1. INTRODUCTION

Power generation is the vital infrastructural requirement for the economic growth of our country in recent years. As economy grows the demand for power increases at a very faster rate. The Private Sector participation in the development of power projects is evident in our country due to encouragement extended by the Central Government Electricity Act, 2003 and the Indian Government vision of 'Electricity for all' by the end of Eleventh Plan Period (2011-2012) and the limited resources available with the State and the Central sectors.

North Chennai Power Company Limited (NCPCL) is a Special Purpose Vehicle (SPV) promoted by ABAN Group, which is one of the largest Offshore Drilling Company in the world. NCPCL has proposed to set up a Thermal Power Plant of 1200 MW(2 x 600MW) capacity using imported coal at Kalanji and Kattupalli villages, North of Ennore Port, Ponneri Taluk, Thiruvallur District, Tamilnadu.

This report presents the summary of Rapid EIA study conducted for NCPCL Thermal Power Plant, based on three months field data (April 2007- June 2007) and data collected from secondary sources. The baseline environmental scenario and the possible impacts of the proposed with respect to air, water, soil, noise, ecology etc. was studied and report generated.

2. NEED OF THE PROJECT

The proposed Power Plant is expected to achieve commercial operation by the end of the Eleventh Plan period (2007 – 12). This Power Plant is envisaged to meet the demand of the beneficiaries mostly in the Southern Region and

other regions. The power supply position in Southern Region (SR) during 2001-02, 2002-03, 2003-04, 2004-05 and 2005-2006 and 2006-2007(upto January 2007) are as follows:-

TABLE-1 A

POWER SUPPLY POSITION IN SOUTHERN REGION

Description	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07 (up to Jan 2007)
Peak Demand	22757 MW	22419 MW	23813 MW	23075 MW	24848 MW	25165 MW
Peak Availability	19201 MW	20428 MW	21928 MW	23364 MW	23372 MW	23520 MW
Deficit	3556 MW	1991 MW	1255 MW	711 MW	1476 MW	1645 MW
% of Deficit	15.6 %	8.9 %	5.4 %	3.1 %	8.3 %	6.5 %
Energy Requirement	140516 Mu	140316 Mu	144372 Mu	147672 Mu	156822 Mu	147190 Mu
Energy Availability	128095 Mu	130229 Mu	136844 Mu	145395 Mu	155582 Mu	143669 Mu
Deficit	12421 Mu	10087 Mu	7528 Mu	2277 Mu	1240 Mu	3521 Mu
% of Deficit	8.8 %	7.2 %	5.2 %	1.5 %	0.8 %	2.4 %

From the above table, Southern Region has been experiencing power shortages (both in term of peak demand as well as energy requirement) during the past five years. As per TNEB, the shortage for summer 2008 will be 1000-1200 MW.

Project Demand and Supply gap table clearly highlights the present energy situation of the country.

TABLE-1 B

Project Demand and Supply Gap

Region	Energy Requirement (in MU)	Energy Availability (in MU)	Peak Requirement (in MW)	Peak Availability (in MW)
Northern Region	172,190	152,168	31,516	26,644
Western Region	189,904	162,133	36,453	26,882

Southern Region	147,190	143,669	25,165	23,520
Eastern Region	56, 942	55,256	10,491	10,058
North Eastern Region	572,812	519,656	1,407	1,166
All India	572,812	519,656	100,403	86,425

With the above in view, North Chennai Power Company Limited, in the Private Sector has proposed to install a 1200 MW coal based Power Plant at North Chennai, planned to be operational by the end of 11th Five Year Plan.

3. SITE AND SOURROUNDING

Location of the project site, nearest airport, railway station, highways etc. are given below:

District	: Thiruvallur
State	: TamilNadu
Latitude	: 13°20'12" N to 13°18'56" N
Longitude	: 80°20'11" E to 80°20'14" E
Location	: 8.6 kms from Ennore Port, Chennai, Tamilnadu (35 kms North of Chennai) 18 kms from Andhra Pradesh State border 10.74 kms from Pulicat lake.
Plant site elevation above MSL	: Average of 3 mts
Nearest Railway Station	: Athipattu Pudunagar on Chennai- Kolkatta route 10 km

	from site(Broad gauge).
Nearest Road	: Thiruvotriyur Ponneri road Connecting Chennai is around 12 kms away from the site.
Nearest Highway	: NH5 is 28 kms away from the site (by road)
Rail region /Zone	: Southern Railway
Nearest Airport	: Chennai Meenambakkam (45 Kms)
Nearest Harbour	: Ennore Port (8.6 kms)

The project site is on the northern side of Ennore Port in Ponneri Taluk of Thiruvallur District. The district is surrounded by Kancheepuram district in the South, Vellore district in the West, Bay of Bengal in the East and Andhra Pradesh State in the North. The main advantage of setting up this 1200 MW coal based thermal power station at this location are as follows:

1. This proposed project site being located adjacent to the industrial area, power plant and harbour, major basic infrastructure facilities are available.
2. The proposed site is a barren land and the need for displacement of families or hamlet and rehabilitation of the same does not arise.
3. As the power plant is proposed in the coastal area, sea water is proposed for fresh water requirement. The cooling medium for the condenser is sea water from Bay of Bengal. Once through method is adopted for cooling the condenser by sea water. As per the MoEF stipulations the sea water discharged back in to the sea shall maintain a temperature difference of 5°C. This is achieved by suitably designing the condenser, so

that the temperature difference between the condenser outlet water and the inlet sea water temperature is maintained as stipulated by MoEF guidelines.

