ITPCL's 1200 MW THERMAL POWER PLANT AND CAPTIVE DESALINATION PLANT AT CUDDALORE, TAMIL NADU

IL&FS

IL&FS TAMIL NADU POWER COMPANY LIMITED

Technical Note on Use of Blended Coal

September, 2018

L&T Infra Engineering

L&T Infrastructure Engineering Limited

C1181305
RP001, Rev.0

Table of Contents

L&T Infra Engineering

L&T Infrastructure Engineering Ltd.

Client:	**IL&FS Tamil Nadu Power Company Limited** [ITPCL]		
Project:	EC Amendment (Use of Blended Coal) for ITPCL Thermal Power Plant at Cuddalore district, TN	**Project No.:** C1181305	
Title:	Technical Note on Use of Blended Coal for ITPCL's TPP	**Document No.:** RP001	**Rev.:** 0

File path:
I:\ports\2018\c1181305 - itpcl ec amend-blended coal\working\reports\second draft 28.08.2018\technical note 21.09.2019\001-r0-brt-technical note on use of blended coal for itpcl's tpp - 29.09.2018.docx

Notes:

1.

Revision Details:

Rev.	Date	Details	Prepared Init.	Prepared Sign.	Checked Init.	Checked Sign.	Approved Init.	Approved Sign.
0	21.09.2018	First Submission	ALJ ATK SNV GNT VHR MRU		BRT SAP		CVS	

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1 Introduction

1.1 Project Background

IL&FS Tamil Nadu Power Company Limited (ITPCL) is developing a project comprising of 3180 MW (2X600 and 3X660 MW) Thermal Power Plant, 40 MLD captive desalination plant and 15 MTPA of captive port. The project is located along the coastal region of Kottatai, Ariyagoshti and Villiyannalur villages in Parangipettai block of Cuddalore district, Tamil Nadu.

The project was accorded Environmental Clearance and CRZ Clearance under the provisions of EIA Notification, 2006 and CRZ Notification, 1991 (as amended) vide Ministry of Environment, Forests and Climate Change (MoEF&CC) Letters No. J 13012/34/2008-IA.II (T) dated May 31, 2010 and F.No.11-43/2010-IA.III dated October 29, 2010, respectively for the development of 3600 MW (2X600 MW and 3X800 MW), 30 MLD Desalination Plant and 15 MTPA Captive Port. In addition, Corrigendum to Environmental Clearance of (2X600 MW and 3X800 MW) coal based TPP were obtained from MoEF&CC on August 14, 2012.

During the Process of Implementation, certain changes in project parameters such as (i) Change in configuration (3600 MW (2X600 MW and 3X800 MW) to 3180 MW (2X600 and 3X 660 MW)), (ii) Flexibility in S% on Coal upto 0.8% and (iii) Change in Ash Pond Location were found required. Accordingly ITPCL has applied for amendment to EC for the above aspects and Expert Appraisal Committee, Thermal (EAC (T)), MoEF has appraised the project during its meeting on November 19, 2013 and recommended for amendment to EC. MoEF&CC has issued the amendment vide letter no. J-13012/34/2008 – IA. II(T) dated February 04, 2014.

ITPCL has applied for amendment to EC for transport of coal from the nearby existing port (Karaikal Port) through rail up to Puduchattiram station and through the private railway siding (in the same line proposed for HFO/LDO transport) upto TPP's coal stockyard. MoEF&CC has issued the amendment vide letter F.No. J-13012/34/2008 – IA. II (T) dated March 27, 2015.

Consent to Operate (CTO) was issued for Unit 1 (600 MW) by TNPCB in consent orders no: 19177 (A) and no. 23140 (W) dated July 14, 2015 and is being renewed periodically. Combined Consent to Operate (CTO) was issued for Unit 1 and 2 (1200 MW) by TNPCB in consent orders no: 160424778221(A) and no. 160414778221(W) dated April 15, 2016 and is being renewed periodically. Unit 1 commissioned on 29.09.2015 and Unit 2 was commissioned on 30.04.2016. Environmental Clearance Validity Extension for the remaining 3X660 MW units was granted by MoEF&CC vide its letter No. J-13012/34/2008 – IA. II (T) dated February 26, 2018.

Environmental and CRZ Clearance Validity Extension for the Captive Port and other facilities were granted by MoEF&CC vide its letter No. F.No.11-43/2010-IA.III dated February 27/ March 05, 2018. Consent to Establish (CTE) was issued for Port by TNPCB August 16, 2015 is extended till October 28, 2020 vide consent order no. 1803212364515 (A) and no. 1803112364515 dated May 02, 2018.

At present, availability of domestic coal has increased considerably in the country and Coal is being offered to IPP's through special forward E-auction for regulated sector (Power Sector)/ Spot E-auction/linkages etc. Sale of RAW LIGNITE through e-Auction is being carried out by NLC India Limited through M/s. MSTC Limited (formerly known as Metal Scrap Trade Corporation Limited), Chennai.

Based on the analysis carried out by ITPCL, use of Indigenous Coal for Blending is found to be Technically, Economically Feasible & Environmentally appropriate at existing 1200 MW. Therefore, ITPCL would like to seek amendment to EC from EAC (T), MoEF&CC for the use of Indigenous Coal along with Imported Coal with a blend ratio of 25:75 in addition to use of 100% imported Coal.

In this regard ITPCL appointed NABET accredited consultant L&T Infrastructure Engineering Limited (L&TIEL) for providing necessary technical assistance for obtaining amendment to Environmental Clearance from MoEF&CC.

Accordingly this report was prepared by addressing the Technical aspects of use of Indigenous coal partly along with imported coal and alternative options of indigenous coal transport and preferred transport through road, existing environment description, environmental and Social impacts due to use of blended coal and during indigenous coal transport, Environmental monitoring and Management Plan.

1.2 Details of Project Proponent

The contact details of the authorized person at ITPCL are provided below:

Mr. M.S. Srinivasan, IAS(R), Chairman
IL&FS Tamil Nadu Power Company Limited
4th Floor, KPR Tower,
Old No. 21, New No. 2
1st Street, Subba Rao Avenue,
College Road,
Chennai - 600 006
Tamil Nadu, India
Phone: +91 44 46745550 Fax: +91 44 46745551
E-mail: ms.srinivasan@ilfsindia.com

1.3 Project Site

The project site is located on the coastal side of Kottatai, Ariyagoshti, and Villiyannalur revenue villages in Parangipettai block of Cuddalore district, Tamil Nadu. The location map showing the project site is given as **Figure 1.** The NLC India mines are located at about 25.0 km (aerial distance) west from the ITPCL TPP site.

1.4 Salient Features of ITPCL Project

IL&FS Tamil Nadu Power Company Limited (ITPCL) is in the process of setting up a thermal power plant in Cuddalore District, Tamil Nadu. The ultimate capacity of the power plant will be about 3180 MW (2×600 MW sub-critical technology and 3×660 MW super critical technology). The salient features of the ITPCL Project are provided in **Table 1-1**.

Table 1-1: Salient Features of the ITPCL Project

S.No	Item	Description
	Thermal Power Plant	
1	Capacity	3180 MW
2	Configuration	2×600 MW using Sub-critical Technology and 3×660 MW using Super Critical Technology
3	Technology	Sub-critical and Super Critical Technology
4	Fuel	Imported Coal
5	Fuel Requirement	13.40 MTPA
6	Sulphur Content	Up to 0.8%
7	Stack	2×275 m

S.No	Item	Description
8	Railway Siding	From Puduchattiram to TPP • For the Transport of HFO/LDO (as per EIA) • For Transport of Imported Coal from Karaikal Port (as per amendment)
	Captive Port	
1	Capacity	15 MMTPA
2	Type	All Weather Port
3	No of Berths	Two (mechanised)
4	Length of Breakwaters	North:2,100 m; South: 1,150 m
	Captive Desalination Plant	
1	Capacity	40 MLD
2	Technology	Reverse Osmosis
	General	
1	Intake/ Outfall System	Intake: between breakwaters; outfall: 1500 m from shore
2	Land	1128 Acres
3	Water Requirement/ Discharge	Total seawater required: 33,000 m^3/hr. The total quantity of return cooling water discharge from the proposed power plant and reject brine from the proposed desalination plant is around 24,062 m^3/hr.
4	Source	Raw water from Sea, Potable Water from Desalination Plant
5	Environmental Aspects	• Installation of FGDs • Low NOx Burners • ESP to minimize the PM emissions • Super Critical technology for 3 units to minimize the coal consumption and GHG emissions. • Stack height of 275 m to get better dispersion . • Dust suppression system to minimize the fugitive dust emission. • Wind Screen around Coal Stockyard • Fire Protection system

The integrated layout showing all the project features is given as **Figure 2**.

