal
Convenor

N. Venkateswaran
Program Manager

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Last Amended on	-	Page	6 of 8

S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
2.	Waste Water	Temp.	APHA (22nd Edition) 2550-B: 2012	Ambient to 60 °C
		pH	APHA (22nd Edition) 4500-H+ B: 2012	1 to13.3
		TSS	APHA (22nd Edition) 2540-D: 2012	10 mg/l to 1000 mg/l
		Dissolved Oxygen	APHA (22nd Edition) 4500- O C: 2012	1 mg/l to 12 mg/l
		Oil & Grease	APHA (22nd Edition) 5520-B/D: 2012	1 mg/l to 1000 mg/l
		Bio Chemical Oxygen Demand (BOD)	APHA (22nd Edition) 5210 -B: 2012	2 mg/l to 200 mg/l
		Chemical Oxygen Demand (COD)	APHA (22nd Edition) 5220-B/C/D: 2012	5 mg/l to 1000 mg/l
		Lead	APHA (22nd Edition) 3111-B: 2012	0.2 mg/l to 30 mg/l
		Hexavalent Chromium	APHA (22nd Edition) 3500- Cr B: 2012	0.1 mg/l to 10 mg/l
		Total Chromium	APHA (22nd Edition) 3111-Cr B: 2012	0.06 mg/l to 20 mg/l
		Copper	APHA (22nd Edition) 3111-B: 2012	0.04 mg/l to 10 mg/l
		Manganese	APHA (22nd Edition) 3111-B: 2012	0.1 mg/l to 10 mg/l
		Arsenic	APHA (22nd Edition) 3114-B: 2012	0.01 mg/l to 5 mg/l
		Zinc	APHA (22nd Edition) 3111-B: 2012	0.01 mg/l to 2 mg/l
		Mercury	APHA (22nd Edition) 3112-B: 2012	0.001 mg/ml to 1 mg/ml

Sumit Sundriyal
Convenor

N. Venkateswaran
Program Manager

310
312

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Discipline	Chemical Testing	Issue Date	03.02.2015
Certificate Number	T-1751	Valid Until	02.02.2017
Last Amended on	-	Page	7 of 8

S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
	Waste Water	Phenols	APHA (22nd Edition) 5530-Phenols D: 2012	0.1 mg/ml to 5 mg/l
		Nickel	APHA (22nd Edition) 3111-B: 2012	0.2 mg/l to 20 mg/l
		Ammonia	APHA (22nd Edition) 4500-NH_3: 2012	0.1 mg/l to 50 mg/l
		Silica	APHA (22nd Edition) 4500-SiO_2 C/F: 2012	0.4 mg/l to 50 mg/l
		Sulfate	APHA (22nd Edition) 4500-SO_4^{2-} E: 2012	1 mg/l to 400 mg/l
		Chloride	APHA (22nd Edition) 4500-Cl^- B/ D: 2012	0.15 mg/l to 1000 mg/l
		Fluoride	APHA (22nd Edition) 4500-F^- C/ D: 2012	0.1 mg/l to 10 mg/l
		Nitrate	APHA (22nd Edition) 4500-NO_3 E: 2012	0.01 mg/l to 100 mg/l
		Residual Chlorine	APHA (22nd Edition) 4500-Cl^- B: 2012	0.04 mg/l to 20 mg/l
		Phosphate	APHA (22nd Edition) 4500 E/ D: 2012	0.01 mg/l to 6 mg/l
		Kjeldahl Nitrogen	APHA (22nd Edition) 4500-N_{org} B/C: 2012, 4500-NH_3 C/F: 2012	0.2 mg/l to 200 mg/l
		Cyanide	APHA (22nd Edition) 4500-CN C: 2012	0.05 mg/l to 10 mg/l

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N. Venkateswaran
Program Manager

311

303

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Certificate Number	T-1751	Valid Until	02.02.2017
Last Amended on	-	Page	8 of 8

S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
	Waste Water	Cadmium	APHA (22nd Edition) 3111-B: 2005	0.05 mg/l to 2.0 mg/l
		Iron	APHA (22nd Edition) 3111-B: 2012	0.3 mg/l to 10 mg/l
		Selenium	APHA (22nd Edition) 3111-D: 2012	0.1 mg/l to 5.0 mg/l
		Sulfide	APHA (22nd Edition) 4500-S^{2-} D/F: 2012	1 mg/l to 20 mg/l

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Sumit Sundriyal
Convenor

N. Venkateswaran
Program Manager

312
303

Attachment - 8

October 04, 2016

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding is entered into by and between M/s. Ghosh, Bose & Associates Pvt Ltd, an Accredited EIA Consultant of NABET/QCI (Registration Certificate No. NABET/EIA/1013/014), with its Registered Office at 8 Harrington Mansion, 8 Ho Chi Minh Sarani, Kolkata 700 071 (**FIRST PARTY**) and M/s. Greenc Laboratory Services a NABL Accredited Laboratory (Registration Certificate No. T-2686), with its Registered Office at 605-607, Level-V, Shopprix Mall, Sector-5, Vaishali, Ghaziabad,Uttar Pradesh (**SECOND PARTY**), wherein both parties have agreed that the Baseline Data Generation in relevant Environmental Disciplines for the various EIA Studies to be conducted by the First Party would be undertaken by the Second Party, on a case to case basis.

This MoU shall be valid for a period of 3 (Three) Years, i.e. upto 03-10-2019

Signed on behalf of
M/s. Ghosh, Bose & Associates Pvt Ltd

Sutanu Ghosh
Managing Director.

Signed on behalf of
M/s. Greenc Laboratory Services

Nandini Choudhury
Managing Director

M/S. Greenc Laboratory Services is a subsidiary of M/s. Greencindia Consulting (P) Ltd.

राष्ट्रीय परीक्षण और अंशशोधन प्रयोगशाला प्रत्यायन बोर्ड
NATIONAL ACCREDITATION BOARD FOR TESTING & CALIBRATION LABORATORIES
सचिवालय : प्लॉट नं. – 45, सेक्टर नं. – 44, गुड़गाव – 122 002, हरियाणा, भारत
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NABL/T/1931/C

10th December, 2015

Mr. Rahul Singh
Quality Manager
GreenC Laboratory Services,
605-607, Level-5, Shopprix Mall,
Sector V, Vaisali, NCR,
Ghaziabad-201001, Uttar Pradesh, India
Phone No.1: 120-4111527, 9990156652
Fax No(s): 120-4111527
Email-Id: lab.greenc@gmail.com

Subject: Accreditation Certificate & Scope of Accreditation

Dear Mr. Rahul Singh,

In continuation to my previous letter informing the Renewal of Accreditation to your laboratory as per ISO/IEC 17025:2005, please find enclosed the accreditation certificates for Chemical testing field of your laboratory. The certificates have been issued for period of two years and the certificate is valid till 13.10.2017.

The accreditation is subject to continued compliance of NABL norms during the accreditation period. Surveillance (Desktop) assessment will be conducted after 10 months from the issue date of certificate.

You are required to use NABL symbol inline with revised NABL 133.

Kindly acknowledge the receipt of the certificates.

Sincerely,

10.12.2015

Deepak Kumar Sharma
Accreditation Officer
nabl.deepak@gmail.com

Encl.: As above

P.S.: Kindly inform us within 15 days for any discrepancy in the Certificate(s) / Scope of Accreditation.

NABL

National Accreditation Board for Testing and Calibration Laboratories

(An Autonomous Body under Department of Science & Technology, Govt. of India)

CERTIFICATE OF ACCREDITATION

GREENC LABORATORY SERVICES

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2005

"General Requirements for the Competence of Testing & Calibration Laboratories"

for its facilities at

605-607, Level-V, Shopprix Mall, Sector 5, Vaishali, Ghaziabad, Uttar Pradesh

in the discipline of

CHEMICAL TESTING

(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Certificate Number T-2686

Issue Date 14/10/2015

Valid Until 13/10/2017

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the additional requirements of NABL.

Signed for and on behalf of NABL

N. Venkateswaran	Anil Relia	Prof. S. K. Joshi
Program Manager	Director	Chairman

रा.प्र.प्र.बो.

राष्ट्रीय परीक्षण और अंशशोधन प्रयोगशाला प्रत्यायन बोर्ड

(विज्ञान एवं प्रौद्योगिकी विभाग, भारत सरकार के अधीन स्वायत्तशासी निकाय)

प्रत्यायन प्रमाण–पत्र

ग्रीनसी लेबोरेटरी सर्विसेस्

का मूल्यांकन और प्रत्यायन निम्न मानक के अनुसार

आई.एस.ओ./आई.ई.सी. 17025:2005

"परीक्षण एवं अंशशोधन प्रयोगशालाओं की सक्षमता की सामान्य अपेक्षाएँ"

गाजियाबाद, उत्तर प्रदेश

में स्थित इसकी सुविधाओं के लिए

रासायनिक परीक्षण

के विषय क्षेत्र में किया गया।

(इस प्रयोगशाला के प्रत्यायन के विषय क्षेत्र की जानकारी एन.ए.बी.एल वेबसाइट www.nabl-india.org से भी प्राप्त कर सकते हैं)

प्रमाण-पत्र संख्या प -2686

जारी करने की तिथि 14/10/2015

वैधता की तिथि 13/10/2017

यह प्रमाण-पत्र उपर्युक्त मानक तथा राष्ट्रीय परीक्षण और अंशशोधन प्रयोगशाला प्रत्यायन बोर्ड की अतिरिक्त अपेक्षाओं का निरंतर संतोषप्रद अनुपालन किए जाने पर अनुबंध में निर्दिष्टानुसार प्रत्यायन के क्षेत्र के लिए वैध रहेगा।

रा.प्र.प्र.बो. की ओर से हस्ताक्षरित

एस. वेंकटेश्वरन	अनिल रेलिया	प्रो. श्रीकृष्ण जोशी
कार्यक्रम प्रबन्धक	निदेशक	अध्यक्ष

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SCOPE OF ACCREDITATION

Laboratory	Greenc Laboratory Services, 605-607, Level-V, Shopprix Mall, Sector 5, Vaishali, Ghaziabad, Uttar Pradesh		
Accreditation Standard	ISO/IEC 17025:2005		
Discipline	Chemical Testing	Issue Date	14.10.2015
Certificate Number	T-2686	Valid Until	13.10.2017
Last Amended on	09.11.2015	Page	1 of 4

S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
I.	WATER			
1.	Potable Water/ Domestic Water / Surface Water / Ground Water	pH at 25°C	APHA (22nd Edition) 4500 H+B: 2012	1 to 14
		Color	APHA (22nd Edition) 2120 B: 2012	1 Hazen to 500 Hazen
		Turbidity	APHA (22nd Edition) 2130 B: 2012	1 NTU to 1000 NTU
		Electrical Conductivity	APHA (22nd Edition) 2510 B: 2012	2 µS to 200000 µS
		Total Dissolved Solid (TDS)	APHA (22nd Edition) 2540 C: 2012	2 mg/L to 5000 mg/L
		Total Suspended Solid (TSS)	APHA (22nd Edition) 2540 D: 2012	5 mg/L to 5000 mg/L
		Total Hardness	APHA (22nd Edition) 2340 C: 2012	4 mg/L to 5000 mg/L
		Calcium (Ca)	APHA (22nd Edition) 3500 Ca B: 2012	2 mg/L to 2000 mg/L
		Magnesium (Mg)	APHA (22nd Edition) 3500 Mg B: 2012 (By Calculation.)	1 mg/L to 2000 mg/L
		Sodium	APHA (22nd Edition) 3500 Na B: 2012	5 mg/L to 1000 mg/L
		Potassium	APHA (22nd Edition) 3500 K B: 2012	5 mg/L to 1000 mg/L
		Alkalinity as $CaCO_3$	IS 3025 (Part 23): 1986 (Re 2009)	2 mg/L to 5000 mg/L
		Acidity as $CaCO_3$	IS 3025 (Part 22): 1986 (Re 2009)	2 mg/L to 5000 mg/L
		Iron	IS 3025 (Part 53): 2003 (Re 2009)	0.01 mg/L to 10 mg/L

Deepak Kumar Sharma
Convenor

N. Venkateswaran
Program Manager

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Last Amended on	09.11.2015	Page	2 of 4

S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
	Potable Water/ Domestic Water / Surface Water / Ground Water	Fluoride	APHA (22nd Edition) 4500 F D: 2012	0.1 mg/L to 10 mg/L
		Chloride	APHA (22nd Edition) 4500 Cl B: 2012	2 mg/L to 1000 mg/L
		Sulphate	APHA (22nd Edition) 4500 SO_4 E: 2012	5 mg/L to 1000 mg/L
		Phosphorus	APHA (22nd Edition) 4500 P D: 2012	0.05 mg/L to 6 mg/L
		Dissolved Oxygen	IS 3025 (Part 38): 1989 (RA 2003)	2 mg/L to 10 mg/L
2.	Construction water	pH value at 25°C	APHA (22nd Edition) 4500 H^+ B: 2012	1 to 14
		Acidity as $CaCO_3$	IS 456: 2000 (RA 2011)	2 mL/100 mL to 50 mL/100 mL
		Alkalinity as $CaCO_3$	IS 456: 2000 (RA 2011)	2 mL/100 mL to 50 mL/100 mL
		Volatile Residue (Organic)	IS 3025 (Part 18): 1984 (RA 2002)	5 mg/L to 5000 mg/L
		Fixed Residue (Inorganic)	IS 3025 (Part 18): 1984 (RA 2002)	5 mg/L to 5000 mg/L
		Sulphate	APHA (22nd Edition) 4500 SO_4^{2-} E: 2012	5 mg/L to 1000 mg/L
		Chloride	APHA (22nd Edition) 4500 Cl B: 2012	2 mg/L to 1000 mg/L
		Total Suspended Solids (TSS)	APHA (22nd Edition) 2540 D: 2012	5 mg/L to 5000 mg/L

Deepak Kumar Sharma
Convenor

K. Venkateswaran
Program Manager

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SCOPE OF ACCREDITATION

Laboratory	Greenc Laboratory Services, 605-607, Level-V, Shopprix Mall, Sector 5, Vaishali, Ghaziabad, Uttar Pradesh		
Accreditation Standard	ISO/IEC 17025:2005		
Discipline	Chemical Testing	Issue Date	14.10.2015
Certificate Number	T-2686	Valid Until	13.10.2017
Last Amended on	09.11.2015	Page	3 of 4