4. Availability of adequate and reliable construction power and water.

4. SITE SELECTION

The present site of the power plant was selected after examining various suitable alternative location based on the following criteria.

- Availability of suitable and adequate land
- Availability of water
- Availability of infrastructural facilities
- Environmental aspects
- Road and Railway Access.

While selecting the site for NCPCL Thermal power Project, the siting Guidelines of Ministry of Environment and Forests, Govt. of India for siting of thermal power plants have been complied. There are no sensitive areas within 10 Kms of the proposed project.

5. PROJECT FEATURES

5.1.1 Project Components

TABLE 2

SALIENT FEATURES OF PROPOSED POWER PLANT

Sl.No	Description of facility	Facility provided
1.	Land Requirement	
a.	Plant Area with green belt	325 acres
b.	Land under CRZ	101 acres
c.	Area for Ash Dyke	9 acres
d.	Area for water channel & Coal Conveyor Corridor	16.77 acres
e.	Area of the green belt	98 acres(included in(a))
f.	Township	Not envisaged for the project
	Total	426 acres

2.	Fuel requirement	
a.	Coal	555 T/hr at BMCR with coal having GCV of 5300 Kcal/ Kg (design case)
b.	HFO	16820 KL/ year
c.	LDO	9600 KL/year
3.	Fuel source	Imported Coal from Australia & Indonesian coal fields. Fuel oil- From IOC/CPCL Terminal at Manali
4.	Fuel Storage	
a.	Coal	Crushed coal stockpile with 30 days storage at 80% PLF Raw coal stockpile with 60 days storage at 80% PLF
b.	HFO	2 tanks of 2000 m^3
c.	LDO	One tank of 1000 m^3
5.	Fuel Transportation	
a.	Coal	By Sea route to Port and by road to the Plant.
b.	Oil	From Indian oil storage tanks located near to the site through road tankers.
6.	Water	
a.	Fresh water requirement	563 m^3/hr using Desalination Plant
b.	Source of water for the plant	Sea Water
c.	Condenser cooling	Once through
d.	Distance of Intake Point in Sea for pumping	1.2 kms from shore.
e.	Coordinating Point of Intake	N 1472756 E 0430480
7.	Ash Generated per hour/unit	35.53 T/hr at BMCR with coal having not more than 16% ash content.
8.	Ash Collection & Disposal system	
a.	Collection	Bottom Ash Submerged Scraper conveyor system. Fly Ash extraction by pneumatic vacuum and pressure system
b.	Disposal	100 % Disposal from day one operation.
9.	Bottom Ash	14.21 TPH
10.	Fly ash	49.74 %
11.	ESP efficiency	99.9%
12.	Stack	One 275 m tall twin flue R.C.C Chimney with

		7.5 m dia of each flue.
13.	Bulk power evacuation	Evacuated to 400 kV and 230 kV class gas insulated Switchgear (GIS) type substation
14.	Manpower	175 - During Construction 450 - During Operation & Maintenance
15.	Cost of coal at site	Rs. 2885/ ton
16.	Net generation	7820.93 Million kWh
17.	Project cost (March 2008 Base) a. Without IDC b. With IDC	 Rs. 5267.89 Crores Rs. 5757.59 Crores

5.1.2 Water

The water required will be drawn from Bay of Bengal by constructing an offshore sea water pump house. Seawater intake will be 2,77,000m^3/hour. The water will be drawn by large diameter pipes from the offshore pump house to the plant. The product water of desalination plant will be used meeting fresh water requirement of the proposed power plant.

5.1.3 Coal

Coal requirement for the proposed power plant will be met by importing coal from coal fields of Australia and Indonesia. From Port the coal will be transported to the site by road. The coal requirement is in the level of 555 TPH and the annual requirement is estimated to be around 3.89 million tons for 1200 MW capacity operating at a PLF of 80 %. The calorific value of coal will be 5300 kcal/kg having not more than 16% ash content.

The bunker storage capacity is 12 hours and the lump size of incoming raw coal is less than 50 mm. A Chennai based company called 'SICL' is going to install an exclusive common usage terminal in Ennore Port. Their jetty will be able to handle vessel of 1,00,000 DWT. The unloading capacity from the ship will be in the level of 35,000 TPH. 'SICL' will convey the coal from the port to an identified stack yard area on the other side of Buckingham canal, at a distance of 2 ½ Kms from the port. From the stock yard coal will be transported to the plant boundary by road.

5.1.4 Power Purchase Agreement

TNEB and TNERC have been kept appraised on the status of this Project. It is proposed to supply 25% of power generated from this mega power plant to TNEB and the balance 75% to PTC, New Delhi.

5.1.5 Land Use

Plain Sandy and barren land. Average elevation from Mean Sea Level is 3 m. However, the North portion of the site requires very little quantity of filling. So there is no need of borrowing filling material from outside. However, during construction time grading will be carried out with the ashes available from near by power plants.

6.0 ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

In order to identify the environmental impacts due to the construction and operation of the project and associated facilities, an Environmental Impact assessment study has been undertaken, which also covers Environmental Management Plan, Disaster Management Plan and Occupational Health and Safety Studies.

The study area for EIA comprises of 10 Km radius around the proposed site for Thermal Power Project. The study has been started since June, 2006. However continuous observation from April – June, 2007 for one season has been considered.