Unit 1 (600 MW) was commissioned on 29.09.2015 and Unit 2 (600 MW) was commissioned on 30.04.2016.

1.5 Project Status/ Environmental/CRZ Clearances Obtained

Details of the Environmental/ CRZ clearances obtained are provided in **Table 1-2.**

Table 1-2: Environmental Clearances Obtained

STATUTORY CLEARANCE	ISSUING AUTHORITY	STATUS	REFERENCE
Environmental Clearance - May 31, 2010	EAC (T), MoEF	Accorded	**Appendix A**
Environmental /CRZ Clearance – October 29, 2010	EAC (CRZ), MoEF	Accorded	
EC Corrigendum – August 14, 2012	EAC (T), MoEF	Accorded	
EC Amendment for Relocation of Ash Pond/Change in S%/Change in Configuration – February 04, 2014	EAC (T), MoEF	Accorded	
EC Amendment for Imported Coal Transport through Rail Route – March 27, 2015	EAC (T), MoEF	Accorded	
Environmental Clearance Validity Extension - February 26, 2018	EAC (T), MoEF&CC	Accorded	
Environmental/ CRZ Clearance Validity Extension - February 27/ March 05, 2018	EAC (Infra-2), MoEF&CC	Accorded	

Also, as part of environmental initiatives and to comply with the EC conditions, ITPCL had framed Environmental Management Plan (EMP), and started Environmental Monitoring through reputed agencies. ITPCL has also developed in house Environment Management Cell to implement the EMP.

1.5.1 Facilities developed at ITPCL Site

The major components along with its associated facilities developed so far at site are as follows:

1.5.1.1 Thermal Power Plant

- Capacity: 2×600 MW using Sub-critical Technology
- Stack: 1 No. of 275 m Height
- Railway Siding: From Puduchattiram station to TPP for transport of Coal/HFO/LDO
- Area:961 Acres

1.5.1.2 Captive Desalination Plant

- Capacity: 10 MLD
- Technology: Reverse Osmosis

1.5.1.3 Others

- Intake System: About 700m long to draw about 276840 KLD of Seawater for the entire 3180 MW capacity till desilting basin and Pump House for 1200 MW
- Outfall System: > 1500 m from Shore to discharge about 204936 KLD of return cooling and reject brine

1.6 Present Proposal (Use of Blended Coal) for ITPCL's TPP

Considering the availability of Indigenous Coal (Lignite) at Neyveli (NLC India Limited mines) which is located about 25 km West (aerial distance), ITPCL proposes to use the Indigenous Coal along with Imported Coal (blend ratio of 25:75) in the existing 2X600 MW units in order to derisk the company from coal supply /availability risk in Operation with Insignificant or minimal additional environmental/social impacts.

Accordingly ITPCL has proposed the use of blended coal in addition to use of 100% Imported coal at their existing 2X600 MW units, Indigenous Coal transport by Road as an interim arrangement and seeks amendment to EC from EAC (T) MoEF&CC. When NLC develops the railway siding (which is under consideration) the transportation of indigenous coal will be shifted from road to rail. The details are presented in the subsequent sections of this report.

2 Need for Use of Blended Coal as an Alternative to 100% Imported Coal Use

2.1 Present Permission and Usage

MOEF&CC granted Environmental clearance to ITPCL's 3180 MW Thermal Power Plant with the use of Imported coal of 13.4 MMTPA. As mentioned earlier, Out of 3180 MW, Only 1200 MW is commissioned and currently consuming about a maximum of 5.0 MMTPA of Imported coal. The imported coal is being sourced from Indonesia and transported through ships upto Karaikal Port and thereafter by Rail rakes upto ITPCL TPP.

2.2 Availability of Indigenous Coal

NLC India Limited (formerly Neyveli Lignite Corporation Limited) ('Navratna' - A Government of India Enterprise) at present has four open cast lignite mines namely Mine I, Mine II, Mine IA and Barsingsar Mine (three at Neyveli in the State of Tamil Nadu and one at Barsingsar in the State of Rajasthan) with a total installed capacity of 30.60 MTPA. The lignite mined out is used as fuel to the linked Pit head power stations. Also raw lignite is being sold to cement companies and small scale industries to use it as fuel in their production activities.

Besides, Bithnok lignite mines (2.25 MTPA), Hadla lignite mines (1.9 MTPA), Barsingsar Expansion (0.40 MTPA) and Expansion of Mine-IA (4.0 MTPA) are also under implementation. In addition to the above, a proposal is underway to set up Mine-III of 11.50 MTPA and South of Vellar cum Palayankottai Mine projects of 11.50 MTPA as the fuel linkages to the Second Expansion Project of TPS-II (phase 1 & 2). With all the above Projects, the lignite mining capacity of NLC at the end of the year 2025 would increase to 62.15 MTPA.

NLC India mines at Neyveli are located at about 25.0 km from the ITPCL TPP.

Sale of raw lignite through e-Auction is being carried out by NLC India Limited through M/s. MSTC Limited (formerly known as Metal Scrap Trade Corporation Limited), Chennai on "as-is-where-is and no complaint basis only" from Mine-IA. It also mentions that the loading and transportation of Raw Lignite has to be arranged by the buyer at their own cost.

At present, availability of domestic coal has increased considerably in the country and Coal is being offered to IPP's through special forward E-auction for regulated sector (Power Sector)/ Spot E-auction/linkages etc.

2.3 Details of NLC India Limited and its Users

The main activity of NLC India is Mining (Coal & Lignite) and Power Generation (Thermal and Renewable Energy). NLC India at present has four open cast lignite mines namely Mine I, Mine II, Mine IA and Barsingsar Mine. The capacities of the mines are given below.

- Mine I : 10.5 MTPA (Neyveli, Tamil Nadu)
- Mine I A : 3.0 MTPA (Neyveli, Tamil Nadu)
- Mine II : 15.0 MTPA (Neyveli, Tamil Nadu)
- Barsingsar Mine: 2.1 MTPA (Barsingsar, Rajastan)

2.3.1 MINE - I Including Expansion

The lignite seam was first exposed in August 1961 and regular mining of lignite commenced in May 1962. German excavation technology in open cast mining, using Bucket Wheel Excavators, Conveyors and Spreaders were used for the first time in the country in Neyveli Mine-I. The capacity of this mine was 6.5 MT which met the fuel requirement of TS-I. The capacity was increased to 10.5MT of lignite per annum from March 2003 under Mine-I expansion scheme and at present meets the fuel requirement for generating power from TPS-I (600 MW) and TPS-I Expansion (420 MW).

2.3.2 MINE - II Including Expansion

In February, 1978 Government of India sanctioned the Second Lignite Mine of capacity 4.7 MT of lignite per annum and in February' 83, Government of India sanctioned the expansion of Second Mine capacity from 4.7 Million Tonnes to 10.5 Million Tonnes. Unlike Mine-I, Mine-II had to face problems in the excavation of sticky clayey soil during initial stage. The method

of mining and equipment used are similar to that of Mine-I. The seam is the same as of Mine-I and is contiguous to it. The lignite seam in Mine-II was first exposed in September 1984 and the excavation of lignite commenced in March, 1985. GOI sanctioned the expansion of Mine-II from 10.5 MTPA to 15.0 MTPA of lignite in October 2004 with a cost of Rs. 2295.93 crore. Mine-II Expansion project was completed on 12th March 2010. The lignite excavated from Mine-II meets the fuel requirements of Thermal Power Station-II (1470 MW) and Thermal Power Station–II Expansion (500 MW) under implementation.

2.3.3 MINE-IA

Government of India sanctioned the project Mine-I A of 3 million tonnes of lignite per annum at a sanctioned cost of Rs. 1032.81 crores in February' 98. This project is mainly to meet the lignite requirement of M/s ST-CMS for their power plant ***and also to utilize the balance lignite to the best commercial advantage of NLC***. The project was completed on 30th March 2003 within time and cost schedule.

2.3.3.1 Expansion of Mine 1A

In order to meet the additional requirement of lignite arising out of implementation of 1000 MW Neyveli New Thermal Power Project at Neyveli, expansion of Mine-IA is being implemented, which would result in raising the Mine IA capacity by 4 MTPA. Acquisition of required land has been taken up with Government. Ministry of Coal has accorded approval for mining expansion plan of Mine 1A. Works are under Progress.