S.No.	Product/ Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
3.	Swimming Pool water	pH value at 25°C	APHA (22nd Edition) 4500 H+ B: 2012	1 to 14
		Total Alkalinity as $CaCO_3$	IS 3025 (Part 23): 1986 (RA 2009)	2 mg/L to 5000 mg/L
		Total Dissolved solids (TDS)	APHA (22nd Edition) 2540 C: 2012	2 mg/L to 5000 mg/L
		Chloride	APHA (22nd Edition) 4500 Cl B: 2012	2 mg/L to 1000 mg/L
		Iron	IS 3025 (Part 53): 2003 (RA 2009)	0.13 mg/L to 10 mg/L
		Color	APHA (22nd Edition) 2120 B: 2012	1 Hazen to 500 Hazen
		Turbidity	APHA (22nd Edition) 2130 B: 2012	1 NTU to 1000 NTU
II.	POLLUTION & ENVIRON MENT			
1.	Soil Analysis	Moisture Content	IS 2720 (Part 2): 1973 (RA 2005)	0.5 % to 50 %
		pH	IS 2720 (Part 26): 1987 (RA 2007)	1 to 14
		Conductivity	IS 14767: 2000	2 µS to 200000 µS
		Organic Carbon	IS 2720 (Part 22): 1972 (RA 2001) (By Calculation)	0.33 % to 17.5 %
		Organic Matter	IS 2720 (Part 22): 1972 (RA 2001)	0.35 % to 30 %
2.	Effluent / Waste Water	pH at 25°C	APHA (22nd Edition) 4500 H+ B: 2012	1 to 14
		Total Suspended Solid (TSS)	APHA (22nd Edition) 2540 D: 2012	5 mg/L to 5000 mg/L
		Dissolved Oxygen	IS 3025 (Part 38): 1989 (RA 2003)	1 mg/L to 10 mg/L

Deepak Kumar Sharma
Convenor

N. Venkateswaran
Program Manager

NABL

SCOPE OF ACCREDITATION

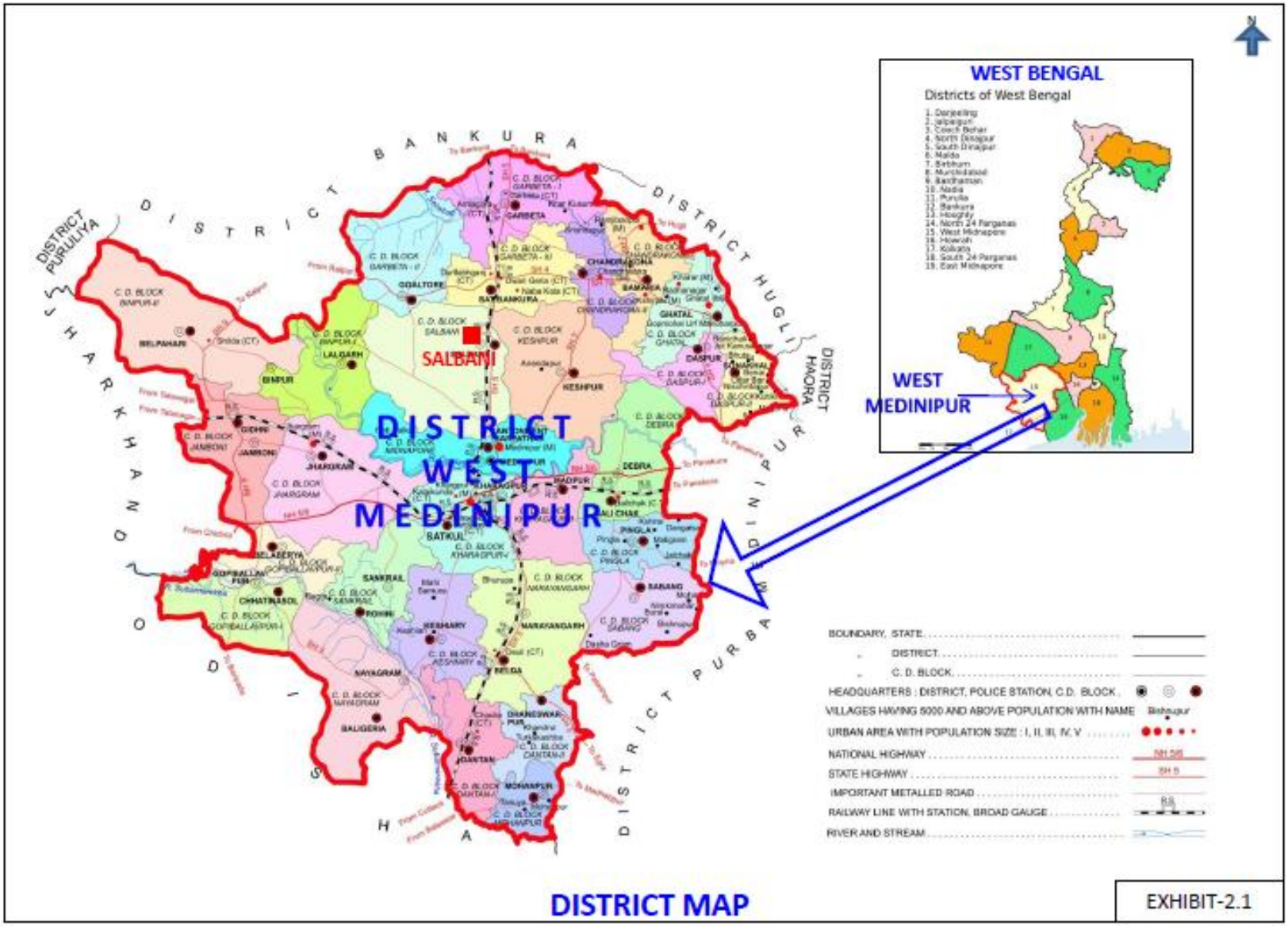
Laboratory	Greenc Laboratory Services, 605-607, Level-V, Shopprix Mall, Sector 5, Vaishali, Ghaziabad, Uttar Pradesh		
Accreditation Standard	ISO/IEC 17025:2005		
Discipline	Chemical Testing	Issue Date	14.10.2015
Certificate Number	T-2686	Valid Until	13.10.2017
Last Amended on	09.11.2015	Page	4 of 4

S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
	Effluent / Waste Water	BOD (3 days at 27°C)	IS 3025 (Part 44): 1993 (RA 2003)	5 mg/L to 750 mg/L
		COD	IS 3025 (Part 58): 2006	5 mg/L to 1200 mg/L
		Oil & Grease	IS 3025 (Part 39): 1991 (RA 2003)	5 mg/L to 100 mg/L
III.	AIR GASES & ATMOSPHERE			
1.	Ambient Air Monitoring	SPM	IS 5182 (Part 4): 1999 (RA 2005)	20 $\mu g/m^3$ to 800 $\mu g/m^3$
		RPM (PM_{10})	IS 5182 (Part 23): 2006	10 $\mu g/m^3$ to 403 $\mu g/m^3$
		SO_2	IS 5182 (Part 2): 2001	5 $\mu g/m^3$ to 200 $\mu g/m^3$
		NO_x	IS 5182 (Part 5): 2006	6 $\mu g/m^3$ to 200 $\mu g/m^3$

-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-

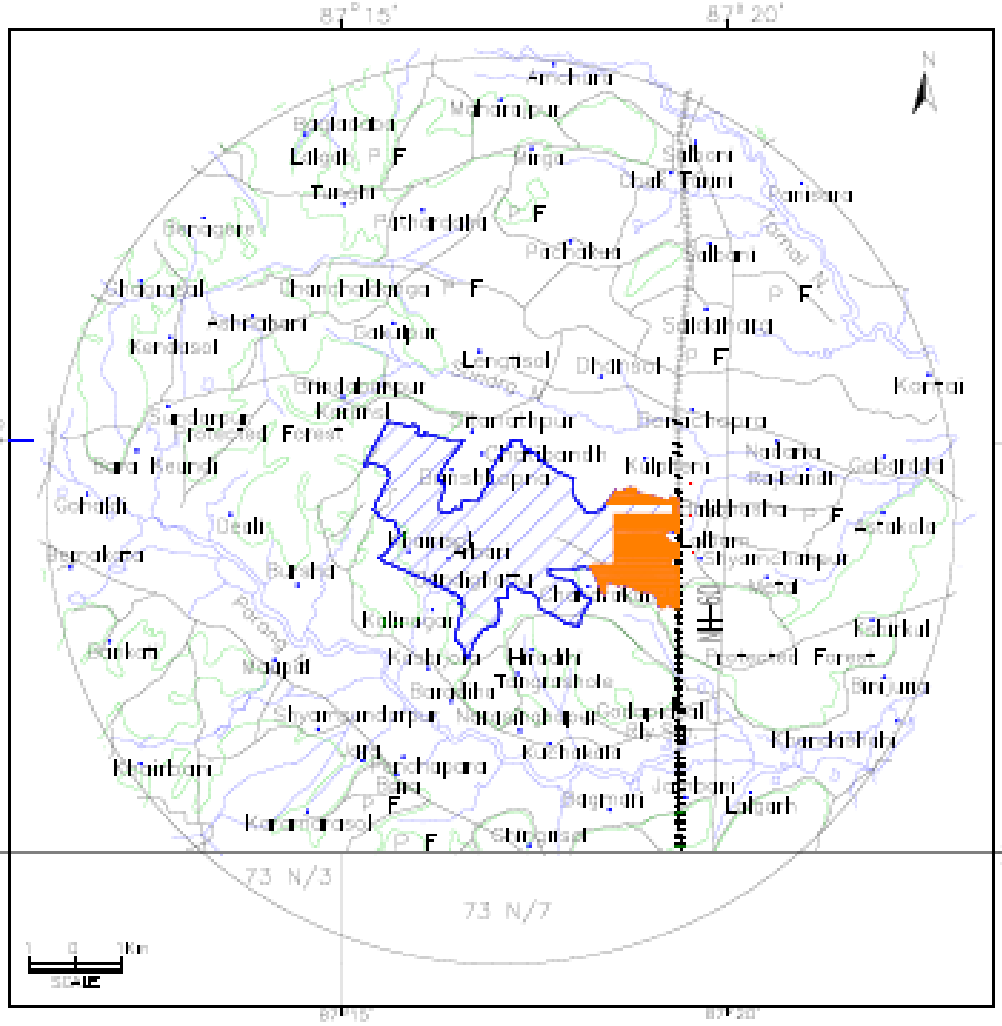
Deepak Kumar Sharma
Convenor

N. Venkateswaran
Program Manager



DISTRICT MAP

EXHIBIT-2.1

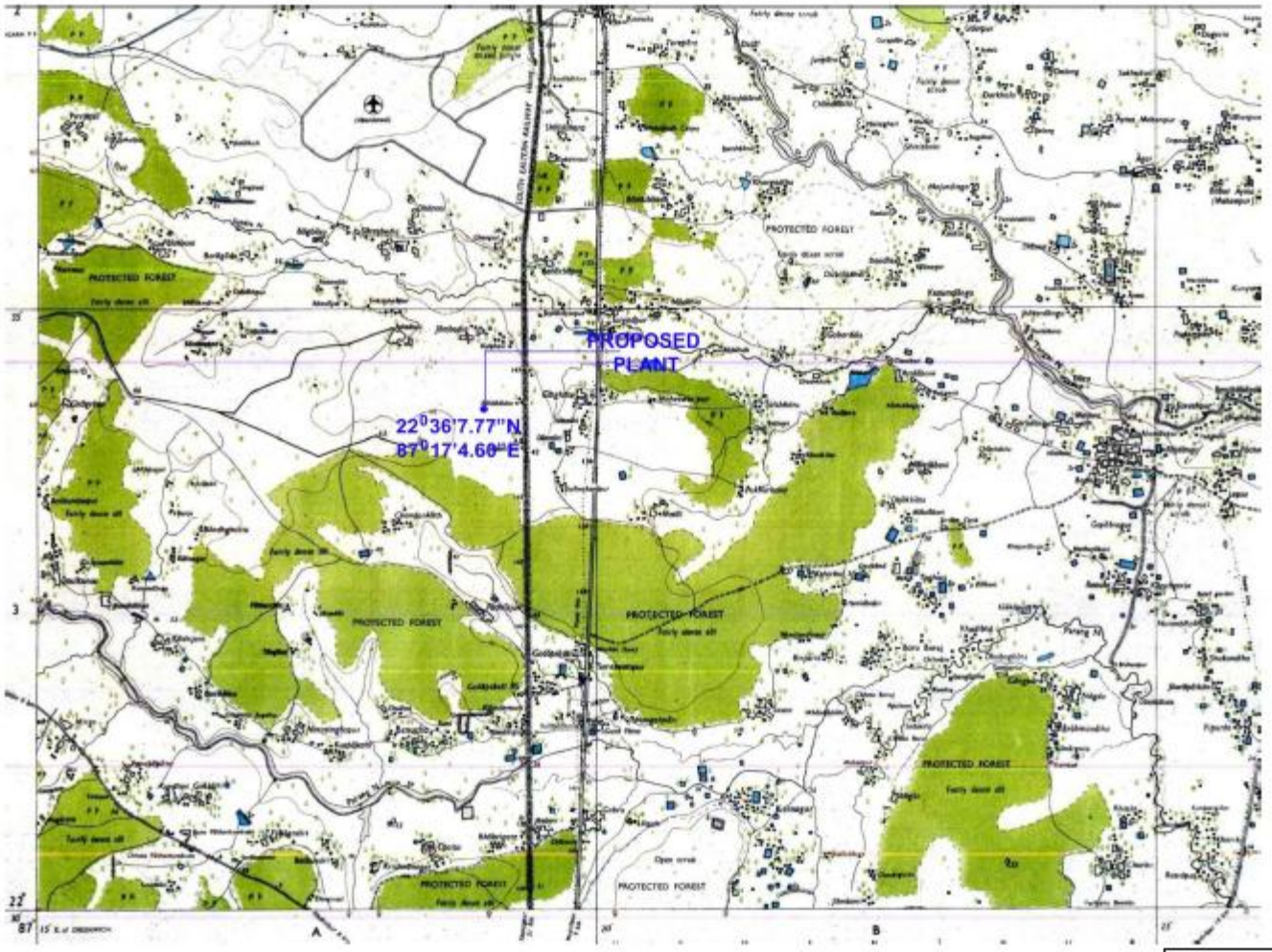


LEGEND

- Composite Project Area
- Power Plant Area
- Nadi-Nala
- Highway/Road
- Railway Line
- Railway Station
- Forest Boundary
- Village