6.1 BASELINE ENVIRONMENTAL SCENARIO

The baseline environmental status for various environmental attributes were carried out during the months of April 2007 to June 2007 within the study area through field monitoring supported by data from secondary sources.

Meteorological parameters for Wind speed, Wind direction, Temperature, Relative Humidity, Atmospheric pressure and Rainfall were studied.

Data collected indicate that the annual rainfall is 1300 mm, out of which the maximum rainfall occurs during the Northeast Monsoon period (October to December).

Temperature will be 35°C to 37°C in Summer from April to July and occasionally it rises more than 40° C. During December and January the temperature will vary from 22°C to 30°C. However the minimum temperature does not drop below 18°C.

Analysis of wind speed and direction at the proposed site shows that the wind speed was generally light to moderate, with wind directions being WSW and NE.

6.1.1 Soil Characteristics

6.1.1.1 Data Generation

The physicochemical and nutrient characteristics of the soil were monitored for both pre-monsoon (August 2006) and post-monsoon (April 2007) season at 6 locations in the study area. At each location, soil samples were collected from three different depths viz 30 cm, 60 cm and 100 cm below the surface. The details of the sampling locations are given below.

TABLE-3

DETAILS OF SOIL SAMPLING LOCATIONS

Sample Code	Location	Distance w.r.to Project Site (km)	Direction
S1	Project Site	-	
S2	Kalanji	1 Km	South
S3	Kattupalli	2 Km	South
S4	Kattoor	4 Km	West
S5	Kadappakkam	5 Km	North West
S6	Palaverkadu	7 Km	North West

6.1.1.2 Baseline Soil Status

It has been observed that the pH of the soil ranged from 6.28-6.69 indicating that the soil is neutral in nature. The soil in the study area is predominantly sandy loam. The

conductivity varies from 88- 175 µmho/cm. The average concentrations of nitrogen, phosphorous and potassium are 0.48%, 0.40% and 0.03% respectively. The average sodium absorption ratio is 0.006 which is very much below the value 9 where after the permeability of soil is affected. The soil in the study area is poor in fertility.

6.1.2 Ambient Air Quality

The prime objective of the baseline air monitoring is to evaluate the existing air quality of the study area. This will also be useful for assessing the conformity to standards of the ambient air quality during the operation of the proposed power plant. Ambient Air Quality Monitoring stations were set up at six locations. The details of existing air quality (range) of the locations are presented below.

TABLE-4

DETAILS OF AIR QUALITY

Location Code	Location	Parameters			
		RPM µg/m^3	SPM µg/m^3	SO_2 µg/m^3	NOx µg/m^3
AAQ 1	Project Site	15 - 46	74 - 89	7.9 - 11.3	9.1 - 12.2
AAQ2	Kalanji	22 - 47	78 - 104	5.8 - 10.7	8.6 - 10
AAQ 3	Kattupalli	30 - 58	90 - 105	8.7 - 12.8	10 - 12
AAQ 4	Kattoor	35 - 65	78 - 92	8.4 - 12.3	10.3 - 12.7
AAQ 5	Kadapakkam	22 - 48	85 - 103	6 - 10.3	8.4 - 11.3
AAQ 6	Palaverkadu	39 - 52	77 - 93	6.3 - 10.2	8 - 10.3

6.1.2.1 Observations on Primary Data

The observations based on the results are summarized below:

SPM : A maximum value of 105 µg/m^3 for SPM was observed at Kattupalli Village (AAQ-3). All the observed values are within the prescribed limits. The 24 hours applicable limit is 200 µg/m^3 for residential areas.

RPM: The maximum value 65 µg/m^3 for RPM which was observed in Kattoor Village (AAQ-4). The next highest RPM value was 58 µg/m^3 which was observed in Kattupalli Village (AAQ-3). The 24 hours applicable limit is 100 µg/m^3 for residential areas.

SO_2: The higher values of SO_2 are observed to be 12.8 µg/m^3 at Kattupalli Village (AAQ- 3) and the next highest was 12.3 µg/m^3 at Kattoor Village (AAQ- 4). The 24 hours applicable limit for residential area is 80 µg/m^3

NOx: The higher values of NOx were observed to be 12.7 µg/m^3 at Kattoor Village (AAQ-4). The next highest NOx value of 12.2 µg/m^3 was observed at Project Site (AAQ-1). The 24 hours applicable limit is 80 µg/m^3 for residential areas.

6.1.3 Water Quality

Selected water quality parameters of the surface water resources within 10 km radius of the study area has been studied for assessing the water environment and to evaluate

anticipated impact of the Proposed Power Plant. Understanding the water quality is essential in preparation of Environmental Impact assessment and to identify critical issues with a view to suggest appropriate mitigation measures for implementation. According to

PWD of the State Government, water table is very shallow in Ponneri Taluk and annual variation is 1.32 to 3.60 m. The level of exploration of the ground water is very low.

6.1.3.1 Water Sampling Locations

Water Samples were collected for both pre-monsoon (August 2006) and post-monsoon (April to June 2007) season from six sampling locations. The groundwater analysis results are compared with the standards for drinking water as per IS: 10500-1983 "Specification for drinking Water" for ground water. The details of the sampling locations and summary tabulation of pollution parameters are given in Table-5.

TABLE-5.