2.3.4 BARSINGSAR MINE

GOI sanctioned implementation of Barsingsar mine with a capacity of 2.1 MTPA of lignite per annum at an estimated cost of Rs. 254.60 crore in December 2004. Both overburden and lignite production has been outsourced. Lignite excavation commenced on 23rd November 2009 and production attained the rated capacity on 31st January 2010. The lignite from this mine is being supplied to Barsingsar TPP (2x125 MW).

2.4 Proposed Use of Blended Coal

The following factors are considered while finalizing the use of Indigenous coal (Lignite) with Imported Coal in the existing ITPCL 1200 MW TPP.

- Technically, Economically Feasible & Environmentally appropriate
- Adequate Lignite Availability at Neyveli through E-Auction and encourage use of Lignite which is expressed by NLCIL vide its letter dated April 04, 2018
- Nearness to ITPCL TPP (~25.0 Km)
- Lesser transportation distance, Cost and related emissions
- Due to volatility in the availability of imported coal at reasonable price, foreign exchange fluctuations, frequent changes in sovereign laws of coal producing countries and shipping & transportation bottlenecks, the availability of coal for power plants at reasonable cost is looking difficult.
- In line with GoI Policy to reduce the dependence on imported coal and promote usage of indigenous coal. Reduction of import would also improve the balance of trade for the country.

Considering the above beneficial aspects, use of Imported Coal/Indigenous coal along with Imported Coal is proposed for the 2X600 MW units. The blend ratio will be 25 (Indian):75 (Imported) by maintaining the blend calorific value of minimum of 4200 Kcal/kg.

2.5 Use of Both Imported Coal as well as Blended Coal

The current proposal (use of Imported/ Blended Coal) is for First Existing Two (02) Units (2x600 MW) units only out of approved 3180 MW. Based on the availability of Indigenous coal in future, further amendment for the remaining Three Units (3X660 MW) will be sought once units are operational.

It is pertinent to mention that during the inadequate supply of indigenous coal, the existing 1200 MW TPP will be continued to operate by using imported coal as its present conditions.

3 Technical Details of Indigenous Coal, Imported Coal and Blended Coal

3.1 Indigenous Coal

3.1.1 Source and Availability

It is proposed to source indigenous coal from NLC mines, located at about 25.0 km from the ITPCL TPP. Indigenous coal is proposed to be sourced through e-Auction. The recent sale tender floated by NLC India Limited vide E- Auction No:EARL-03 dated 09.05.2018 and EARL-05 dated 23.05.2018 shows availability of about 5,00,000 Tones.

However, ITPCL is in discussion with NLC India Limited for "Sale of Lignite other than by e-auction" and hope this will be recognised by them and suitable agreement will be entered. Adequate Lignite Availability at Neyveli and encourage use of Lignite was expressed by NLCIL vide its letter dated April 04, 2018.

3.1.2 Fuel Analysis (Characteristics)

The average coal characteristics of Raw lignite as given in tenders floated by NLC India Limited is given in **Table 3-1.**

Table 3-1: Indigenous Coal Characteristics

S.No	Constituents	Average value
1.	Moisture	51 %
2.	Ash	7.5 %
3.	Volatile Matter	23.5 %
4.	Fixed Carbon	19.75 %
5.	Sulphur	0.85%
6.	Calorific value	2715 Kcal/kg

In addition, ITPCL also verified the Lignite Characteristics by selective sampling and the results are given below and provided as **Appendix B**.

Table 3-2: Indigenous Coal Characteristics as analysed by MSK Lab

S.No	Constituents	Value
1.	Moisture	49.56 %
2.	Ash	5.11 %
3.	Volatile Matter	24.86 %
4.	Fixed Carbon	20.47 %
5.	Sulphur	0.76%
6.	Calorific value	2997 KCal/Kg

3.2 Imported Coal

3.2.1 Fuel Analysis (Characteristics)

The analysis of imported coal is given below.

Table 3-3: Imported Coal Characteristics

S.No	Description	Range for Design and Performance Curves
1	**Proximate Analysis**	
1.1	Total Moisture (%)	26 - 35
1.2	Volatile Matter (%)	32 - 41
1.3	Ash (%)	0.25 - 6
1.4	Fixed Carbon (%)	27 - 32.75
1.5	Gross Calorific Value (Kcal/Kg)	4000 - 5000
1.6	Sulphur (%)	0.13 - 0.4

3.2.2 Approval and Permission

Apart from using the coal with above specifications mentioned in **Section 3.2.1**, permission has been accorded vide letter No: J-13012/34/2008 – IA. II(T) dated February 04, 2014 to use up to 0.8% Sulphur in coal consequent to implementation of FGD in the Plant.

3.3 Blended Coal

3.3.1 Fuel Requirements & Characteristics after Blending

The following are the expected characteristics of the coal after blending in the ratio of 25:75 Indigenous Coal and Imported Coal respectively.

Table 3-4: Blended Coal Characteristics

S.No	Constituents	Quality Range			Remarks
		Indigenous Coal (25%)	Imported Coal (75%)	Blended Coal	
1.	Moisture (%)	49.56	26-35; Average 30.5	35. 265	No Significant Change wrt Imported Coal
2.	Ash (%)	<6	6	6	No Change wrt Imported Coal
3.	Coal Requirement TPH (Each 600 MW)	83.9	251.8	335.8	
4.	Sulphur (%)	<0.8	0.8	0.8	
5.	Calorific value (Kcal/Kg)	2460 to 2997	4200-4600	4200	

3.4 Blending Methods

The main methods for coal blending used on-site at coal-fired power plants are summarised in below **Table 3-5**.

Table 3-5: Blending Methods – Advantages and Disadvantages

Method	Description	Location of Blending	Advantage	Disadvantage	Remarks
Beds/Stockpiles	Stacking of two or more coals in Layers	at coal stockyard	Only one system is required Relatively inexpensive	All coal must be stacked before blending Not Possible to change the blending ratio	Sufficient Coal Stacking area is available at ITPCL.
Blending on	Two types of coal	At common	Blending ratio	All coal must be	Sufficient Coal

Method	Description	Location of Blending	Advantage	Disadvantage	Remarks
moving Belt	are stacked in two yards and gathered by separate stacker/ reclaiming	transfer point homogenisation at transfer point	can be changed at any time	stacked first	Stacking area & Conveyors are already available at ITPCL
Blending on moving Belt (First Coal reclaimed and Second coal from track hopper)	First Coal is reclaimed from the coal yard and second coal is fed from the track hopper/wagon	At common transfer point homogenisation at transfer point	Blending ratio can be changed at any time. Only One Coal needs to be stacked. Other can come in as delivered.	Lower blending accuracy	Sufficient Coal Stacking area, Track Hopper system and Conveyors are already available at ITPCL

ITPCL will be able to carry out all the above described blending methods.

4 Indigenous Coal Transportation Mode Alternatives

4.1 Indigenous Coal Transport through Road Network – Traffic Study

NLC India Limited, Neyveli mines are well connected to ITPCL's TPP site by road network. The traffic study includes details of alternative road network available, normal traffic and Road conditions, normal traffic projections, generated traffic, total traffic, Level of Service (LoS), abutting land use & habitations suitability for the Indigenous Coal Transportation etc., are provided in the **Appendix C** and summary of the same is discussed below.

4.1.1 Alternative Routes Considered for Study

Among the available road network, two significant (02) options are studied to check the feasibility to transport the indigenous coal to ITPCL Plant Site from Neyveli mines.

Option1: Mandarakuppam/Neyveli – Vadalur – Kurinjipadi - Kullanchavadi - Alapakkam - Villiyanallur - Plant Site (About 44.2 Km)

Option2: Mandarakuppam/Neyveli – Vadalur – Maruai – Pinnalur – Seithiyathope – Bhuvanagiri – B. Muttalur - Villiyanallur - Plant Site (About 51.2 Km)

Map Showing Road route Option 1 and 2 are given below.