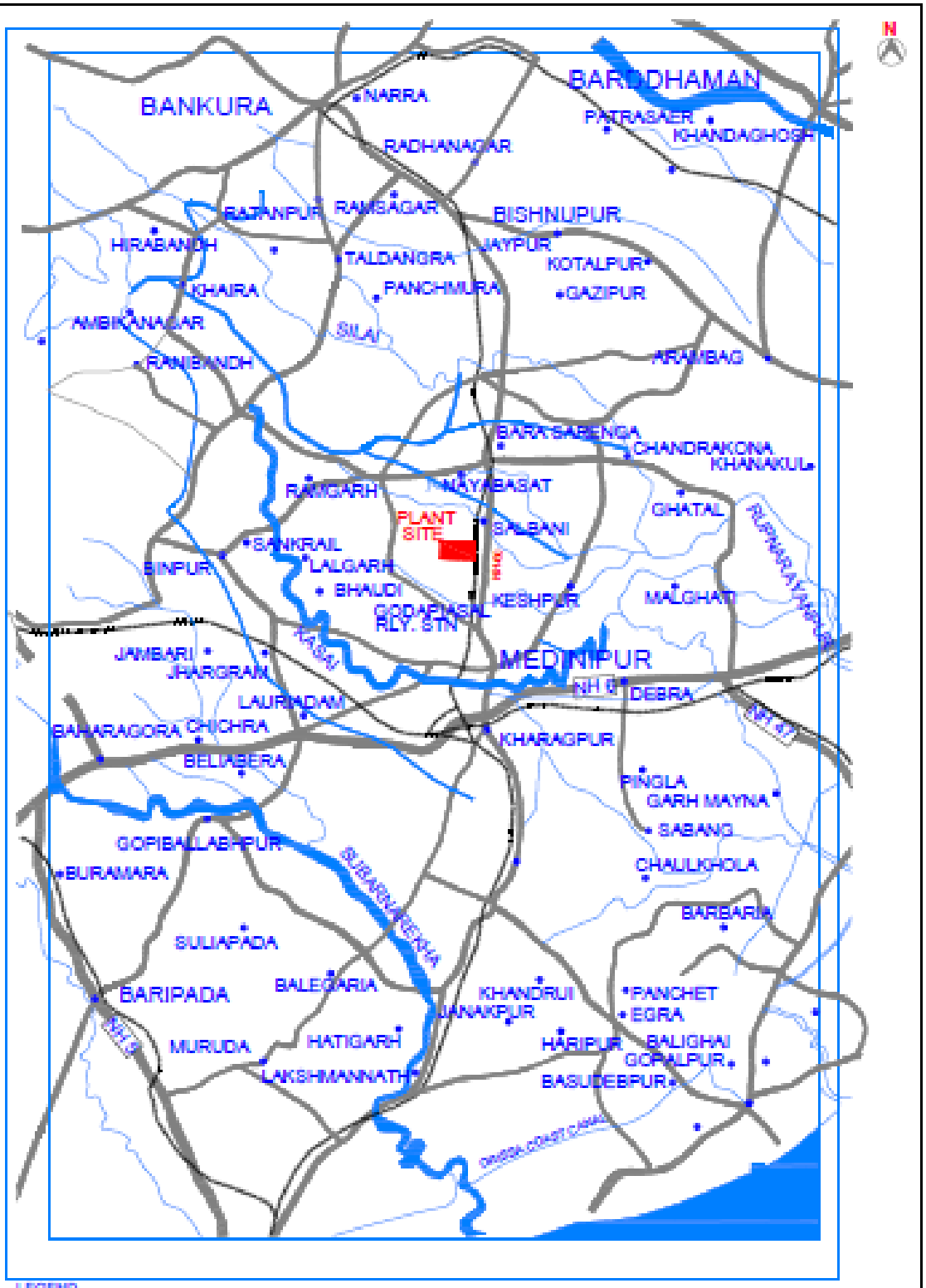
VICINITY MAP

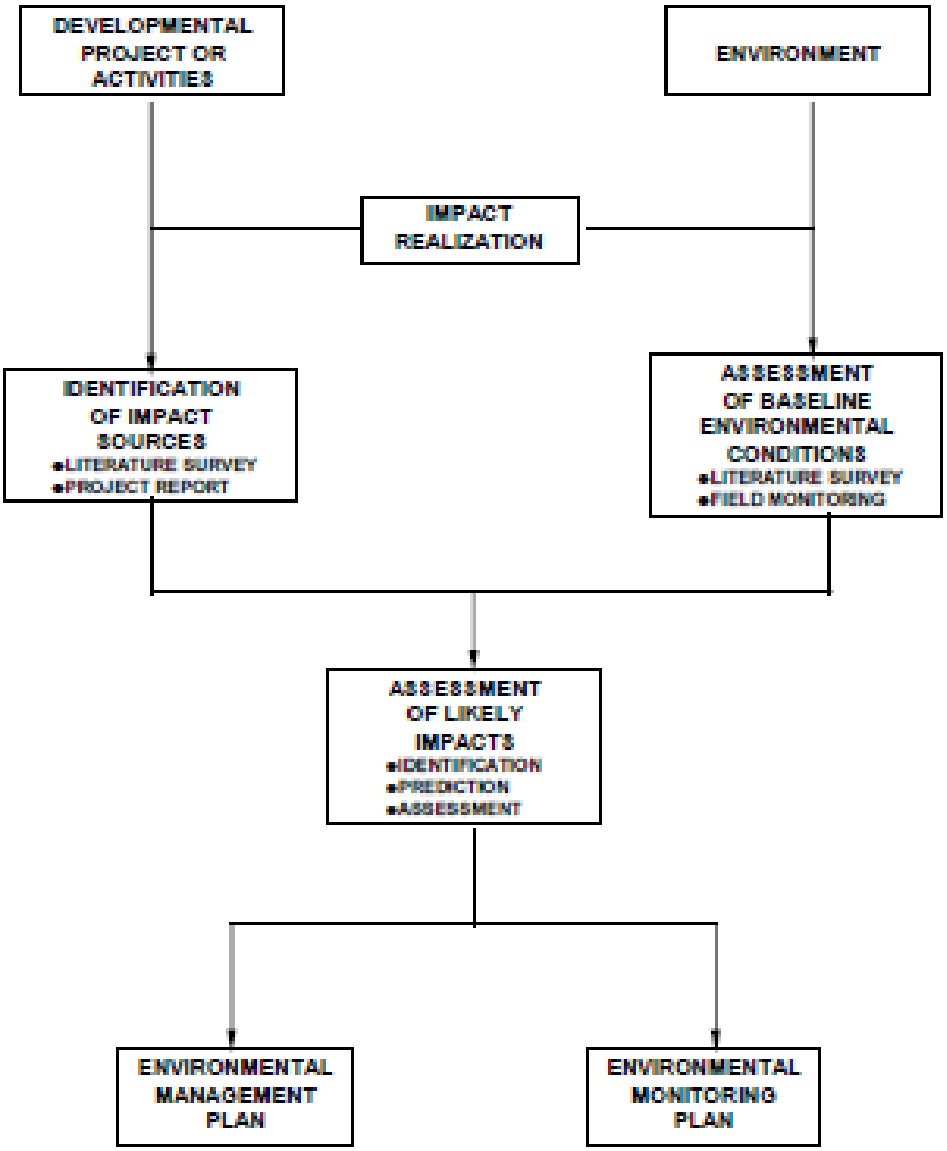
EXHIBIT-2.2



TOPO SHEET SHOWING PLANT LOCATION

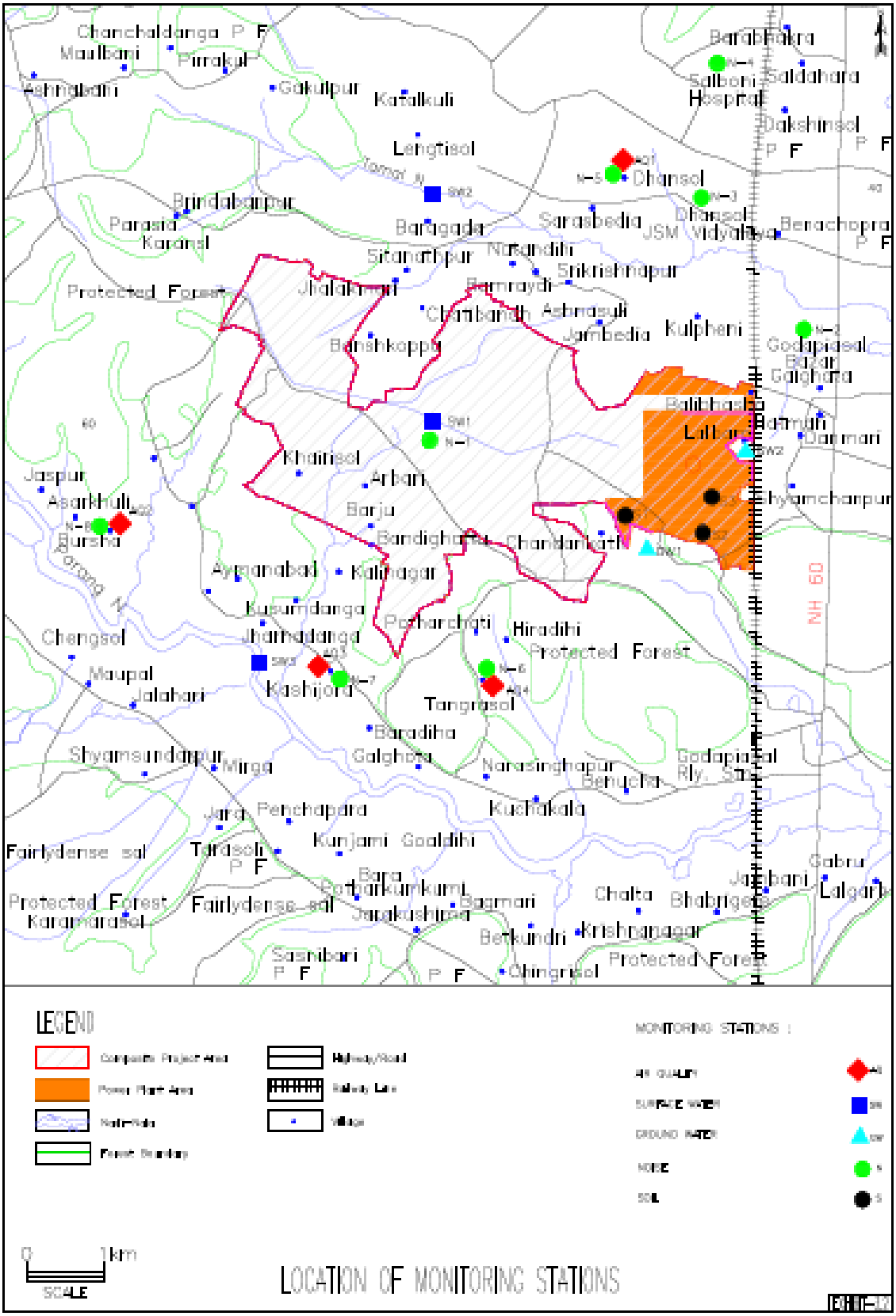
EXHIBIT-2.3

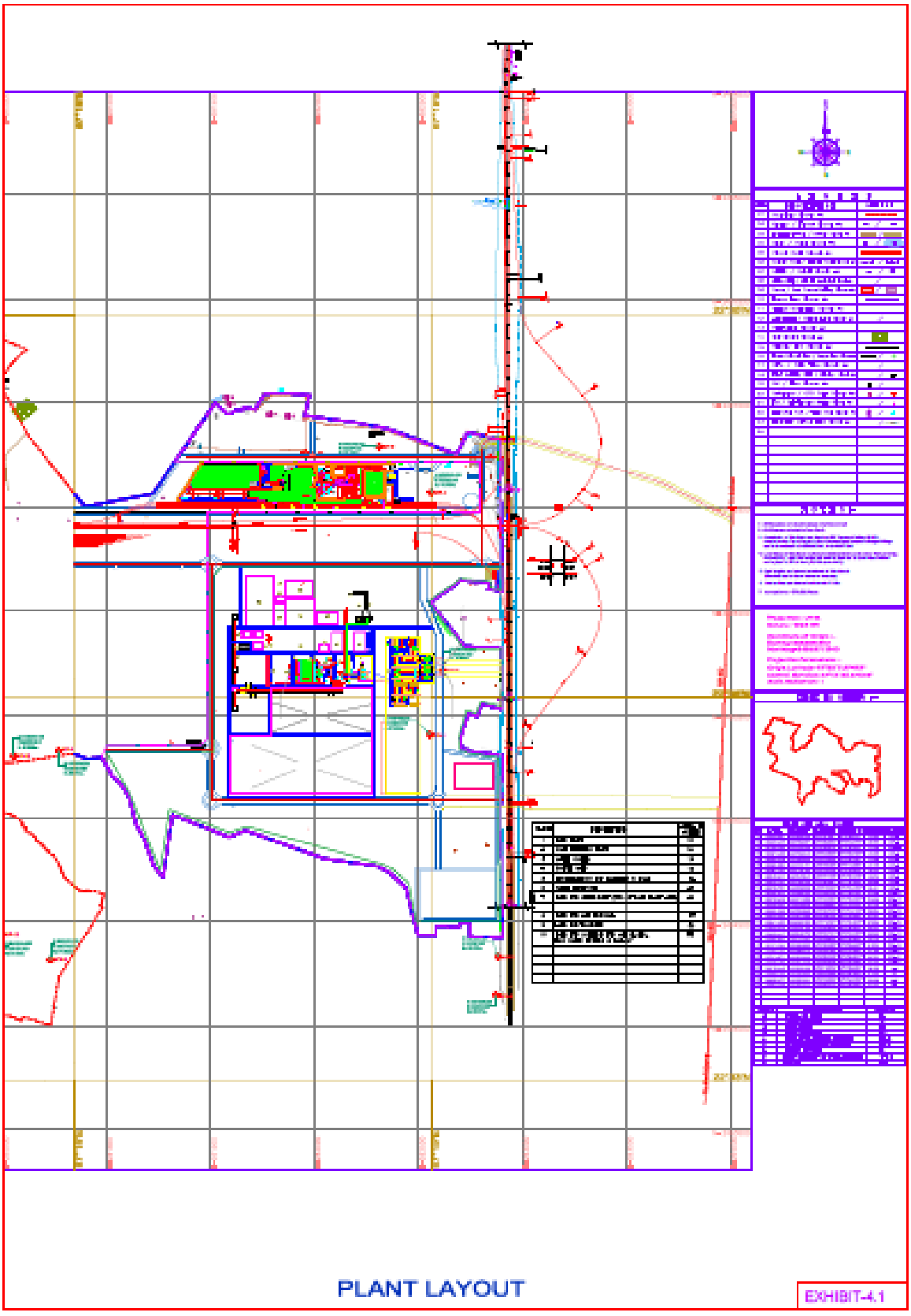

N
BANKURA
BARDDHAMAN
NARRA
PATRASAER
KHANDAGHOSH
RADHANAGAR
RAJANPUR
RAMSAGAR
BISHNUPUR
HIRABANDH
JAYPUR
TALDANGRA
KOTALPUR
KHAIRA
PANCHMURA
GAZIPUR
AMBIKANAGAR
SILAI
ARAMBAG
RANIBANDH
BARA SABENGA
CHANDRAKONA
KHANAKUL
RAMGARH
NAYABASAT
GHATAL
PLANT SITE
SALBANI
SANKRAIL
BINPUR
LALGARH
BHAUDI
KESHPUR
MALGHAT
GODAPIASAL RLY. STN
JAMBARI
JHARGRAM
MEDINIPUR
LAURIADAM
DEBRA
BAHARAGORA
CHICHRA
KHARAGPUR
BELIABERA
PINGLA
GARH MAYNA
SABANG
GOPIBALLABHPUR
BURAMARA
CHAULKHOLA
BARBARIA
SULIAPADA
BALEGARIA
KHANDRUI
PANCHET
EGRA
BARIPADA
JANAKPUR
MURUDA
HATIGARH
HARIPUR
BALIGHAI
GOPALPUR
LAKSHMANNATH
BASUDEBPUR
ORISSA COAST CANAL
LEGEND
ROAD
RIVER
RAIL
RLY. STN.
TOWN
COMMUNICATION MAP
EXHIBIT-2.4



SEQUENTIAL FLOW DIAGRAM OF EIA

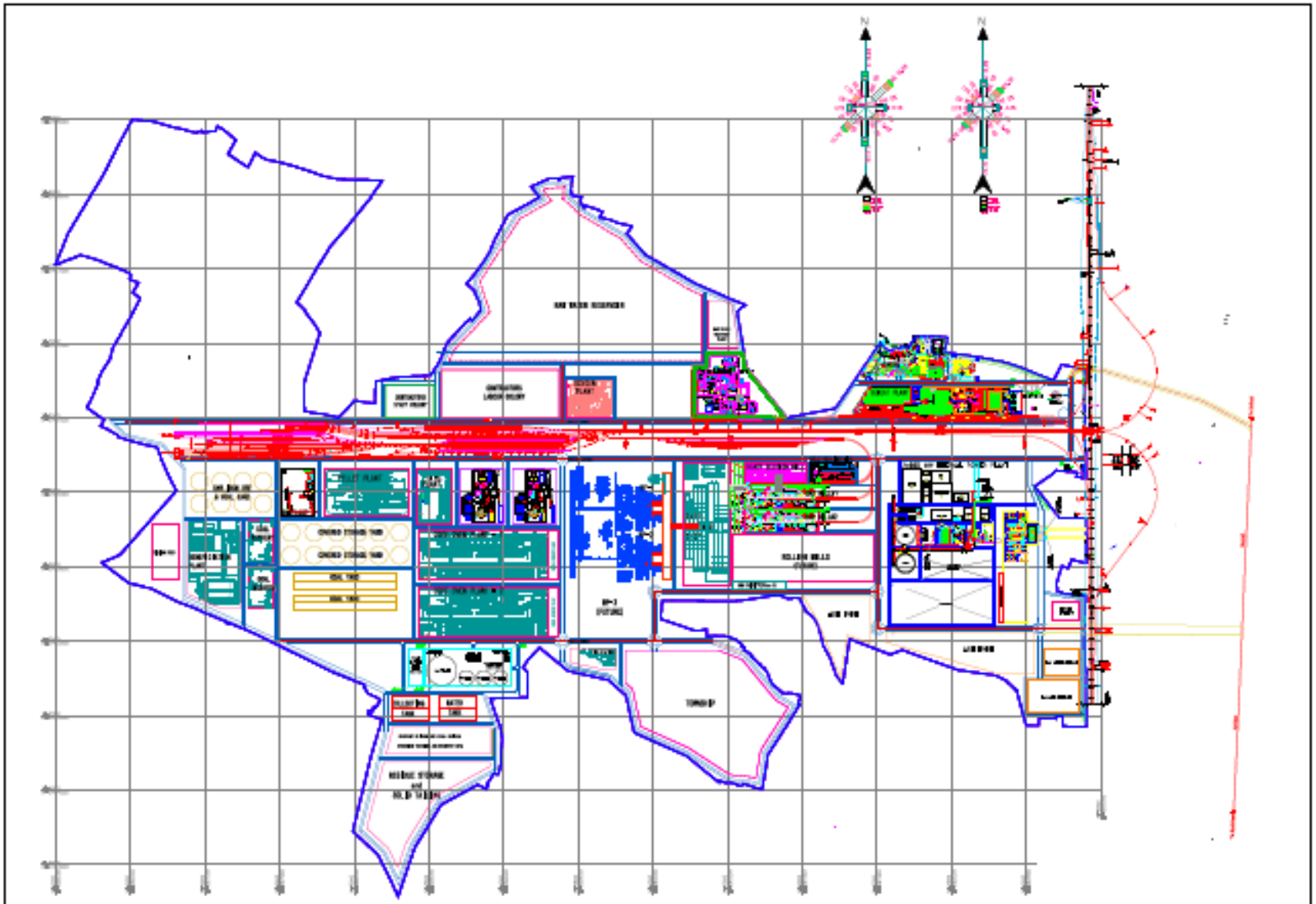
EXHIBIT – 3.1


Chanchaldanga
Maulbani
Pirrakul
Gokulpur
Kasalkuli
Lehgtisol
Barab Fakra
Salboni
Hospital
Saldahara
Dakshinsol
Dhansol
Berachopra