WATER QUALITY (Pre- Monsoon)

Location Code	Location	Parameters			
		pH	TDS (mg/l)	TSS (mg/l)	Chlorides (mg/l)
GW1	Project Site	6.7	296	4	96
GW 2	Kalanji	6.63	288	6	85
GW 3	Kattupalli	6.5	240	Nil	65
GW 4	Kattoor	6.91	366	Nil	78
GW 5	Kadapakkam	6.86	390	6	101
SW 6	Palaverkadu	7.18	10580	2	4778

TABLE-5. A

WATER QUALITY (Post- Monsoon)

Location Code	Parameters											
	pH			TDS (mg/l)			TSS (mg/l)			Chlorides (mg/l)		
	Apr	May	Jun	Apr	May	Jun	Apr	May	Jun	Apr	May	Jun
GW1	6.82	6.79	6.83	180	174	187	2	1	1	69	78	74

GW 2	6.74	6.71	6.72	254	263	270	4	3	2	70	66	62
GW 3	6.65	6.68	6.66	198	205	182	1	1	Nil	54	42	50
GW 4	6.97	7.09	7.3	168	176	151	1	Nil	Nil	67	70	65
GW 5	6.92	6.90	6.89	300	283	314	2	5	2	95	83	76
SW 6	7.10	7.08	7.15	10230	10182	10093	3	2	2	4639	4380	4421

The analysis of the collected water samples showed that the pH ranges between 6.5 to 7.18 during pre-monsoon and 6.65 to 7.30 during the post monsoon. The total dissolved solids, total hardness, chlorides, sulphates and other parameters are all well within the permissible limit of IS: 10500.

6.1.4.1 Noise Level Survey

The main objective of noise monitoring in the study area is to evaluate the baseline noise and assess the impact of the total noise expected to be generated by proposed project. Noise measurements were carried out using Lutron SL 4001 model. The sound level meter used was in accordance with IS: 9779 and IEC 651 standards for noise survey. Instrument calibration was

calibrated in ETDC. Six locations were monitored for assessing the existing noise levels in and around the project site. The noise levels are given below in Table 6.

TABLE-6

AMBIENT NOISE LEVELS RECORDED IN THE STUDY AREA [dB(A)]

Sl. No	Location	L10	L50	L90	Leq	Lday	Lnight	Ldn
1.	Project Site	41.5	36.8	39.7	38.2	40.9	37.8	40.3
2.	Kalanji	40.2	36.5	39.2	37.9	40.0	37.3	40.1
3.	Kattupalli	49.8	42.1	41.5	42.0	48.8	42.5	49.3
4.	Kattoor	45.6	38.5	39.0	41.9	45.2	39.1	44.8
5.	Kadapakkam	45.3	38.1	38.8	40.3	44.9	38.0	45.0
6.	Palaverkadu	42.9	35.2	36.8	40.1	41.5	37.3	42.1

6.1.4.2 Observations

Day time noise levels

Noise levels during day time were found to be in the range 48.8 - 40.0 dB (A). The maximum noise level was observed to be 48.8 dB (A) at Kattupalli Village and a minimum of 40.0 dB (A) was observed at Kalanji.

Night time noise levels

Noise levels were observed to fall in the range of 37.3- 42.5 dB (A) during the night time. A maximum of 42.5 dB (A) was observed at Kattupalli Village and a minimum of 37.3 dB (A) was observed at Palaverkadu.

6.1.5.1 Demography and Socio-Economics

A Socio Economical survey for 10 km radius around the proposed Thermal Power Plant Project has been carried out. The results of the survey are given in the following table (Table – 7).

TABLE- 7

DEMOGRAPHIC STUDY

S. No	Description	Total	Male	Female
1	Population	6526	3419	3107
2	Literates	3280	1968	1312
3	Population in age group of 0-6	729	308	421
4	Workers	2968	1869	1099
5	Marginal workers	1073	672	401
6	Agricultural labourers	885	356	529
7	Scheduled Castes	679	354	325
8	Scheduled Tribes	29	12	17

The total population in the study area is found to be 6526 among which the males were 3419 and females 3107. About 885 people were dependent on agricultural works and 1073 people were found to be marginal workers.

6.1.6.1 Ecology

Terrestrial Ecology

The study of terrestrial ecology within the study area of 10 km radius has been carried out through field investigation. The coastal area being situated by seacoast has a mixture of scrub ecosystem, tidal eco system, marsh ecosystem and agro ecosystem. The study area contains wasteland which includes scrubs, marshes and marine, backwater and fresh water bodies.

The dry tropical vegetation exists in the study area. Grasses like Cyanodon dactylon, Parthenium hysterophorus, Corton saparsiflorus and Odina odina and trees like Acacia nilotica, Azadirachta indica, Anona squamosa, Delonix regia, Ficus benghalensis are observed in and around the study area. The study area is devoid of any natural forest. The study area harbours mainly domestic animals and it does not harbour any wild life of importance due to human settlement increase in population and clearing of wild flora for making cultivable land. Some reptiles, amphibians and bird species were also observed in the study area.

7.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

7.1 Operation Phase

7.1.1. Air Environment

Air pollution modeling, carried out for proposed power plant shows that incremental concentrations of SO_2 (6.83 µg/m^3), NOx (10.0 µg/m^3) and SPM (0.054 µg/m^3) considering 1% sulphur in coal and 100% conversion of sulphur to SO2. Actual emission will be much lesser as the sulphur in coal will be in the range of 0.45% to 0.60%. The predicted resultant concentrations will remain well within the National Ambient Air Quality Standards.