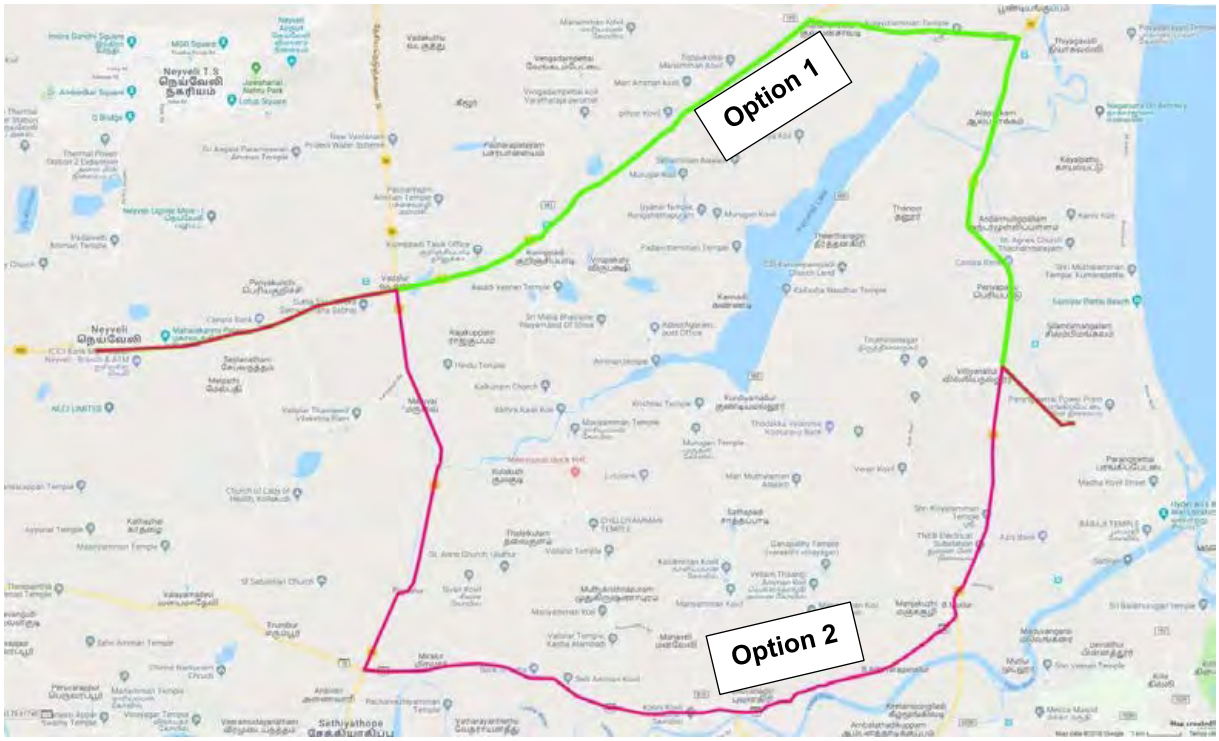


Figure 4-1: Map Showing Road Network Options Available from Neyveli to ITPCL

4.1.2 Advantages and Disadvantages of Alternative Routes Studied

The Multi-Criteria-Matrix of selection process is adopted to find out the best suited route for transporting indigenous coal from NLCIL Neyveli mines to ITPCL Site based on the Traffic studies findings and other factors.

Table 4-1: MCM – Alternative Routes

S.No	Parameters	Units	Route 1	Route 2
1.	Distance from NLCIL Mines to ITPCL Plant Site	Km	44.2	51.2
2.	Road Conditions	-	Good with less Bends/Curves	Moderate with more Bends/Curves comparatively
3.	Fuel Consumption by Trucks	-	Less	More
4.	Emissions from Trucks	-	Less	More
5.	Level of Service of Existing Road for present/Normal Traffic	V/C Ratio	B,B,B,A,C (Good-Very Good-Excellent)	B,B,B,B,C (Good-Very Good)
6.	Level of Service of Existing Road for Projected Normal Traffic and ITPCL Generated Traffic	V/C Ratio	B,B,B,B,C (Good-Very Good)	C,C,C,C,C (Good)
7.	Enroute Habitations	Nos	27 including 2 Town Panchayats	27 including 3 Town Panchayats
8.	Land Use	-	The Land use abutting the route 1 is mining area, agricultural land, plantations, and waste land, built up area (Urban and Rural), dry tanks with few stream crossings	The Land use abutting the route 1 is mining area, agricultural land, plantations, and waste land, built up area (Urban and Rural), dry tanks with few stream crossings

4.1.3 Best Suited Route

Considering the above discussed advantages and disadvantages of Route 1 and Route 2, **Route 1** (NLCIL (Mandarakuppam/Neyveli) – Vadalur – Kurinjipadai bypass – Kullanchavadi – Alapakkam – Villiyanallur – ITPCL Site) is found suitable in all aspects (such as less distance, less emissions, good road conditions, good level of services, less enroute population) and hence **is preferred** for indigenous coal transport from NLCIL mines to ITPCL Site. This route is more or less same route which railway line is laid.

4.2 Indigenous Coal Transport through Rail

4.2.1 NLC Mines - Railway Connectivity

Virudachalam – Cuddalore Southern Railway line at Neyveli is passing near NLC Mines. Only ST-CMS Power Plant is having private siding which is located at about 3.25 km NW of NLC, Neyveli mines. Other than this no railway siding is available for transport of coal to the users through rail mode.

It is pursued with NLC and Southern Railways to augment an additional railways siding in coal mine/Neyveli. Also the company has signed MoU with a Logistics provider to explore the possibilities of utilising its existing resource or develop a new railways siding in Neyveli.

The map showing rail way network near the mine area is given below.

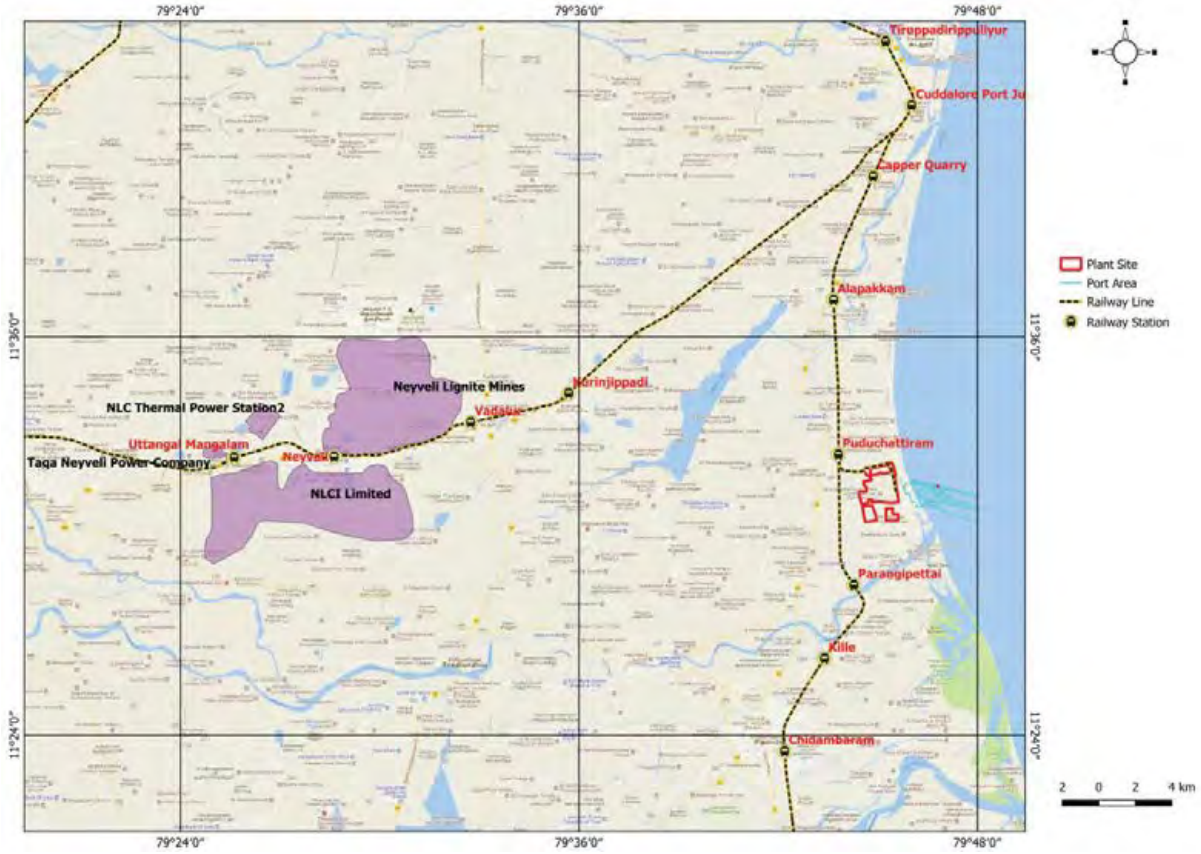


Figure 4-2: Railway Network Near NLC India Limited Mines Areas

4.2.2 ITPCL's Railway Siding for HFO/LDO and Imported Coal Transportation

Currently, Imported Coal is being transported from Karaikal Port through an existing railway private siding/line (~5.3 km) from the Puduchattram railway station to project site. This railway siding will serve as a second line of supply even after the Port is commissioned.