Brindabanpur
Parasia
Karansl
Baragada
Sarasbedia
JSM Vidyalaya
Sitarampur
Nutandihi
Srikrishnapur
Protected Forest
Jhalakmati
Ramraydi
Chambandh
Ashrasuli
Jambedia
Kulpheni
Godapiasal
Bazar
Galghora
Bankhoppa
Lalbhasha
Lalpur
Bamuni
Dalmari
Khatisol
Arban
Jaspur
Asarkhuli
Barja
Shyamchanpur
Bursha
Bandighatta
Chandankati
Ayganabad
Kalinagar
Kusumdanga
Patharchati
Hiradihi
Protected Forest
Chengsol
Jharhadanga
Maupal
Jalahari
Kashijora
Tangrasol
Baradiha
Shyamsundarpur
Mirga
Galghora
Narasinghapur
Behuchia
Rly. Sta.
Kuchakala
Jara
Penchapara
Kunjami
Goaldihi
Fairlydense sal
Tarasoli
Bara
Protected Forest
Fairlydense sal
Jaykrishnapur
Bagmari
Chalta
Bhabnigeria
Gabru
Jashani
Lalgarh
Karamtarasol
Betkundri
Krishnanagar
Protected Forest
Sashibari
Chingrisol
NH 60
LEGEND
Composite Project Area
Power Plant Area
Water Body
Forest Boundary
Railway/Road
Railway Line
Village
MONITORING STATIONS :
AIR QUALITY
SURFACE WATER
GROUND WATER
NOISE
SOIL
0
1km
SCALE
LOCATION OF MONITORING STATIONS



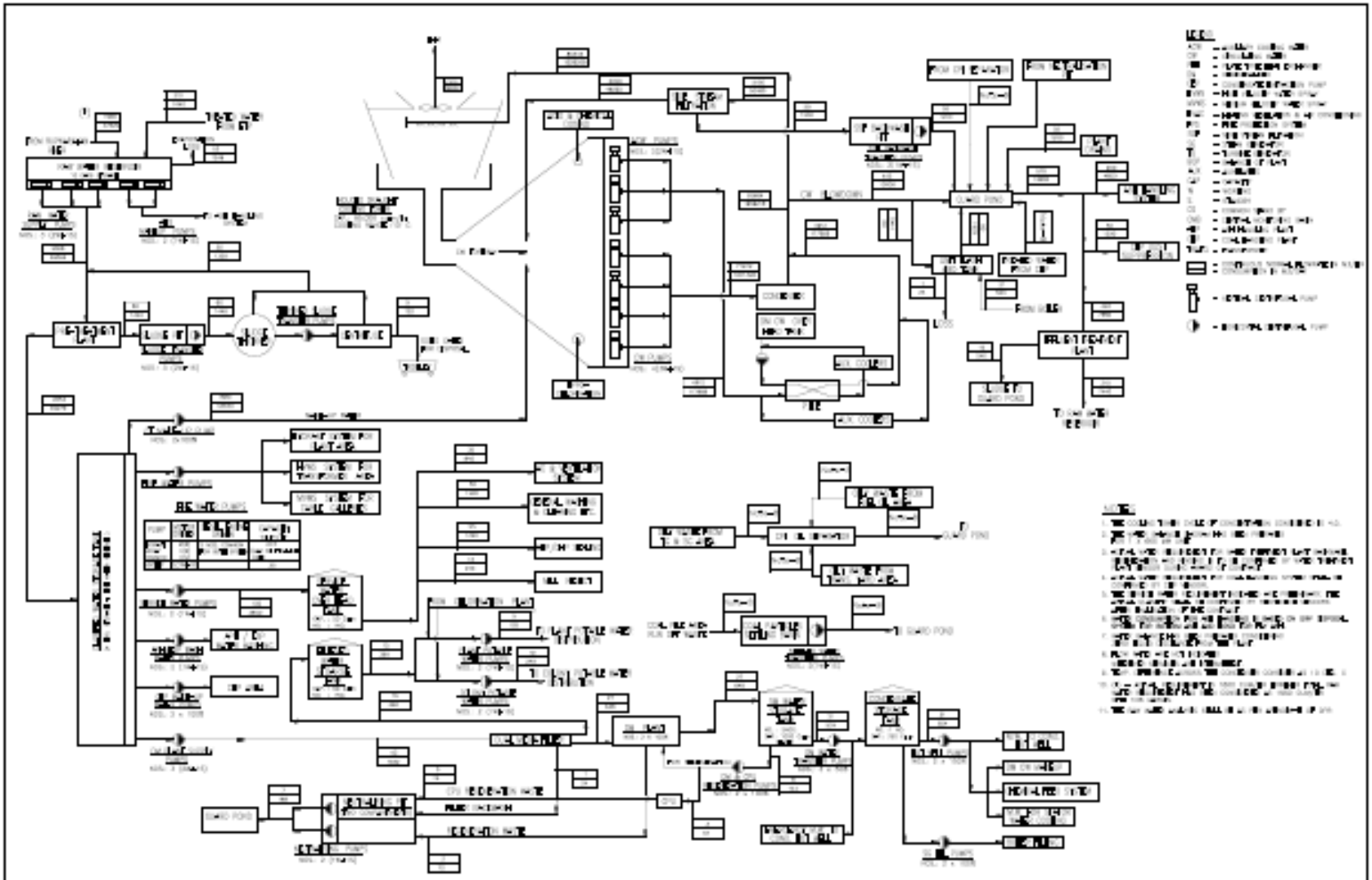
PLANT LAYOUT

EXHIBIT-4.1



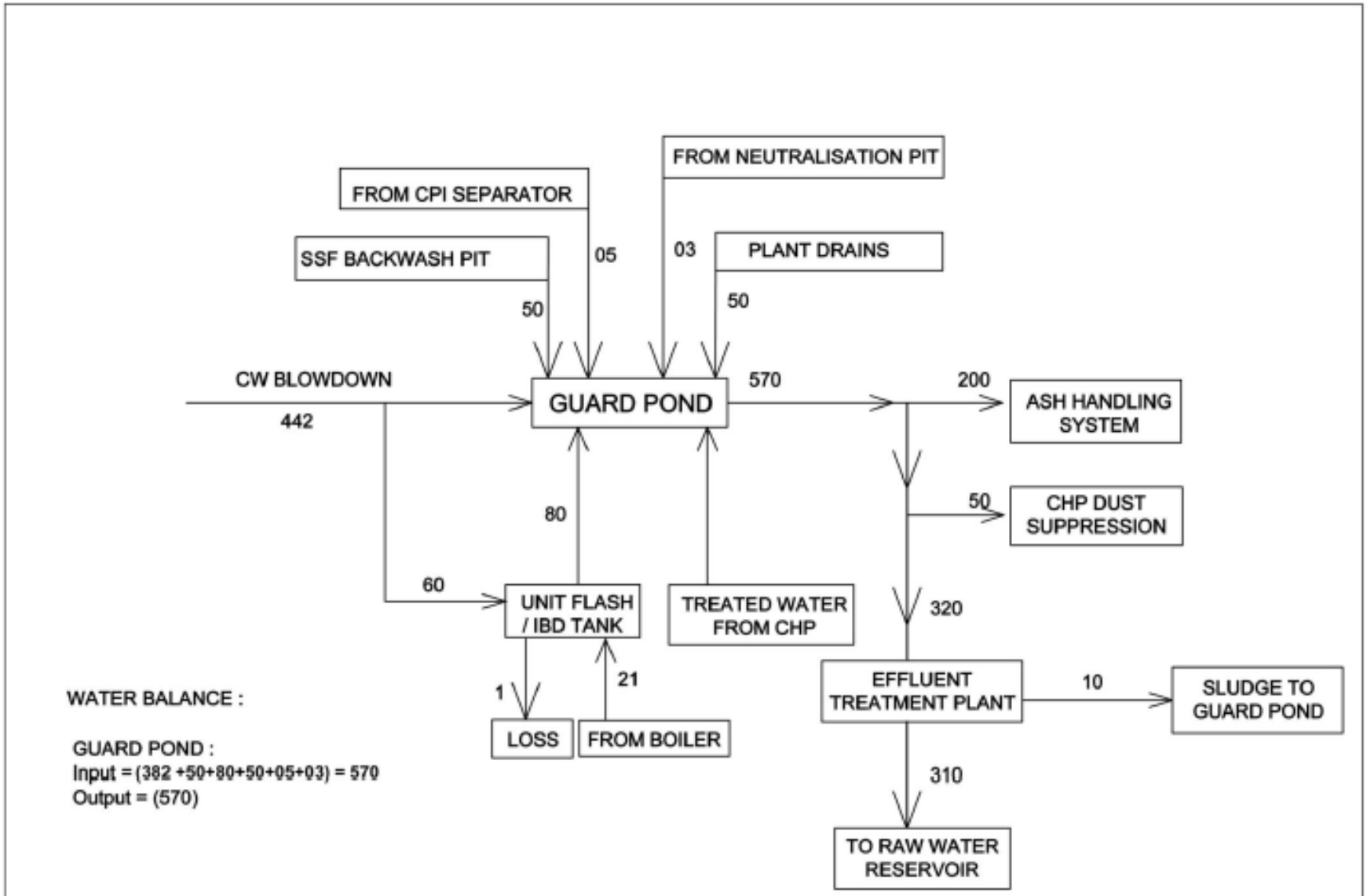
COMPOSITE PLAN FOR ISP,CPP,IPP & CEMENT PLANT