Consequently the proposal is unlikely to have any major impacts on local or regional air quality or to adversely affect human health or status of pollution sensitive vegetation, either locally or nearby terrain.

7.1.2 Air Dispersion Modeling

In the present case, The Industrial Source Complex - Short Term regulatory air dispersion model (ISCST3), a Gaussian plume model and a widely used

air modeling software to predict pollution concentration and/or deposition flux on receptors from a wide variety of sources is used to predict the incremental concentration. The modeling results are presented below.

TABLE-8

RESULTANT CONCENTRATIONS DUE TO INCREMENTAL GLC's

Pollutant	98 Percentile AAQ Concn. recorded during study period (µg/m³)	Incremental Concentration due to the Proposed Power Project (µg/m³)			Resultant Concentration (µg/m³)		
		1 Km	5 Km	10 Km	1 Km	5 Km	10 Km
SPM	104						
	10.8	6.83	2.94	0.84	17.63	13.74	11.64
NOx	12.2	10.0	5.40	2.32	22.2	17.6	14.52

7.1.3 Water Environment

The project will source its entire water requirement from the sea. The total water requirement for the project is 2,77,000 m^3/hr. The project will not extract groundwater and hence there will be not be any impact on ground water.

Under normal operation of the plant, no wastewater will be discharged outside the plant premises. The storm water in the project area will be collected through storm water drains and shall be suitably diverted to rainwater harvesting pits and the overflow from the rainwater harvesting pits will be diverted to nearby sea. Hence impact on water quality is not envisaged.

7.1.4 Solid Waste Management

The municipal organic and inorganic wastes will be managed in eco friendly manner. Organic wastes will be composted and will be used as manure and the inorganic wastes

will be handed over to authorized recyclers. A long term ash management agenda has been drawn to ensure compliance with the Ash Management Rules and meet CREP (Corporate Responsibility for Environment Protection) requirements. All efforts will be put to promote ash utilization in cement industry, brick manufacturing industry, concrete mixing and in road construction projects.

7.1.5 Noise Environment

The main noise generating sources are boilers and turbines. The impact of noise emission from boilers will be minimized by acoustic enclosures and the noise levels will be limited to 85 dB [A].

7.1.6 Greenbelt Development

An area of 98 acres have been proposed to be afforested. Greenbelt has been planned to be developed all around the main plant area, except for switchyard and transmission corridor. Large scale plantations shall also be implemented in all the available spaces within and around the main plant and project areas.

7.1.7 Socio- Economics

The major economic impacts during the construction and operation phase is that, increased availability of direct and indirect employment. Local people will be benefited after commissioning of the proposed project in terms of petty to major contractual jobs and associated business establishments.

7.1.8 Rehabilitation and Resettlement Plan

No need of rehabilitation and resettlement as the project site is a barren land and no near by villages get affected by the project

8.0 Environmental Monitoring Programme

Post project environmental monitoring is important in terms of evaluating the performance of pollution control equipments installed in the project. The sampling and analysis of the environmental attributes will be as per the guidelines of CPCB/TNPCB. The number of sampling stations in each of these disciplines, frequency of sampling and parameters to be analyzed, in and around the project site are presented below:

TABLE-9

ENVIRONMENTAL MONITORING PROGRAMME

S. No	Area of Monitoring	Number of Sampling Stations	Frequently of Sampling	Parameters to be Analyzed
1.	Meteorology	One (Automatic)	Hourly and Daily basis.	Wind speed and direction, Temperature, Relative Humidity, Atmospheric pressure, Rainfall.
2.	Ambient Air Quality	4 Stations	Twice a week:24 hourly period	SPM, RPM, SO_2 and NOx
3.	Noise	5 (two within plant premises and three outside plant premises)	Once every season	Ambient Equivalent continuous Sound Pressure Levels (Leq) at day and Nighttime.
4.	Stack Emission	All the Stacks	Once a fortnight	SPM, SO_2 and NOx
5.	Liquid Effluents	Main Plant Effluents	Monthly	pH, Temp, Conductivity, TSS, TDS, BOD, O&G, Phenolics.
			Quarterly	Heavy Metals
		Ash Pond Effluents	Monthly	pH, TSS, TDS, O&G
			Quarterly	Heavy Metals
		Sanitary Effluents	Monthly	pH, TSS, BOD

6.	Water Quality	Sea Water, upstream of intake and down stream of discharge point	Quarterly	pH, Temp, Conductivity, TSS, TDS, BOD, O&G Heavy metals
7.	Soil	Around the ash disposal area & close to air monitoring stations.	Yearly Once	Physicochemical properties, Nutrients, Heavy metals
8.	Terrestrial Ecology	Within 10km, around the project	Once in three years	Symptoms of injuries on plants
9.	Aquatic Ecology	Marine Water	Once in three years	Density and Diversity of fish, plankton and macroinvertibrates.

9.0 ENVIRONMENTAL MANAGEMENT PLAN

9.1 Environment Management Plan during Construction Phase

During construction phase, the construction activities like site leveling, grading, transportation of the construction material cause various impacts on the surroundings.

9.1.1 Air Quality Management

The activities like site development, grading and vehicular traffic contribute to increase in SPM and NOx concentration. The mitigation measures proposed to minimize the impacts are :

- Water sprinkling in construction area.
- Proper maintenance of vehicles and construction equipment.