The Southern Railway main line from Karaikal Port to Puduchattiram passing through Nagor – Nagapattinam – Thiruvarur – Peralam - Mayiladuthurai – Sirkhazhi – Chidambaram and Puduchattiram. The total rail line including the rail siding from Puduchattiram railway station to ITPCL TPP from **Karaikal Port is 128 km**.

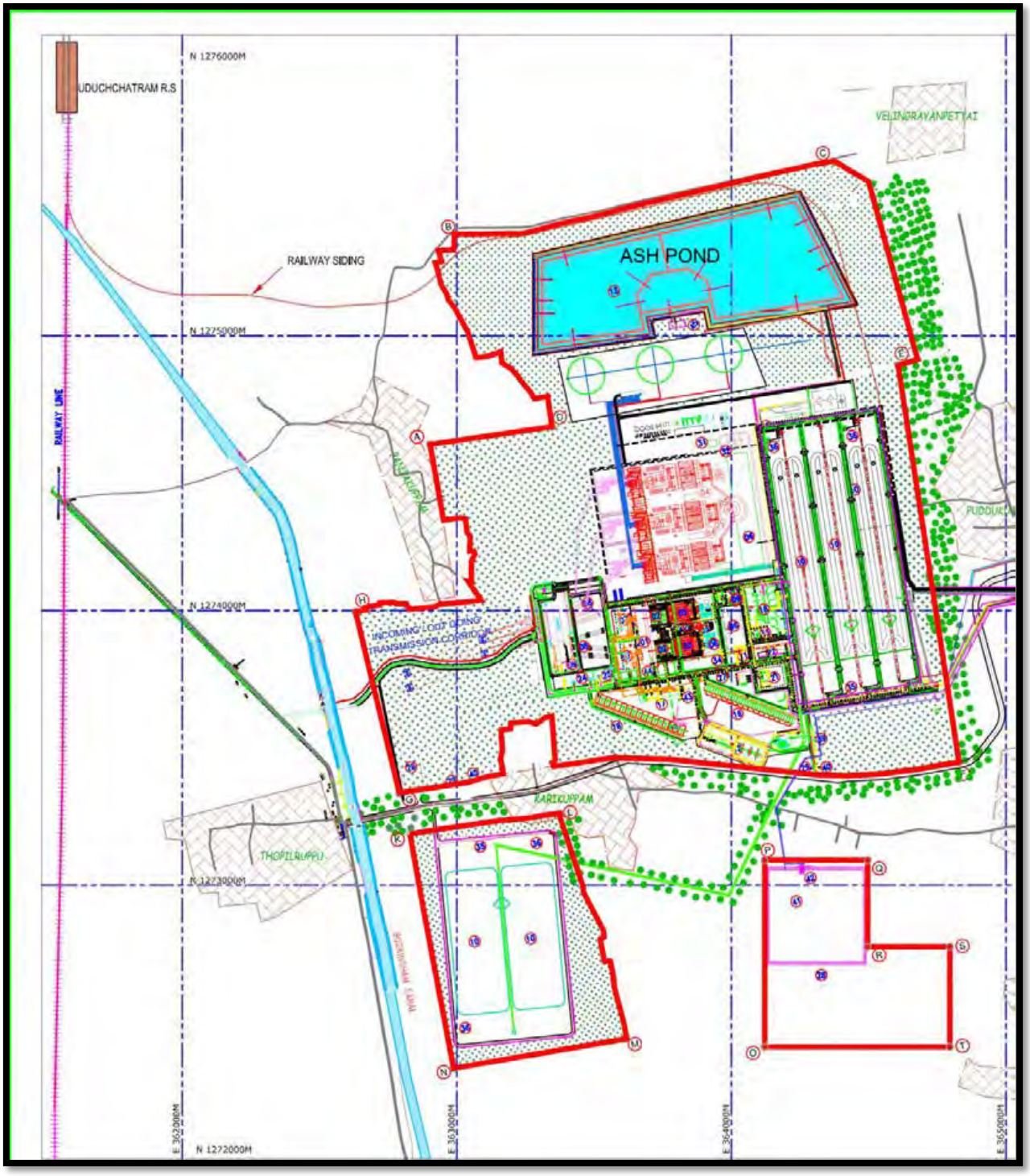


Figure 4-3: Existing Railway Siding at ITPCL from Puduchattiram Railway Station

4.2.3 Bottlenecks for Transport of coal Using Railway line

Though ITPCL is currently transporting imported coal through Rail line from Karaikal Port, the transport of Indigenous Coal from NLC India mines at Neyveli is not preferred (time being) **as a quick option** considering the following factors.

- No Separate rail siding from Mines are existing
- Getting approvals and constructing a new railway siding in NLC mine area by NLCIL will be time consuming

The other aspects analysed are

- At mine site high loading rates into rail wagons cannot be achieved due to moisture in lignite. As a result additional rakes would be required.
- Due to moisture in lignite, the lignite wagons cannot be fully emptied by wagon unloading equipment viz. wagon tippler, track hopper / bottom discharge wagon etc.

4.3 Indigenous Coal Transport through Rail cum Road Network

In this alternative, transport of coal from NLCIL Mines to the areas/ railway stations (Neyveli/Vadalur/Kurinjipadi) abutting/on the existing Virudachalam- Cuddalore SR line is considered by road and from those areas/ Railway Stations to ITPCL TPP by rail. This proposal requires a stock yard development, Wagon loading system additional siding development, land acquisition, R&R etc., which also attracts additional pollution issues due to multiple handling and resultant dust emissions. This option is not feasible because this is densely populated area and people will not permit due to environmental issues. Hence, this option has been ruled out.

4.4 Selection of Preferred Mode of Transport for Indigenous Coal

In general coal transport through road network is not preferable in most of the cases due to its difficulty in traffic.

However, considering the following factors, Indigenous Coal transport from NLCIL Mines at Neyveli to ITPCL TPP site through existing road route is **proposed as an interim option till NLCIL develops separate sidings**.

- NLCIL Mines are located at about ~ 25.0 km (Aerial Distance)
- No separate rail siding is available at NLCIL.
- Laying a separate siding will attract high capital investment and is a time consuming process. .
- Preferred existing road route for Indigenous coal transport will be able to accommodate the ITPCL generated traffic. Considering the Traffic growth pattern, these roads will be able to maintain the same level of service till the year 2025 without any strengthening/ widening requirements.
- Less number of enroute habitations in the preferred existing road route and mostly free flow traffic conditions.
- Planned for only 25% blending with indigenous coal and expected generated traffic (truck movements) are not more than Seven (07) per Hour maximum.
- Once NLCIL develops Rail sidings, then the indigenous coal of 1.25 MMTPA can be transported through Rail from Neyveli to Plant site. The distance to be travelled from Neyveli to Plant site by train/rake is estimated to be about 60 km which is shorter than the current imported coal transport from Karaikal Port (128 km). Development of railway line /sidings is under consideration of NLC in the long run.

5 Baseline Environment (Enroute)

5.1 Study Area & Study Period

The area abutting the preferred indigenous coal transport route by road (Neyvei-Vadalur-Kurinjipadi-Kullanchavadi-Alapakkam-Villiyanallur-ITPCL site) is considered for analysing the baseline environmental conditions. Ambient Air Quality, Noise Quality, Soil Quality, Water Quality (Both Surface and Groundwater) monitoring was carried out during the period May 2018 – July 2018.

5.2 Meteorological Conditions

The climatological table for Parangipettai IMD Station Latitude 11^0 30' N and Longitude 79^0 46' E, published by the Indian Meteorological Department (IMD), based on daily observations at 08:30 and 17:30 hr IST for a 30 year period (1971-2000), forms the basis for the following sections on the meteorological conditions at the site. The monthly variations of the relevant meteorological parameters are given in **Table 5-1** below.