EXHIBIT-4.2



WATER BALANCE DIAGRAM I

EXHIBIT- 43

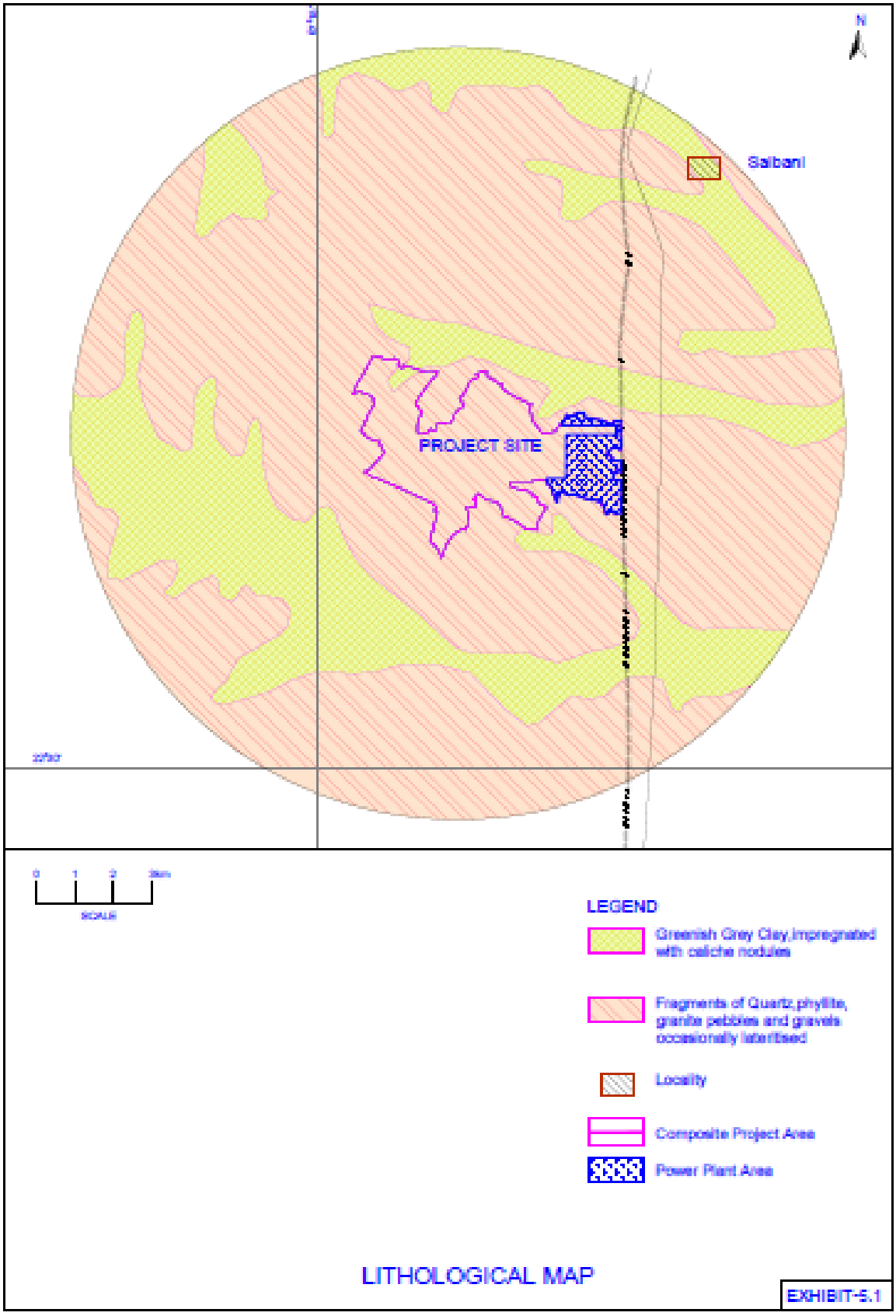


WATER BALANCE :

GUARD POND :
Input = (382 +50+80+50+05+03) = 570
Output = (570)

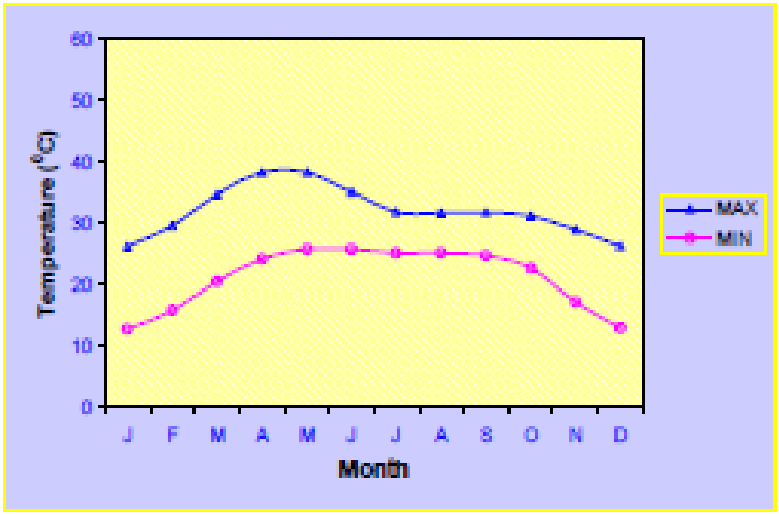
WATER BALANCE DIAGRAM II

EXHIBIT-4.4

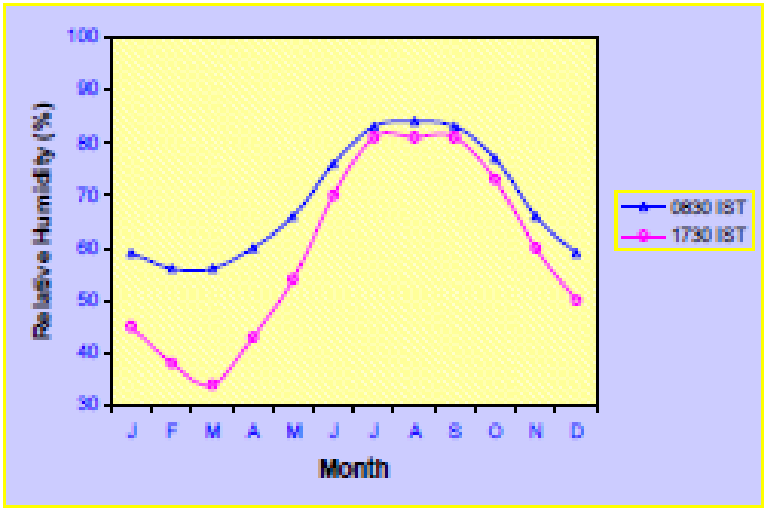


LITHOLOGICAL MAP

EXHIBIT-5.1



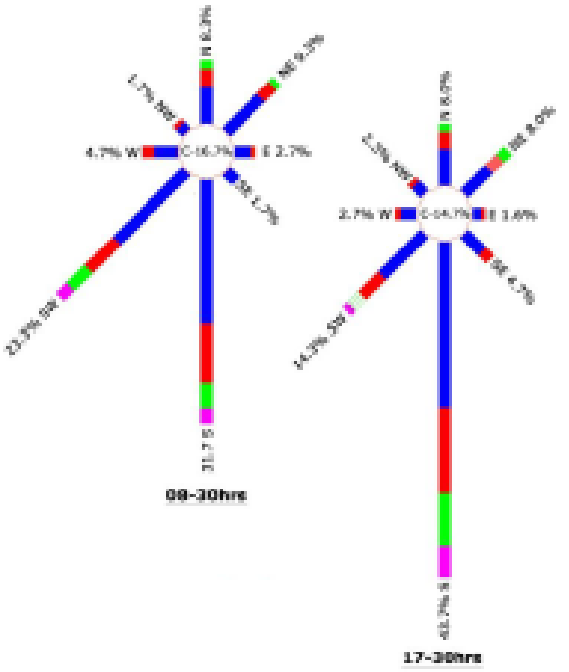
TEMPERATURE



RELATIVE HUMIDITY

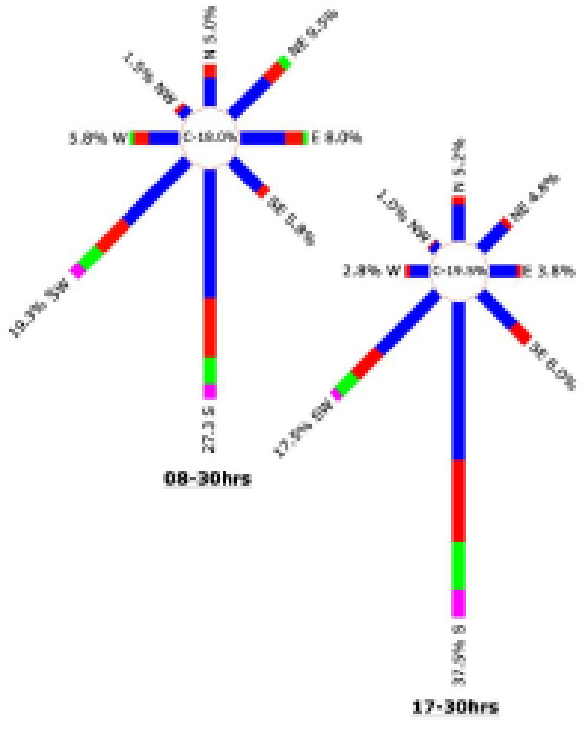
MONTHLY VARIATION OF TEMPERATURE AND RELATIVE HUMIDITY
(STATION : IMD,MEDINIPUR,1993-2002)