9.1.2 Water Quality Management

The waste water from vehicle and construction equipment maintenance centre will contribute oil and grease concentration. The wastewater from canteen and office facilities will contribute to higher BOD levels. The mitigation measures proposed to minimize the impacts are:

- Sedimentation tank to retain the solids from run-off water.
- Oil and grease trap at equipment maintenance centre.
- Adequate sanitary facilities for the construction labours.

9.1.3 Noise Level Management

Operation of construction equipment and vehicular traffic contribute to the increased noise level. In order to control the noise pollution from the project, reduction in noise levels shall be achieved through,

- Proper lay out design of the buildings and plant area.
- Good maintenance of vehicles and construction equipment
- Provision of green belt and afforestation will further help in reducing the noise levels.
- Provision of earplugs and earmuffs to workers.

9.1.4 Ecological Management

As the project site is a barren land and to minimize the impact on the ecology about 98 acres have been planned for greenbelt development.

9.1.4.2 Marine Ecology

The marine ecological management of the study area is given in the report prepared by M/s. Indomer Coastal Hydraulics, Chennai.

(i) Ecologically Sensitive Areas

There are no ecologically sensitive areas within the study area of 10 Km.

(ii) Rare and Endangered Species

There are no rare and endangered species found in and around the project site.

9.2 Environment Management Plan during Operation Phase

NCPCL has the management control for setting up, operations and maintenance of the project. Based on its vast experience NCPCL has already envisaged various pollution control/ environmental measures for the project.

During operation phase, the impacts on the various environmental attributes should be mitigated using appropriate pollution control equipment.

9.2.1 Air Pollution Management

Fugitive stack emissions from the power plant will contribute to increase in concentration of SPM, SO2 and NOx pollutants. The following measures have been envisaged for control of air pollution:

1. High efficiency ESP's to limit SPM emission.
2. One-twin flue stacks of 275m height for wider dispersal of pollutants, resulting in lower ground level concentrations.
3. Installation of dust suppression and extraction system at coal handling plant area to control fugitive dust.
4. Green belt around the plant and plantation in all available spaces within the project Site.
5. Water cover over entire ash disposal area to prevent emission of fugitive dust

9.2.2 Water Pollution Management

While developing the water system for the project, utmost care has been taken to maximize the recycle/reuse of effluents and minimize effluent quantity. However, discharge of effluents from a power plant cannot be totally eliminated. The liquid effluents from the project and effluent treatment measures proposed to be adopted are as follows:

TABLE-8

EFFLUENT TREATMENT MEASURES

Type of Waste	Significant Parameters	Treatment/Disposal
Condenser Cooling Water	pH and Temperature	Once through cooling system is considered, and disposed to sea with control of warm water temperature not more than 5 °C. Part of the quantity is used for desalination and dust suppression.
Desalination Plant Stage 1 and Stage 2	pH and TDS	Return from RO plant I will be disposed with warm water. Rejects from RO I, RO II will be sent to neutralization pit and then discharged to CMB and from there used for green belt development. Return from ID CT blow down will be recycled for desalination. Part will be used for AHP seal water system and recycle for dust suppression
DM Plant regeneration	pH, SS and TDS	Reject from DM will be sent to neutralization pit and then discharged to CMB and from there used for green belt development.
AHP Seal Water system and Dust Suppression/ Extraction System & Coal Storage Area.	SS, pH	Dust Suppression Extraction system and coal storage return water routed to sludge drying bed through settling tank and recirculated to suppression system again. Ash water recirculation system the ash pond effluent will be re-circulated to ash water sump and blow down will be routed to CMB for subsequent usage for greenbelt.
Sanitary waste from the Plant, Office and Canteen	pH, SS, TDS, COD and BOD	The wastewater will be treated in sewage treatment plant after screening and the treated water will be used for green belt development.

Except condenser return water all effluents discharged for reuse or for green belt development after effective treatment conforming to the regulatory Standards. Water quality of the return water discharged into the sea from cooling condenser is confined to the stipulated standards of the TNPCB.

9.2.3 Noise Pollution Management

In the process, various equipments like pumps, cooling tower, compressors etc generate the noise. The recommendations to mitigate higher noise levels are:

- Equipment will conform to noise levels prescribed by regulatory authorities.
- Provision of acoustic enclosures to noise to noise generating equipments like pumps.
- Provision of thick greenbelt to attenuate the noise levels.
- Provision of earplugs to the workers working in high noise level area.

9.2.4 Solid Waste Management

The municipal waste organic and inorganic will be managed in eco friendly manner. Organic wastes will be composted and will be used as manure and the inorganic wastes will be handed over to authorized recyclers. The daily coal requirement of both the units is about 13322 tons at 80 % MCR. The maximum ash content in the coal is 15 % and the ash generated per day by both the units is about 1705 tons at 80 % PLF. The ash handling/ disposal system will be designed to meet the above ash generation. Ash handling will be fully automated. The bottom ash will be about 20 % of the total ash generated i.e 7.105 TPH per unit.

The fly ash generated could be utilized in the following areas:

1. Cement Industry, Brick manufacturing Industry, Construction and Road building projects.
2. Manufacturing of ash based products such as bricks, tiles, lightweight aggregates, blocks etc.
3. Construction of roads and embankment.
4. Rising of ash dykes.
5. Mine filling and low land filling.

As per latest Notification dated 3rd April 2007 by MoEF, the area for ash storage has been restricted to a maximum of three months ash generation while formulating norms for land requirement.