Table 5-1: Climatological Data of Parangipettai

Month	Temperature (°C)		Rainfall (mm)		Relative Humidity (%)		Mean Wind Speed (Kmph)	Predominant Wind Direction (From)	
	Daily Max.	Daily Min	Total	Number of days	0830	1730		08:30*	17:30*
Jan	28.8	20.8	31.8	1.7	82	72	6.1	NW, N, NE	NE, N, NW
Feb	29.9	21.2	45.7	1.5	83	71	6.0	NW, N, NE	NE, SE, N
Mar	32.0	22.9	24.6	0.6	81	71	7.2	NW, SW, S	SE, NE, S
Apr	34.3	25.1	12.9	0.6	76	70	9.2	S, SW, SE	SE, S, SW
May	37.0	26.0	30.3	1.4	70	68	9.6	SW, S, W	SE, S, SW
Jun	37.4	26.0	53.5	3.3	67	58	9.5	SW, W, NW	SE, SW, S
Jul	35.9	25.3	72.9	4.5	72	60	8.6	SW, W, NW	SE, SW, S
Aug	35.3	24.8	93.4	5.3	75	62	7.9	SW, W, S	SE, SW, S
Sep	34.0	24.5	132.9	5.9	80	68	6.9	SW, S, W	SE, SW,S
Oct	32.2	24.0	251.0	9.1	85	74	5.2	SW, W, NW	SE, S, NE
Nov	29.8	22.7	369.9	11.0	86	78	5.4	NW, NE, SW	NE, N, SE
Dec	28.8	21.6	308.1	7.9	86	75	7.0	NW, NE, N	NE, N, NW
Source: IMD Climatological Sheet Published by IMD (1971-2000)									

5.3 Baseline Environment Status

The baseline environment status along the preferred road route was monitored for Ambient Air Quality, Noise Quality, Surface and ground Water and Soil Quality. The location of Monitoring and Sampling is provided in the **Figure 5-1.**

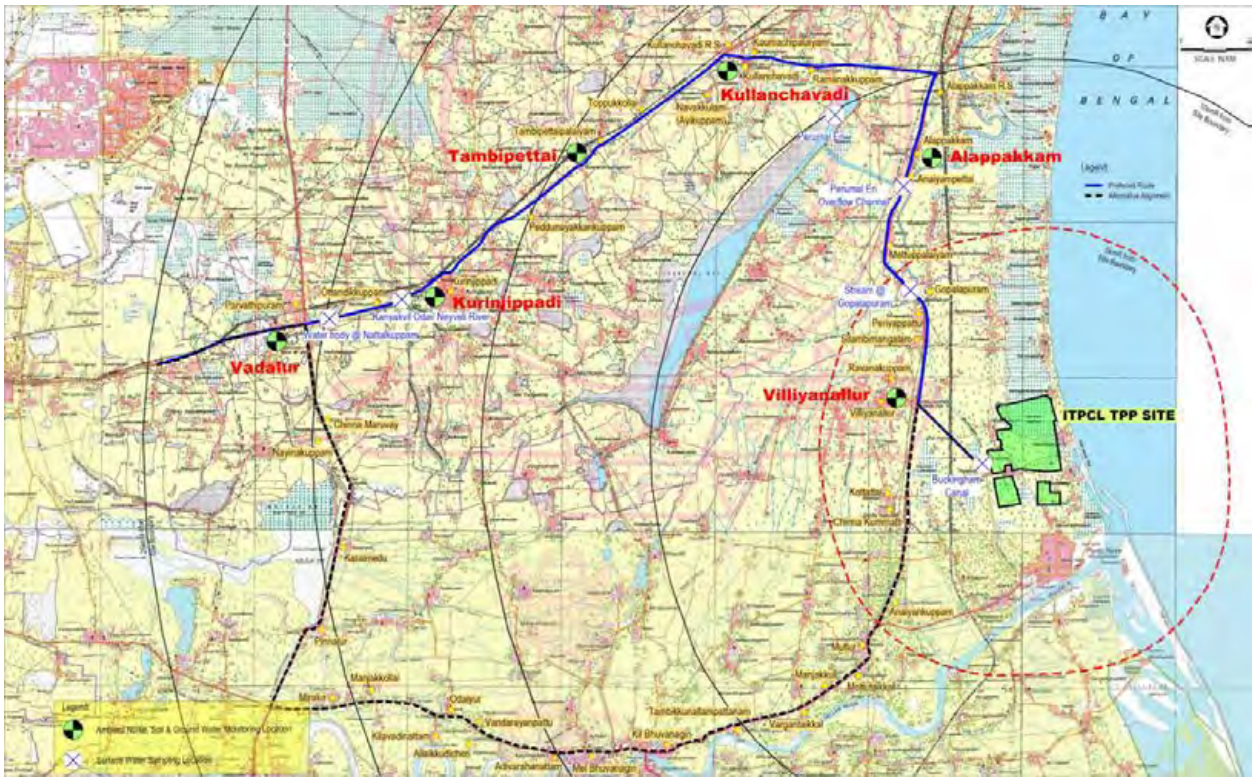


Figure 5-1: Baseline Environment Monitoring Locations along Preferred Route

5.3.1 Ambient Air Quality

5.3.1.1 Along Preferred and Alternate Indigenous Coal Transportation Route

Ambient air quality along the preferred indigenous coal transportation route was monitored during the May 2018 at Six (06) locations and the details are presented in below **Table 5-2**.

Table 5-2: AAQ Monitoring Locations along Preferred Coal Transportation Route

Station Code	Name	Distance from Road (km)	Environmental Setting
AR 1	Neyveli	> 0.1	Industrial, Residential, Rural and Other areas
AR 2	Vadalur		
AR 3	Kurinjipadi		
AR 4	Tambipettai		
AR 5	Kullanchavadi		
AR 6	Alapakkam		
AR 7	Villiyanallur		

In addition, ambient air quality along the alternative routewas also monitored during May 2018 at Five (05) locations and the details are presented below in **Table 5-3.**

Table 5-3: AAQ Monitoring Locations along alternative Coal Transportation Route

Station Code	Name	Distance from Road (km)	Environmental Setting
AR 8	Maruvai	>0.1	Industrial, Residential, Rural and Other areas
AR 9	Pinnalur		
AR 10	Odaiyur		
AR 11	Seithyathope Near X Road		
AR 12	Bhuvanagiri		

The results of AAQ monitoring are presented in below **Table 5-4**.

Table 5-4: Ambient Air Quality along Preferred and Alternative Route

AAQ Location Code	Parameters					
	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)	Ozone (O_3) (µg/m³)	Carbon Monoxide (CO) (mg/m³)
Preferred Route						
AR1	70.6	26.2	15.5	17.0	8.8	0.33
AR2	64.8	22.5	11.2	13.0	7.1	0.28
AR3	66.8	24.0	12.6	14.1	7.4	0.30
AR4	61.0	20.8	10.5	14.1	6.9	0.27
AR5	57.4	18.0	9.2	11.3	6.0	0.25
AR6	60.4	20.8	10.1	13.7	7.2	0.25
AR7	62.4	21.3	11.6	15.2	7.5	0.27
Alternative Route						
AR8	58.6	19.7	9.9	12.8	7.0	0.26
AR9	55.7	18.0	8.8	10.9	6.5	0.24
AR10	56.4	19.9	8.5	10.2	6.3	0.24
AR 11	55.2	18.3	8.0	10.4	6.2	0.25
AR12	63.7	21.5	10.8	12.9	7.0	0.27

Observations:

Maximum concentrations of Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Particulate Matter ($PM_{2.5}$), Particulate Matter (PM_{10}), Carbon Monoxide (CO) and Ozone (O_3) are well within the National Ambient Air Quality Standards for Residential areas at all monitoring locations during the study. Lead (Pb) is found to be Below Detectable Limit (BDL) and other parameters such as Ammonia (NH_3), Benzene (C_6H_6), Benzo (a) Pyrene (BaP) – Particulate phase only, Arsenic (As) and Nickel (Ni) were not detected at all the monitoring locations.

5.3.2 Noise Levels

5.3.2.1 Along Preferred Indigenous Coal Transportation Route

Ambient Noise quality along the preferred indigenous coal transportation route was monitored during the May 2018 at Six (06) locations and the details are presented below in **Table 5-5.**

Table 5-5: Noise Quality Monitoring Locations along Preferred Coal Transportation Route

Station Code	Name	Distance from Road (km)	Environmental Setting
AR 1	Vadalur	>0.1	Commercial Area (Monitored along the Preferred Road Alignment)
AR 2	Kurinjipadi		
AR 3	Tambipettai		
AR 4	Kullanchavadi		
AR 5	Alapakkam		
AR 6	Villiyanallur		

The results of Noise Quality monitoring are presented below in **Table 5-6.**

Table 5-6: Noise Quality Monitoring Locations along Preferred Coal Transportation Route

Station Code	Name	Leq Day dB(A)	Leq Night dB(A)	Ambient Noise Standard Leq Day / Leq Night dB(A)
AR 1	Vadalur	56.8	53.2	65/55
AR 2	Kurinjipadi	56.2	52.3	
AR 3	Tambipettai	54.3	49.9	
AR 4	Kullanchavadi	57.9	53.6	
AR 5	Alapakkam	58.4	53.5	
AR 6	Villiyanallur	56.1	52.3	

Observations:

It is observed that the day equivalent and night equivalent noise levels at all locations are within prescribed CPCB standards

5.3.3 Surface Water Quality

5.3.3.1 Along Preferred Indigenous Coal Transportation Route

Surface water quality along the preferred indigenous coal transportation route was monitored during the May 2018 at Six (06) locations and the details are presented below in **Table 5-7**.