EXHIBIT-5.2.1



IMD : MEDINIPUR

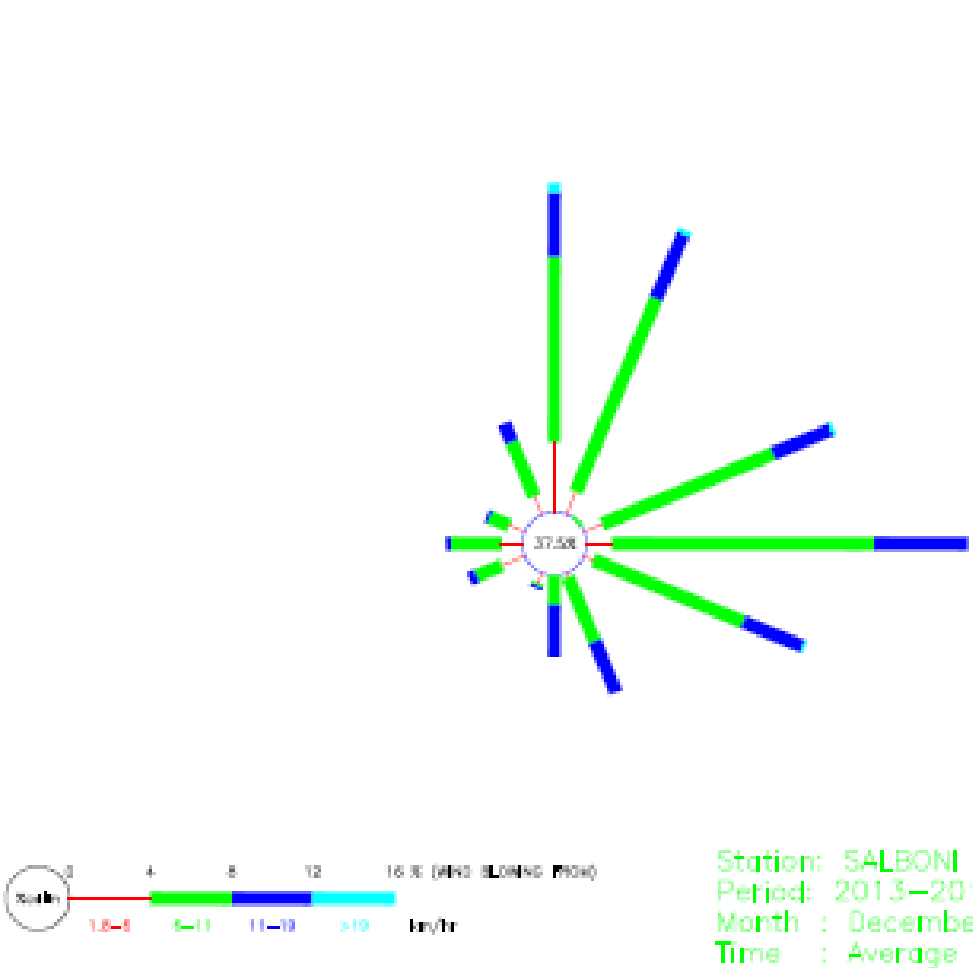
PREMONSOON



MONSOON

WINDROSE DIAGRAM

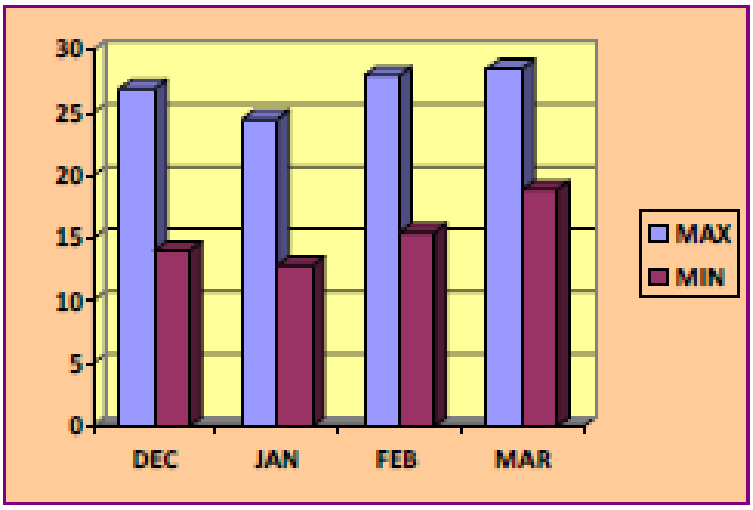
EXHIBIT – 5.2.3



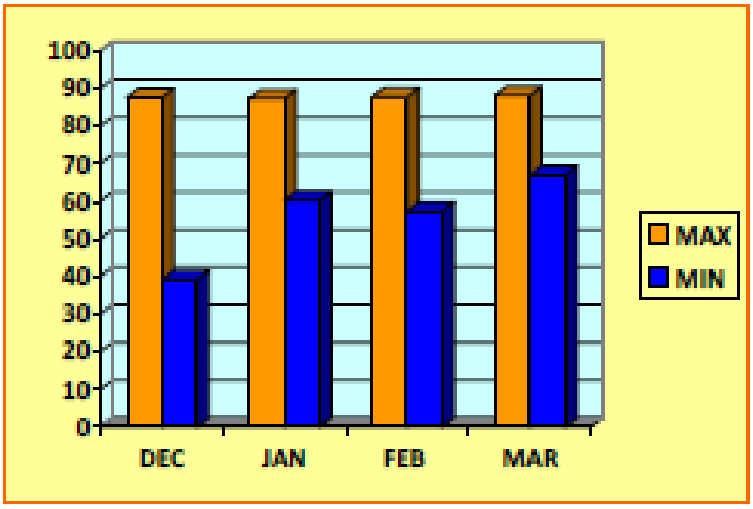
Station: SALBONI
Period: 2013–2014
Month : December–March
Time : Average

WINDROSE DIAGRAM
(December–March)

EXHIBIT–5.2.6



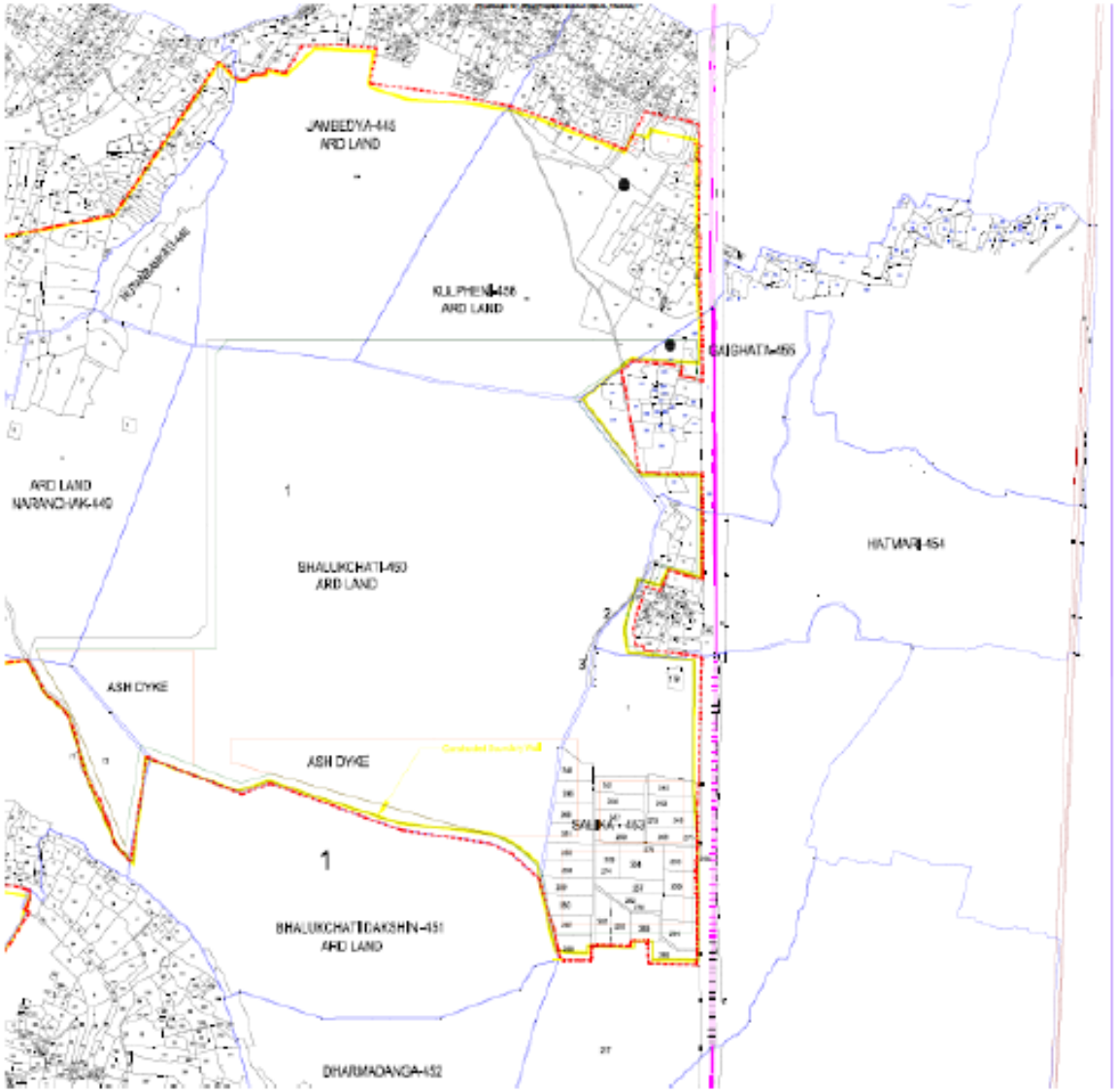
TEMPERATURE



RELATIVE HUMIDITY

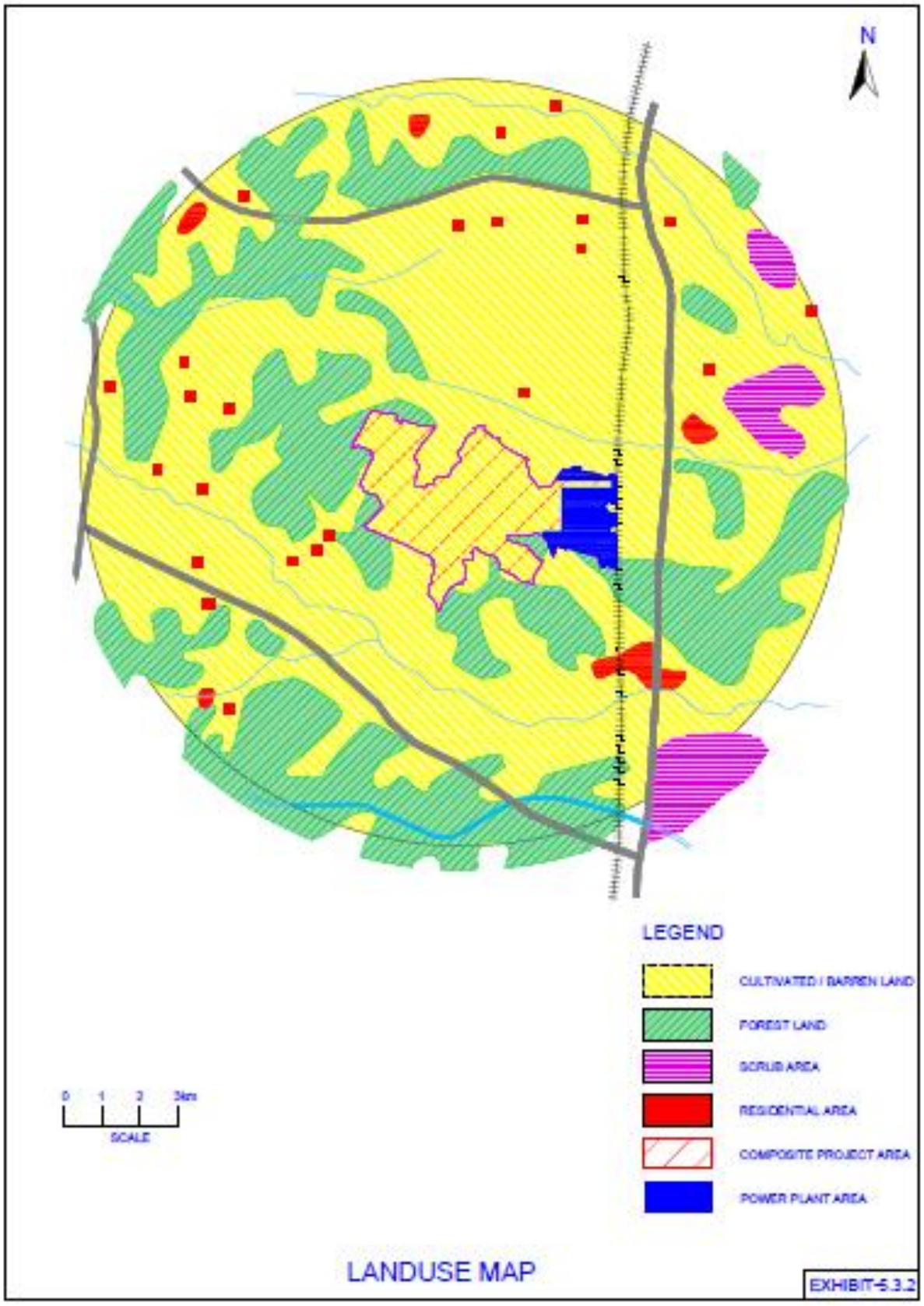
MONTHLY VARIATION OF TEMPERATURE AND RELATIVE HUMIDITY
(STATION : AT SITE)