100% disposal of Fly ash and Bottom ash is planned for the Cement Industries, Brick manufacturing Industries, Construction and Road building projects and incase of emergency and unavoidable circumstances ashes will

be disposed to ash dyke area which is located within the plant. The side walls of the ash dyke are to be lined with tiles and in view of the low permeability and high clay content the possibility of ground water contamination is highly unlikely in the proposed area for ash dyke.

9.2.5 Marine Environmental Management Plan

Detailed Marine Management Plan is given in the report prepared by M/s. Indomer Coastal Hydraulics, Chennai.

10.0 DEMOGRAPHY AND SOCIO- ECONOMICS

Commissioning of power plant will result in considerable growth of service sector and will also generate new industrial and business opportunities in the area. As the power plant and its ancillary facilities would act as an active nucleus for new industries and business activities, shift of population towards this center and peripheral area is likely to increase.

11.0 OCCUPATIONAL HEALTH AND SAFETY PLAN

Construction and operation of NCPCL Thermal Power Project shall involve multifarious activities, which may pose problems related to occupational health and safety. As a part of the EIA, this aspect has also been studied in detail and an occupational health and safety plan has been recommended for implementation at site.

During the construction phase, the main areas of concern are control of air and noise pollution, precautions associated with storage and handling of hazardous materials and safety measures for prevention of accidents. It is recommended that adequate pollution control and sanitation facilities, emergency medical facilities and safety equipment should be provided during construction phase.

During the operation and maintenance phase accidents, exposure to heat, dust and noise, exposure to hazardous chemicals and gases are the prime consideration. It is recommended that suitable personnel protective equipment should be provided to all the

employees likely to be exposed to these conditions. In addition, full-fledged hospital facilities should also be provided round the clock for attending emergency of working personnel. The good house keeping practice and fire fighting arrangements should be strictly enforced. Fire and safety staff and other staff should be sent for training at suitable places to keep their activity and knowledge up to desired standards.

12.0 DISASTER MANAGEMENT PLAN (DMP) IMPACT

The EIA Report includes a DMP covering elements of emergency planning like organization, communication, coordination, procedure, accident reporting, safety review checklist, on-site emergency plan and off-site emergency plan. The On-site and Off-site Emergency Plans recommend various Preventive and Predictive Systems, Protective Systems including Site Controller, Incident Controller and Coordinators. Personnel Protective Equipment to be deployed at site, Control Systems, Mock Drill and Simulation Exercises, Mutual Aid Schemes, Procedures for Communications, Medical Facilities to be provided and Procedure for Reporting to External Agencies. It is recommended that the Off-site Emergency Plan should be prepared in consultation with the district authorities viz. District Magistrate,
Senior Superintendent of Police, Medical authorities, File & Safety Officers and Pollution Control Board Authorities etc.

13.0 INSTITUTIONAL SET-UP FOR ENVIRONMENTAL MANAGEMENT

As the management control for setting up, operation and maintenance of the projects lies with NCPCL Thermal Power Project shall utilize the extensive experience of NCPCL in the area of environmental management. The environmental groups in NCPCL has a three tier organization structure, Environmental Engineering (EEG), Environmental Management (EMG), Rehabilitation and Resettlement (R&R), Horticulture, Medical and Safety Groups at Corporate Center (CC), EMG at Regional Headquarters (RHQ) as coordinator and EMG, Chemistry, ESP Maintenance, Ash Handling, R&R, Horticulture, Medical and Safety Group at site.

The responsibility of environmental management of an operating station lies mainly with Environmental Management Groups at site, which acts as coordinator with all other groups at site, RHQ and CC for environmental matters as well as outside agencies

like State Pollution Control Board. An environmental management group shall be established at project consisting of Senior Executives and supporting staff.

14.0 COST PROVISIONS FOR ENVIRONMENTAL MEASURES

The capital cost for Environmental Management Measures will be around Rs. 517.33 Crores and the recurring cost per annum will be Rs. 12.8726 Crores.

15.0 CONCLUSION

Assessment of impacts due to various emissions and discharges from the proposed power plant indicate that the environmental quality will remain within the stipulated standards even after commissioning and operation of the project. Based on detailed analysis of present environmental quality, impact assessment based on predictions and various environment measures suggested by the project proponent/recommended as a part of this study, it may be concluded that the project is environmentally sustainable. All the negative impacts due to construction and operation of the project shall be mitigated by adopting state-of-the art technologies and management systems. In addition, the benefits of the project in terms of power generations, utilization of barren land, improvement of living standards of the local population, improvements in infrastructure etc. will add to the positive impacts of the project.

EXECUTIVE SUMMARY

1. INTRODUCTION

North Chennai Power Company Limited (NCPCL), Chennai is planning to set up a Coal based Power Plant of 2 x 600 MW capacity near Kalanji village, close to Ennore Port at north Chennai. The power plant intends to draw the seawater for cooling and release the warm water back into the sea and thus the marine facilities to be developed are:

i) Jetty for carrying the intake and outfall pipelines,
ii) Seawater intake head, and
iii) Outfall diffuser.

Two nos. of 3500 mm dia. pipelines will be used for drawing seawater from 1200 m inside the sea. Two nos. of 3500 mm dia. pipelines will be carrying the warm water and will be released into the sea at 600 m distance.