Table 5-7: Surface Water Quality Monitoring Locations along Preferred Coal Transportation Route

Station Code	Name
SW 1	Water body Near Nattalkuppam
SW 2	Perumal Eri Near Palliodai
SW 3	Stream (Uppanar) Near Gopalapuram (Tidal Influenced)
SW 4	Kanyakvil Odai/ Neyveli River Near Andikuppam
SW 5	Perumal Eri Overflow Channel Near Anaiyampettai
SW 6	Buckingham Canal Near ITPCL Site (Tidal Influenced)

The results of Surface water Quality monitoring are presented below

The analytical results of surface water parameters are presented in **Appendix D**.

- pH ranged between 7.91 and 8.35
- Electrical Conductivity (EC) varied between 393 µS/cm and 10180 µS/cm
- Total dissolved solids ranged between 245 mg/l and 6922 mg/l
- Total solids ranged between 428 mg/l and 8213 mg/l
- Total alkalinity (as $CaCO_3$) varied between 68.5 mg/l and 585 mg/l
- Total hardness (as $CaCO_3$) ranged between 100.6 mg/l and 854.6 mg/l
- Calcium (as Ca) ranged between 26.4 mg/l and 152.2 mg/l
- Magnesium (as Mg) ranged between 8.4 mg/l and 151.9 mg/l
- Chlorides (as Cl^-) ranged between 56.1 mg/l and 3071.4 mg/l
- Sulphates (as SO_4) ranged between 41.6 mg/l and 261.8 mg/l
- Nitrates (as NO_3) ranged between 0.7 mg/l and 30.4 mg/l
- Sodium (as Na) ranged between 39.5 mg/l to 1924.8 mg/l
- Potassium (as K) ranged between 0.35 mg/l and 41.2 mg/l
- Iron (Fe) reported between 0.034 mg/l and 0.26 mg/l
- Aluminium (Al) reported between 0.22 mg/l and 1.2 mg/l
- Lead (Pb) reported between <0.01 and 0.02 mg/l
- DO ranged between 4.8 mg/l and 5.9 mg/l

- BOD reported as < 3 mg/l
- Residual free chlorine reported as <0.2 mg/l
- Anionic Detergents, Cadmium, Arsenic, Copper, Lead and Manganese are reported <0.001
- *E.coli* forms ranged from 196 MPN/100ml to 437 MPN/100ml
- Total Coli forms ranged from 270 MPN/100ml to 590 MPN/100ml
- Faecal Coli forms ranged from 74 MPN/100ml to 153 MPN/100ml

It is inferred that all the parameters for surface water sample are within the limits as per ISI-IS2296-1982 Class C (Drinking water source with conventional treatment followed by disinfection) Standards for use based Classification of Surface Water except Total Dissolved Solids at Water body @ Nattalkuppam and Buckingham canal, Chlorides and Fluoride at Buckingham canal are exceeding the permissible limits which are tidal influenced water bodies.

5.3.4 Groundwater Quality

5.3.4.1 Along Preferred Indigenous Coal Transportation Route

Groundwater quality along the preferred indigenous coal transportation route was monitored during the May 2018 at Six (06) locations and the details are presented below in **Table 5-8**.

Table 5-8: Groundwater Monitoring Locations along Preferred Coal Transportation Route

Station Code	Name
GWR 1	Vadalur
GWR 2	Villiyanallur
GWR 3	Kurinjipadi
GWR 4	Tambipettai
GWR 5	Alapakkam
GWR 6	Kullanchavadi

The analytical results of groundwater parameters are presented in **Appendix E.**

The summary of results of Groundwater Quality monitoring are presented below

- pH ranged between 7.12 and 8.43
- Electrical Conductivity (EC) varied between 556 µS/cm and 1264 µS/cm
- Total dissolved solids ranged between 352 mg/l and 795 mg/l
- Total solids ranged between 436 mg/l and 895 mg/l
- Total alkalinity ($CaCO_3$) varied between 83.8 mg/l and 225 mg/l
- Total hardness ($CaCO_3$) ranged between 154.9 mg/l and 323.5 mg/l
- Calcium (as Ca) ranged between 38.2 mg/l and 81.3 mg/l
- Magnesium (Mg) ranged between 10.5 mg/l and 32.5 mg/l
- Manganese (Mn) ranged between 0.29 mg/l and 1.35 mg/l
- Aluminium (Al) ranged between 0.18 mg/l and 0.86 mg/l
- Chlorides (as Cl^-) ranged between 82.1 mg/l and 211.2 mg/l
- Fluorides as (F^-) ranged between 0.4 mg/l to 1.1 mg/l
- Sulphates (as SO_4) ranged between 48.6 mg/l and 130.2 mg/l
- Nitrates (as NO_3) ranged between 9.6 mg/l and 31.1 mg/l
- Sodium (as Na) ranged between 54.8 mg/l and 144.5 mg/l
- Potassium (as K) ranged between 2.39 mg/l and 11.3 mg/l
- Zinc (Zn) ranged between 0.013 mg/l and 6.9 mg/l

- Iron (Fe) ranged between 0.043 mg/l and 0.14 mg/l
- Boron (B) ranged between 0.32 mg/l and 0.42 mg/l
- Residual free chlorine ranged below 0.2 mg/l
- Total Nitrogen, Total phosphorus, Phenolic compounds, Mineral Oil, Cadmium (Cd), Chromium (Cr^{+6}), Arsenic (As), Copper (Cu), Pesticides, Cyanides (CN), Mercury (Hg), Anionic Detergents, Lead (Pb), Selenium (Se), Nickel (Ni), Molybdenum (Mo), Barium (Ba), Ammonia (Total Ammonia- N), Silver (Ag), Sulphide (H_2S), Polynuclear Aromatic Hydrocarbons (PAH), Alpha Emitters and Beta Emitters are observed to be well below the detectable limits and *E. Coli* and Faecal Coliforms were not detected at all locations

It is inferred that groundwater samples are within the permissible limits specified for drinking water quality standards as per IS: 10500 (2012) except Manganese at Alapakkam and Aluminium at Vadalur, Villiyanallur, Kurinjipadi, Tambipettai and Alapakkam where concentrations are exceeding the permissible limits.

5.3.5 Soil Quality

5.3.5.1 Along Preferred Indigenous Coal Transportation Route

Soil quality along the preferred indigenous coal transportation route was monitored during the May 2018 at Six (06) locations and the details are presented below in **Table 5-9**.

Table 5-9: Soil Monitoring Locations along Preferred Coal Transportation Route

Station Code	Name	Distance from Road
SR 1	Vadalur	>0.1
SR 2	Kurinjipadi	
SR 3	Tambipettai	
SR 4	Kullanchavadi	
SR 5	Alapakkam	
SR 6	Villiyanallur	

The analytical results of surface water parameters are presented in **Appendix F**

The summary of results of Soil Quality monitoring are presented below

- Soil texture ranges between Sandy Clay Loam, Sandy Loam and Sandy Clay
- pH of soils ranged between 5.35 and 7.52 showing moderate acidic to moderate alkaline
- Electrical Conductivity varied between 101 µs/cm and 413 µs/cm
- Porosity varied between 43.1 % to 49 %
- Water Holding Capacity varied between 15 % to 28.0 %
- Infiltration Rate ranged between 0.19 cm/h and 4.72 cm/h
- Bulk density varied between 1.0 gm/cc and 1.1 gm/cc
- Nitrogen varied between 13.1 kg/ha to 40.5 which shows very less sufficient levels in soil quality
- Potassium (K) varied between 278.8 kg/ha and 485.3 kg/ha which shows average to more than sufficient in soil quality
- Phosphates as PO_4^{-2} varied between 41.6 kg/ha and 93.9 kg/ha which shows very less sufficient levels in soil quality
- Zinc (Zn) varied between 21.3 mg/kg and 83.9 mg/kg
- Iron (Fe) varied between 0.43% and 2.50%.
- Manganese (Mn) varied between 41.9 mg/kg and 257 mg/kg
- Chromium (Cr) varied between 38.2 mg/kg and 117 mg/kg
- Nickel (Ni) varied between 19.1 mg/kg and 35.1 mg/kg

5.3.6 Terrestrial Ecology

Based on the studies carried out earlier for the project, basically, the vegetation of the area falling within 25.0 km from ITPCL site could be classified under three categories viz., (i) the coastal sands and beach; (ii) the Mangroves and (iii) the Inland vegetation.