EXHIBIT-5.2.7



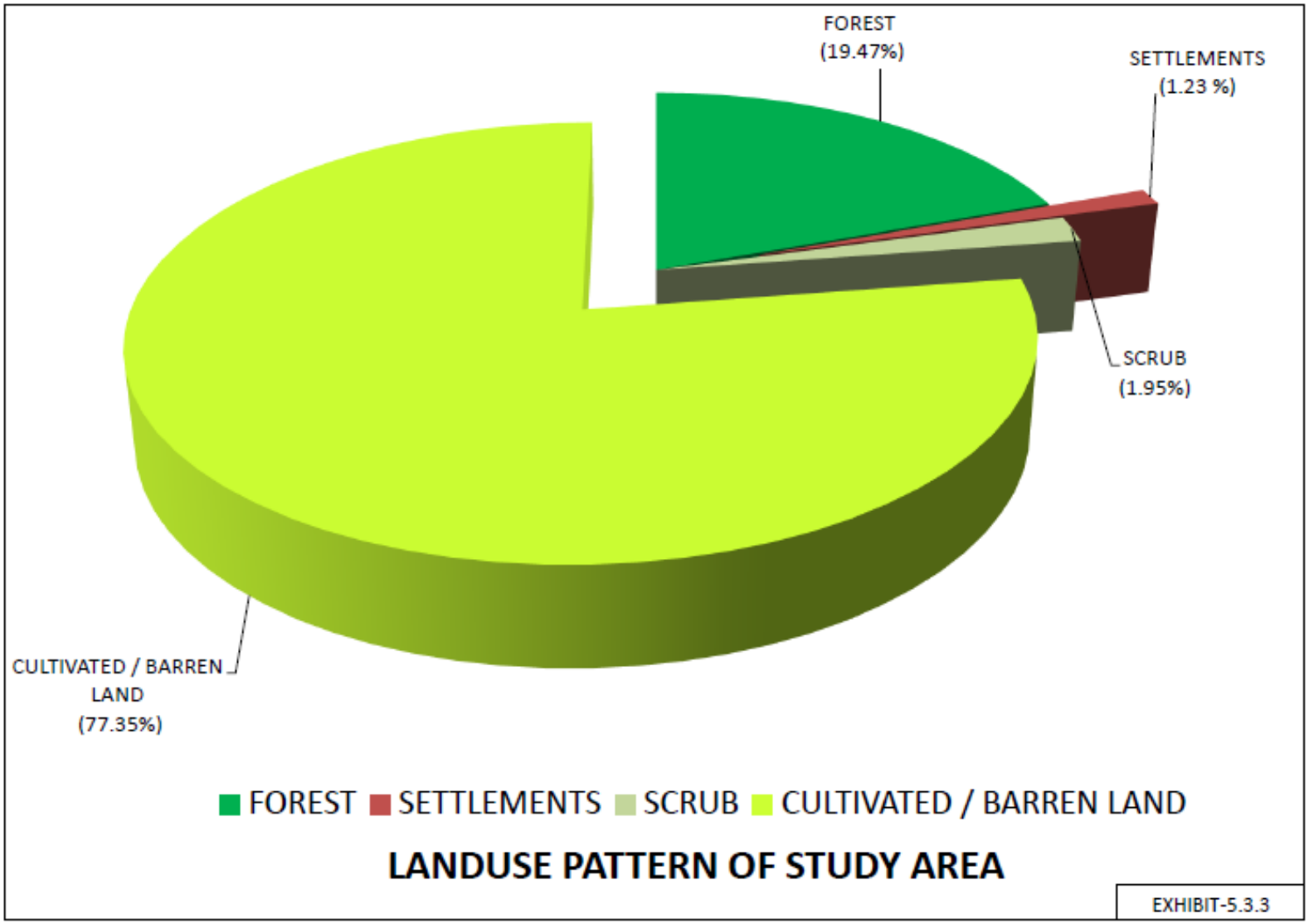
LANDUSE AS PER REVENUE RECORDS

EXHIBIT-5.3.1



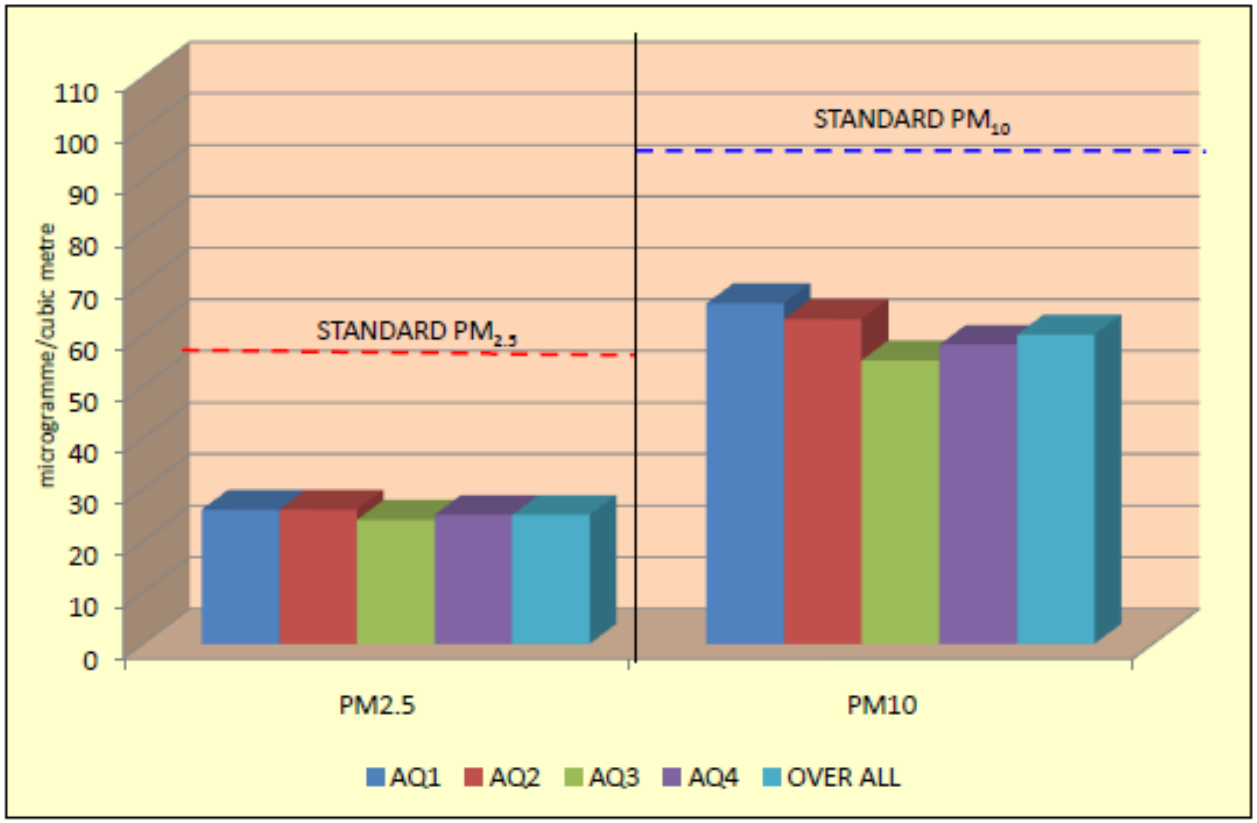
LANDUSE MAP

EXHIBIT-6.3.2



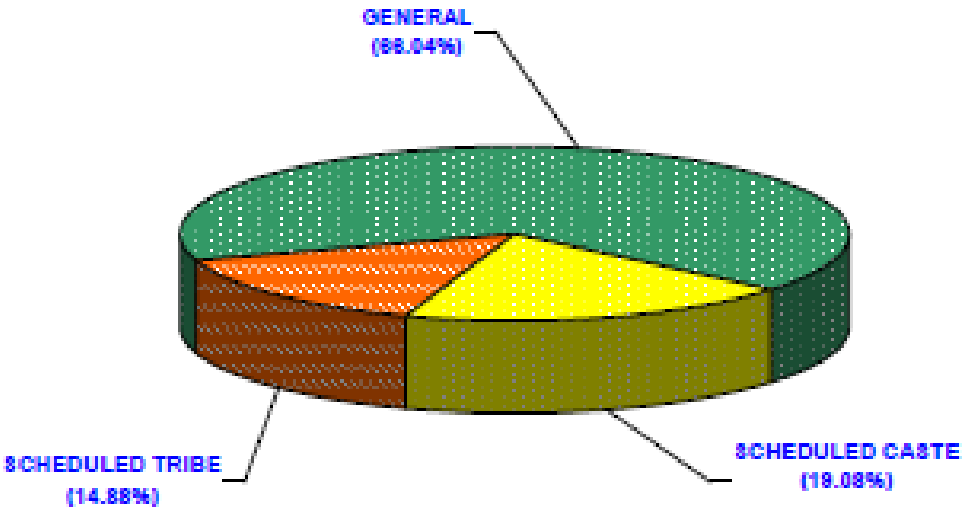
LANDUSE PATTERN OF STUDY AREA

EXHIBIT-5.3.3



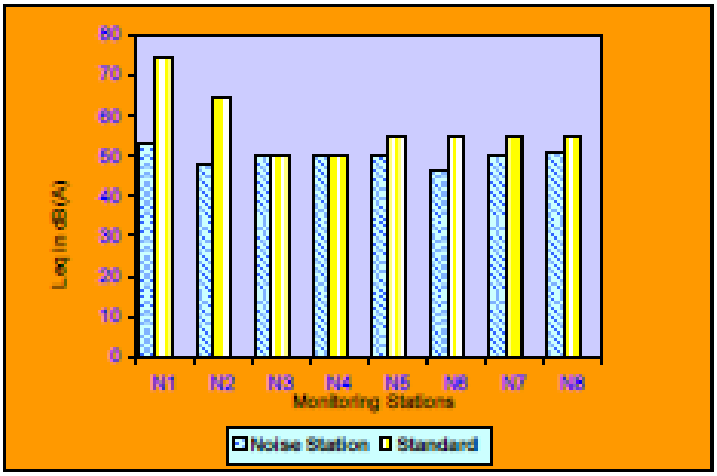
MEAN OF 24 HOURLY AVERAGE LEVELS AS MONITORED AT SITE

EXHIBIT-5.5.1

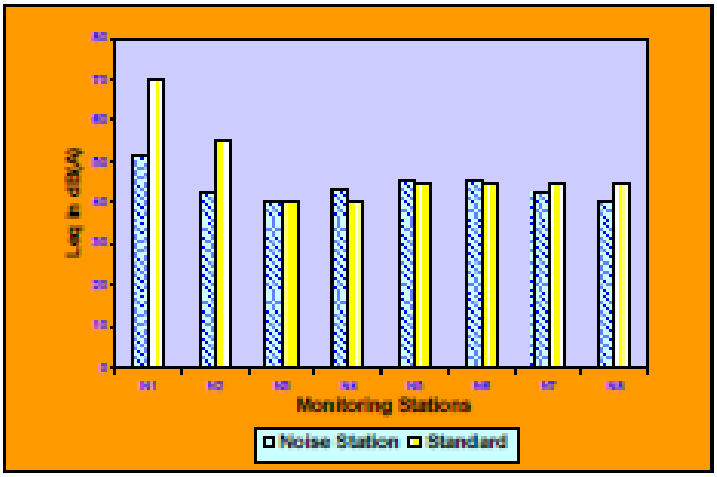


POPULATION BREAK UP IN STUDY AREA (2011)

EXHIBIT-5.7.1



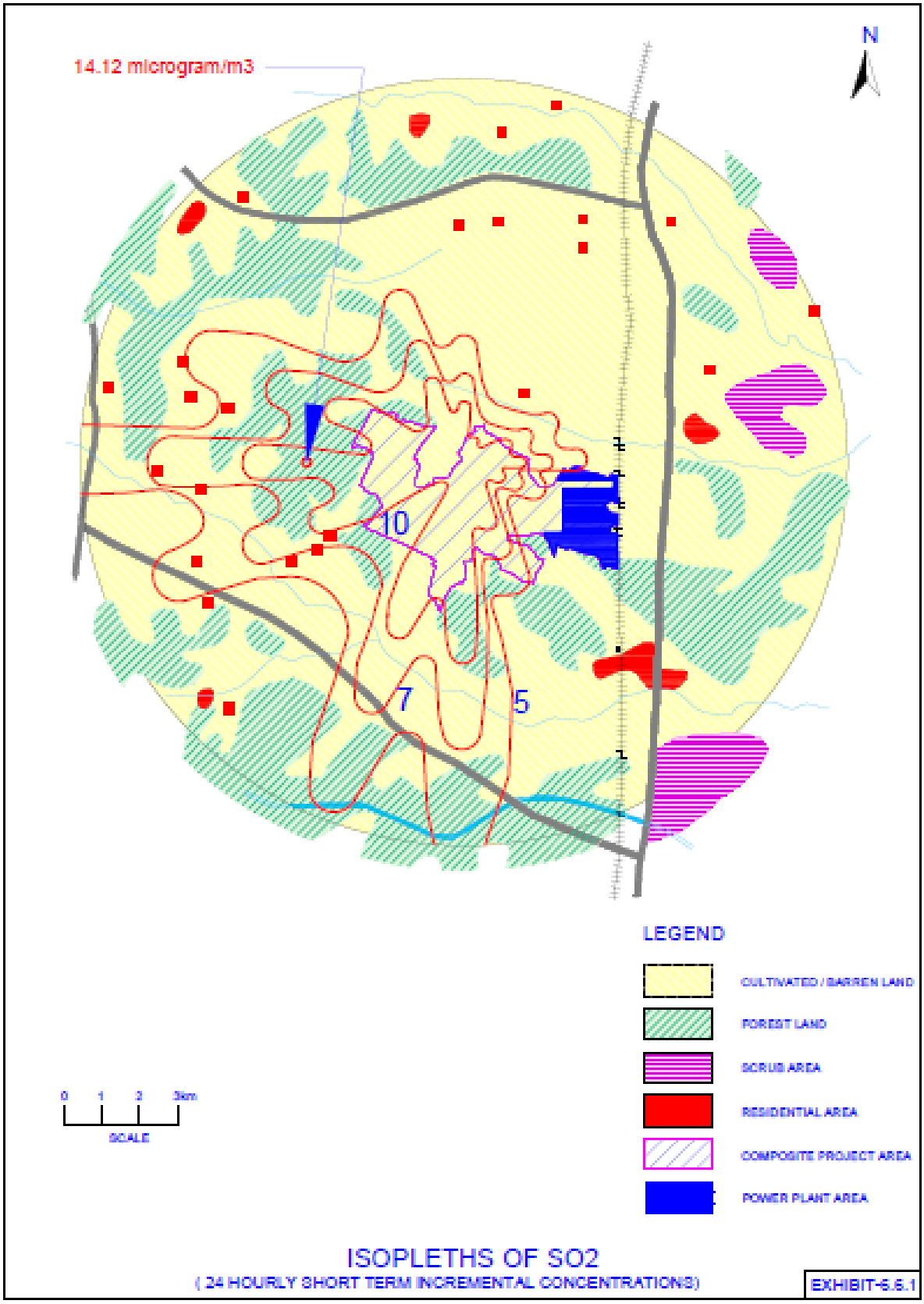
DAY TIME



NIGHT TIME

AMBIENT NOISE LEVEL [Leq IN dB(A)]
AS MONITORED AT SITE

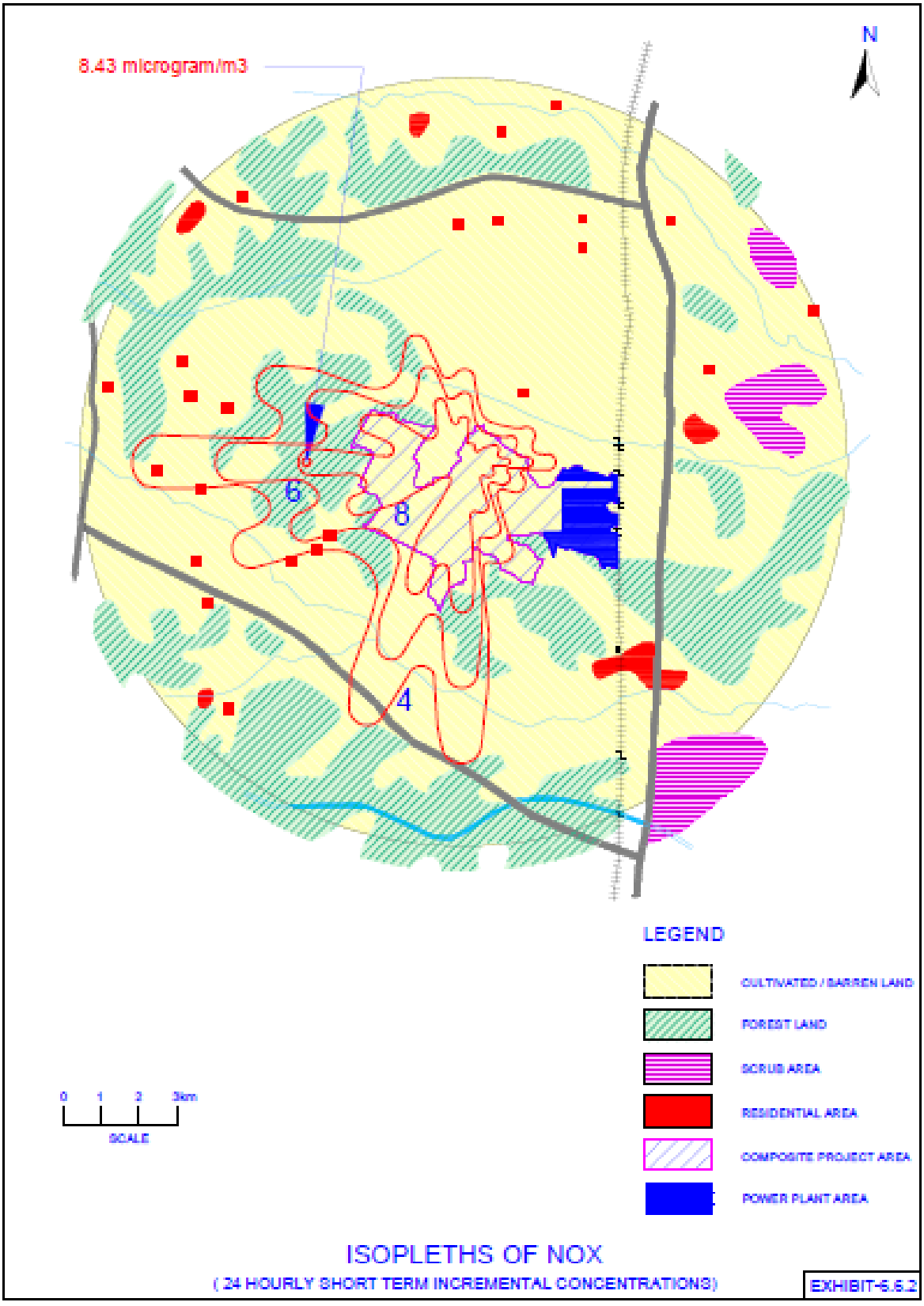
EXHIBIT-5.9.1



ISOPLETHS OF SO2

(24 HOURLY SHORT TERM INCREMENTAL CONCENTRATIONS)