2. BASELINE DATA

The marine environment off the project region has been studied for the evaluation of baseline information as per the norms stipulated by the Ministry of Environment and

Forests, Govt. of India. The baseline data were collected along three transects separated each by 2.5 km apart with three sampling stations (1 km, 2 km, and 3 km off the coast into the sea) along each transect. In addition, one station at 5 km distance at mid transect is also covered. The study area covers around 30 km^2. The studies were carried out on physical, chemical and biological aspects. The data collection was carried in July and August, 2006 covering the southwest monsoon season.

2.1. Physical Environment

The wind patterns during morning hours and evening hours show the influence of land-sea breeze system in this region. During the days of depressions and cyclones, the wind speed commonly exceeds 30 knots. The occurrence of storms in this region are frequent in November and October. The currents are moderate and has the major influence of wind followed by tides. The currents flow parallel to the coastline, with a slight tendency towards the shore. The tides in this region is semi diurnal with an average spring tidal range of 1.0 m and a neap tidal range of 0.4 m. The project region is located on the region which is significantly influenced during the northeast monsoon. The wave climate remains rough from May to November. The occurrence of storms and depressions during northeast monsoon often increases the wave activity in this region. The littoral drift was towards north from April to October and towards south during the remaining months of the year. The annual northerly transport is 0.98 x 10^6 m^3/year and the annual southern transport is 0.51 x 10^6 m^3/year. The longitudinal dispersion coefficient (D_x) was estimated as 7.5 m^2/s and lateral dispersion coefficients were estimated (D_y) as 1.5 m^2/s during calm period. The seabed at nearshore falls steep upto 8 m water depth which lies at a distance of 410 m from the coastline. Thereafter the seabed falls to 12 m water depth at a distance of 2000 m. Then it rises up and becomes shallow due to the presence of shoal, i.e., the water depth reduces to 9 m water depth at 2500 m distance. Once again, the depth increases to 12 m at 2750 m distance. There was a formation of another large shoal further offshore, wherein the water depth once again reduces to 9 m at a distance of 3400 m. Then, thereafter it shows to fall deeper. In the study region, beyond 11 m water depth, the seabed showed formation of 3 different shoals raising to a water depth upto 8 m.

2.2. Water Quality

Examination of water quality of this region indicated that they do not differ substantially both in vertical and spatial directions. Absence of marked vertical gradients of the physical parameters indicate that the coastal waters are well mixed. Various results on the chemical and biological parameters indicate that the water is well oxygenated, nutrient rich and

biologically productive at primary and secondary levels. The sub-tidal benthic fauna is moderately rich in diversity and numbers compare to the Inter tidal benthic fauna.

2.3. Biological Environment

The marine flora and fauna also indicate the existence of diverse population. The area is rich in fishery both pelagic and demersal. The study on various oceanographic parameters and the information on adjacent region indicates that the coastal water is clean and highly productive. Nevertheless, the values of PHC and trace metals indicate that the area is influenced by the Ennore creek located in the south of the project region which brings large industrial wastes from the upstream. The Ennore Port situated north of Ennore creek also contributes to oil pollution due to the operation of ships and tugs on the large scale.

3. MODELLING

CORMIX model was used to study the mixing at nearfield and MIKE 21- FLOW -AD model was used for far field mixing. The study on CORMIX model shows the initial mixing zone, i.e. the rising of plume to the surface is having the length of 100 m (i.e., the length of diffuser) and the width of 80 m (i.e. 40 m on either side of the outfall diffuser). Within this mixing zone, the warm water temperature reduces to 3.5°C in less than 13 minutes. Once the plume rises to the surface, the mixing zone extends further as secondary dispersion and the temperature falls further. The MIKE 21 modelling study showed that the order of mixing due to secondary dispersion is equally effective for the outfall located at distance of 500 m compared to the results obtained at 750 m and 1000 m distances into the sea. The warm water discharged beyond 500 m distance will have negligible impact on the marine environment.

4. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION

4.1. Prediction of impacts

The construction of seawater intake and the warm water outfall with piled jetty for carrying pipelines will have marginal magnitude of impact on: Seawater, Marine ecology, Land use and Community. The magnitude of adverse impact appears to be moderate.

4.2. Impact assessment

The baseline data collected from the project region and the review of the available information indicate that the water quality parameters are within the acceptable limits for the coastal waters. The water quality of the warm water discharged in to the sea is confined to the stipulated standards of the Tamil Nadu Pollution Control Board. The construction of piled jetty, intake head, and outfall diffuser in the coastal region will result in marginal

impacts on marine community viz., coastal fisheries, and aquaculture. But such impact is confined to a limited duration of the period of construction. The analysis on quantity of sea water drawn and the quantity of discharge indicate that impact due to such activity will be restricted to a smaller area within 180 m.

4.3. Mitigation

The jetty has to be constructed with elevated trestle to allow the local boats to sail freely between the piles. The intake head and diffuser head have to be designed in order to avoid vortex formation. It should not cause any danger to the boats and fishermen moving in the vicinity. The intake should have appropriate screens and trash bars with appropriate openings to minimize the entry of small marine organisms, fish larvae and fishes. The standards stipulated by the Pollution Control Boards should strictly be adhered to in discharging the residual chlorine in the return water. The warm water temperature should never be more than 5°C than the ambient seawater. The part of the outfall pipelines before the diffuser head may be buried below the seabed to avoid hindrance for fishing and the movement of the boat. A marker buoy placed close to the outfall would help boats to avoid collusion while enroute.

5. POST PROJECT ENVIRONMENTAL MONITORING

Post Project Monitoring will be planed at intake and outfall locations at periodic intervals as per the norms of TNPCB.