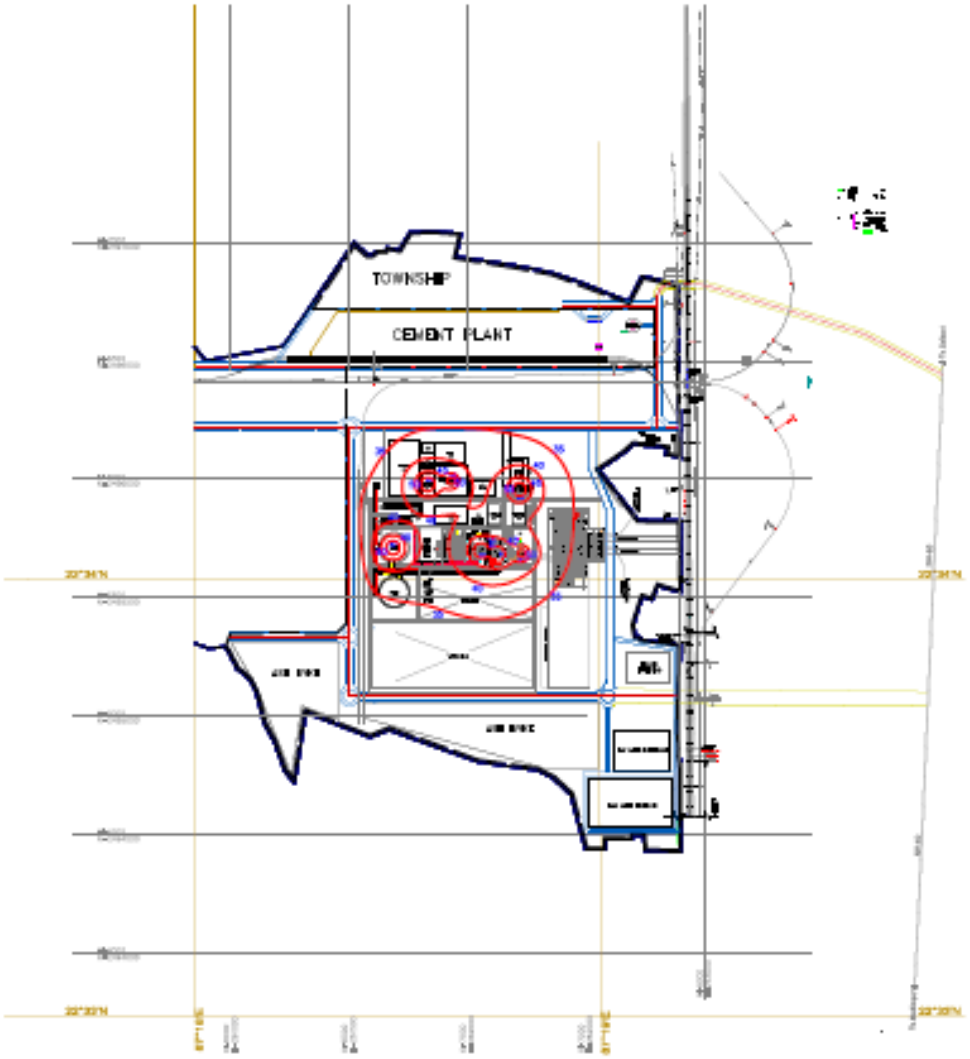
EXHIBIT-6.6.1



ISOPLETHS OF NOX

(24 HOURLY SHORT TERM INCREMENTAL CONCENTRATIONS)

EXHIBIT-6.6.2



SL.NO:	DESCRIPTION	AREA IN ACRES
1	MAIN PLANT	15
2	COAL HANDLING PLANT	71
3	WATER SYSTEM	30
4	SWITCH YARD	12
5	MISCELLANEOUS BOP FACILITIES	28
6	WATER RESERVOIR	27
7	LAND FOR GREEN BELT (33% OF MAIN PLANT AREA)	60
A	TOTAL AREA INSIDE PLANT INCLUDING GREEN BELT	243
8	LAND FOR ASH DISPOSAL	105
9	LAND FOR TOWNSHIP	30
10	LAND FOR CORRIDOR FOR ASH SLURRY,	
	RAW WATER PIPELINE & RAILWAY	76
B	TOTAL AREA OUTSIDE PLANT INCLUDING GREEN BELT	211
C	TOTAL POWER PLANT LAND (A+B)	454
D	FUTURE EXPANSION	306
E	TOTAL POWER PLANT LAND + FUTURE EXPANSION	760

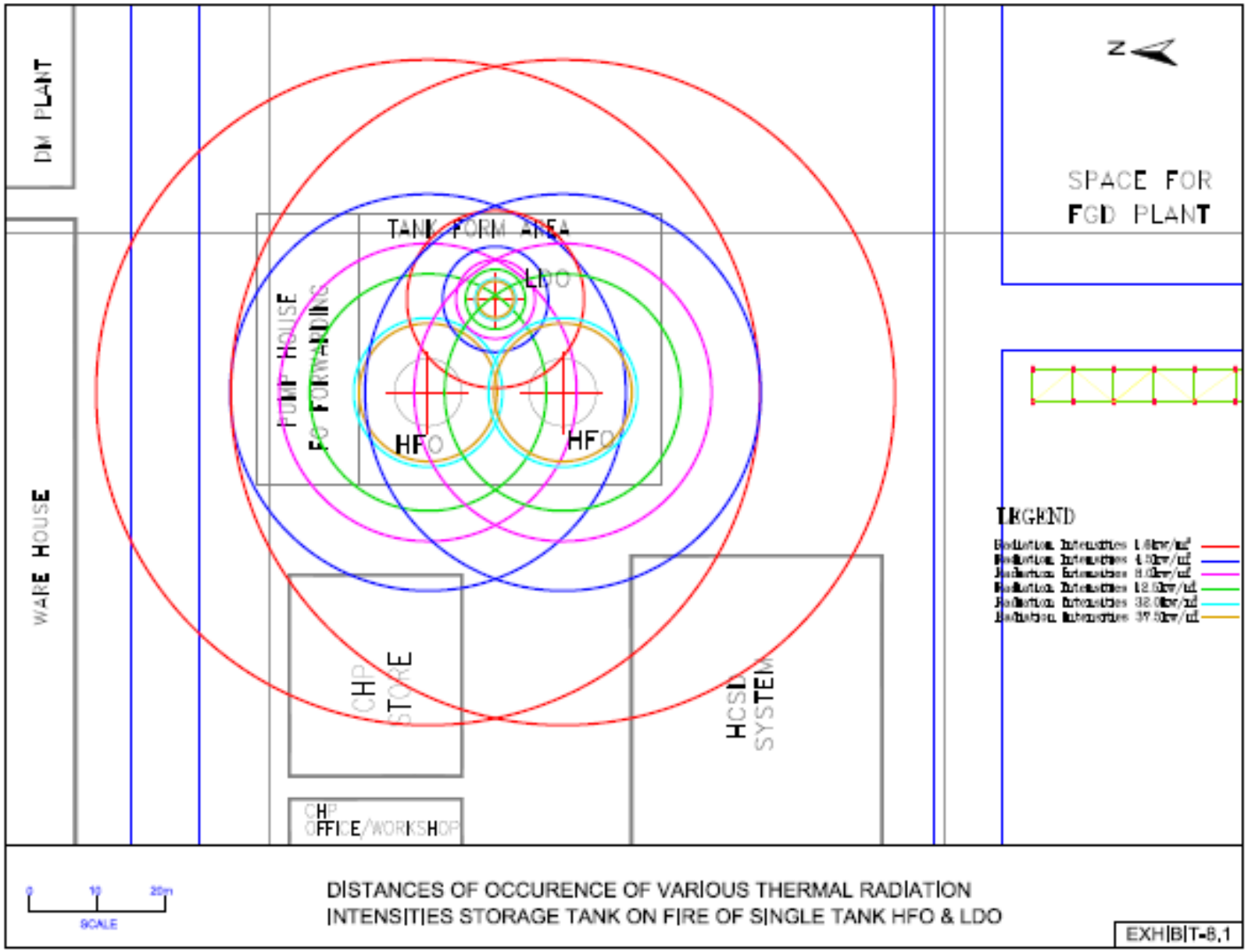
LEGEND:-

TOTAL JSW PROJECT BOUNDARY

TOTAL POWER PLANT BOUNDARY

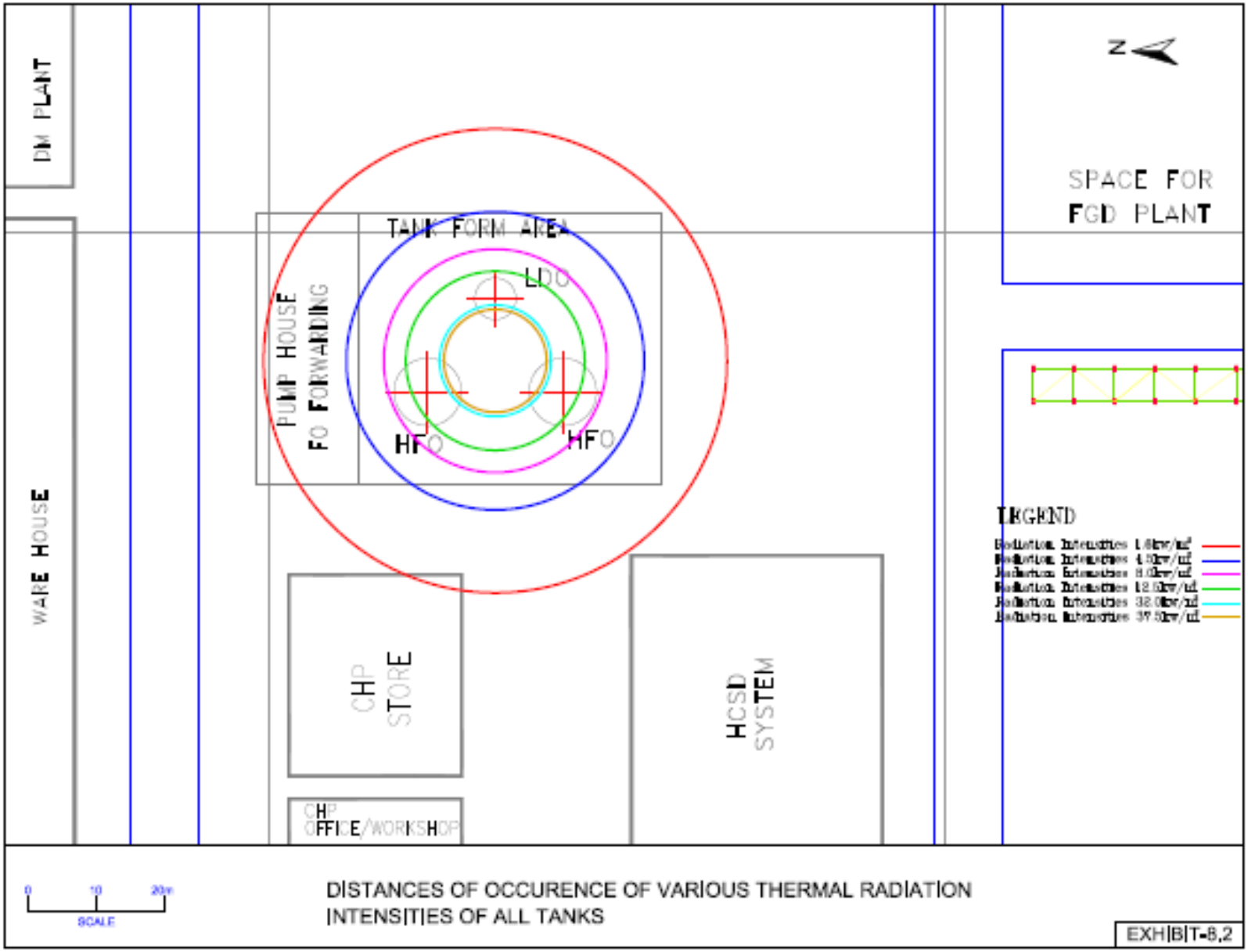
1X660 MW MAIN PLANT BOUNDARY

ISOPLETHS OF NOISE



DISTANCES OF OCCURENCE OF VARIOUS THERMAL RADIATION INTENSITIES STORAGE TANK ON FIRE OF SINGLE TANK HFO & LDO

EXHIBIT-8.1



DISTANCES OF OCCURENCE OF VARIOUS THERMAL RADIATION INTENSITIES OF ALL TANKS

EXHIBIT-8.2