The coastal sands beyond high tide level have been brought under plantations of Casuarina equisetifolia. The natural vegetation is mostly represented by the sand binders such as the Ipomoea pes-tigridis (Ipomoea biloba), Spinifex littoreus, Pandanus fascicularis, Prosopis juliflora, Tamarix alba, etc. The coastal sands further beyond the HTL are colonized by isolated populations of palatable and nonpalatable weeds and grasses.

The inland vegetation is represented by crops, weeds, roadside vegetation and vegetation of the wastelands. There are no endangered plants present in the study area. Paddy, Sugarcane, Groundnut, Millets, Pulses, etc. are the major crops grown in the district. Apart from the above crops, Horticultural crops like Cashew, Banana, Tapioca, Guava, Jack fruit, Mango, etc. are grown in various parts of the district.

Other than the Pichavaram mangrove forests there are no ecologically sensitive areas in the project area. A total number of 12 true mangrove species are present in the Pichavaram mangrove wetland. Avicennia marina alone constitutes 74% of the tree population and it is distributed everywhere except the banks of tidal canals and creeks followed by Rhizophora spp. (V.Selvam at al. 2010).

None of the animal species belong to either rare or endangered or endemic or threatened (REET) category is observed within 25.0 km from ITPCL Site. There are no biosphere reserves or sanctuaries or national parks or other protected areas within the 25 km radius of the project site.

The Land use abutting the preferred Indigenous coal transportation route is mining area, agricultural land, plantations, and waste land, built up area (Urban and Rural), dry tanks with few stream crossings. Margosa (neem), Banyan, Palmyra, coconut, Tamarind, Mango, Cashew and Jackfruit are the common trees found . Since there are no dense forests in the district wild animals are very rare.

5.3.7 Socio-Economic Conditions

5.3.7.1 In Preferred Route & Alternate Route

The preferred alignment is passing mostly through Kurinjipadi and Cuddalore taluks. The alternate alignment is also passing mostly through the Kurinjipadi and Chidambaram taluks. The study areas have been quantified to understand the most coherent alignment in between the preferred route and alternate route for the transportation of Indigenous Coal from Neyveli to site. The study includes town panchayats, revenue villages and small habitations abutting the routes. The data for the villages abutting the two desired route have been sourced from Census of India 2011 as well as for the population data India Water (https://indiawater.gov.in). The settlements and its population along the preferred route are given in **Table 5-10.** The settlements and its population along the Alternate route are given in **Table 5-11**.

Table 5-10: Settlements and its Population along Preferred Route

Village Name	Total Households	Total Population	SC Population	ST Population	Gen Population
Kuravankuppam	642	3,206	922	0	2284
Seplanatham Bus Stop	112	454	0	0	454
Periyakuritchi	245	1072	192	0	880
Old Neyveli	432	2078	238	12	1828
Melpappanpattu	82	352	352	0	0
Keelpathi	54	200	25	0	175
Pravathipuram/Vadalur (T.P)	9736	39514	5652	590	33272
Ottandikuppam/ Onnankuppam	70	350	120	0	230
Andikuppam	56	230	0	0	230
Tambipettai	454	2215	1322	18	875
Tambipettaipalaiyam	337	1655	488	0	1167
Toppukkollai	233	1145	10	72	1063
Kaumachipalaiyam	288	1468	780	0	688
Kullanchavadi	284	1384	0	0	1384
Alappakkam	675	3068	2646	0	422
Anaiyampettai	65	326	0	0	326
Mettuppalaiyam	73	360	0	0	360
Gopalapuram/ G. Colony	192	998	402	0	596
Vadakku Seppalanattam	154	767	0	0	767
Vinankeni	158	797	344	0	453
Kurinjipadi (T.P)	6757	27471	4206	183	23082
Peddunayakkankuppam	500	2461	460	0	2001
Navakkulam (Ayikuppam)	307	1384	885	0	499
Ramanathakuppam/Ramanakuppam	140	641	361	0	280
Periyappattu	421	2188	437	4	1747
Silambimangalam	430	2172	675	0	1497
Ravanakuppam	93	516	206	0	310
Villiyanallur	545	2752	944	0	1808
Puduchattiram	130	668	0	0	668
Total	**23665**	**101,892**	**21667**	**879**	**79346**

Table 5-11: Settlements and its Population along Alternate Route

Village Name	Total Households	Total Population	SC Population	ST Population	Gen Population
Kuravankuppam	642	3,206	922	0	2284
Seplanatham Bus Stop	112	454	0	0	454
Periyakuritchi	245	1072	192	0	880
Old Neyveli	432	2078	238	12	1828
Melpappanpattu	82	352	352	0	0
Keelpathi	54	200	25	0	175
Pravathipuram/Vadalur (T.P)	9736	39514	5652	590	33272
Chinna Maruvay	434	2159	694	0	1465
Karaimedu	291	1071	456	0	615

Village Name	Total Households	Total Population	SC Population	ST Population	Gen Population
Pinnalur	140	575	0	1	574
Miralur	604	2335	1578	6	751
Manjakkollai	622	3349	886	19	2444
Odaiyur	74	277	0	0	277
Vandarayanpattu	174	710	320	0	390
Bhuvanagiri (TP)/Kela/Mela/ Adivarahanattam	5400	21956	5030	103	16823
Manjakkuli	1536	8109	1504	0	6605
Mutlur	637	3126	603	28	2495
Chinna Kummatti	255	1272	483	0	789
Kottattai	172	895	317	0	578
Puduchattriram	130	668	0	0	668
Vadakku Seppalanattam	154	767	0	0	767
Vinankeni	158	797	344	0	453
Nayinakuppam	185	932	5	0	927
Kilavadinattam	209	1129	849	0	280
Allaikkudicheri	389	1598	1046	0	552
Tambikkunallampattanam	105	540	0	0	540
Vargantaikkal/ Bharaikhan taikkal	74	380	0	0	380
Anaiyankuppam	98	520	0	0	520
Villiyanallur	545	2752	944	0	1808
Sethiathoppu (TP)	2269	8824	1393	106	7325
Total	**25958**	**111,617**	**23833**	**865**	**86919**

The preferred alignment population is 101892 which include 27 villages and two town panchayats respectively. The total households in the area are 23665. General population is 79346, ST population is 879 and the SC population is 21667. The alternate alignment population is 111617 which are abutting 27 villages and three town panchayats. The households in the alignment are 25958. General population is 86919, ST population is 865 and the SC population is 23833 respectively. The habitations in the preferred alignment are less which covers the route.

Population of preferred alignment is less than alternate route which makes it less impact on the settlements.

5.4 Half-Yearly Compliance Report

The Half- Yearly Compliance reports for the period between September 2017 and March 2018 already submitted to MoEF&CC (RO), CPCB and TNPCB vide ITPCL Letter No. ITPCL-S/GEN/18-19/2874 dated May 05, 2018.

6 Anticipated Environmental and Social Impacts and Mitigation Measures

In this chapter, likely impacts of the proposed activities (i.e. use of indigenous coal for blending in the existing ITPCL's 1200 MW TPP and transport of the Indigenous coal (interim arrangement) from NLC India Limited by road) on environmental attributes have been identified, assessed and presented. To mitigate likely impacts suitable measures if required have been recommended which need to be incorporated as a part of planning process.

6.1 Land Environment

6.1.1 Due to Use of Blended Coal

The imported coal requirement for each 600 MW existing unit is around 336 TPH considering the GCV of lowest in band of imported Coal (i.e. 4200 Kcal/Kg). Considering the blend ratio of (Indigenous) 25: (Imported) 75 as well as blend calorific value of 4200 Kcal/Kg, the blended coal requirement is estimated to be the same as imported coal. Hence there will not be any additional coal requirement

As there is no additional coal requirement for use of blended coal scenario, the part of the existing stockyard will be earmarked for the storage of indigenous coal. Hence no additional land requirement arises.

Similarly, for 1200 MW the ash generation (considering 6% of ash in coal) while using imported coal alone will be about 2.99 Lakh TPA @85PF (Fly Ash: 2.39 Lakh TPA Bottom Ash: 0.6 Lakh TPA). As there is no change in Ash % as well as coal requirements with respect to imported coal and Blended coal, no additional ash generation is estimated.

It is pertinent to mention that ITPCL is ensuring 100% Fly ash utilization and in addition utilization of bottom ash is tied up. The ash pond area available for 3180 MW is about 107 Acres to take care of lack of bottom ash utilization scenarios.

Hence, there is no impact due to the use of blended coal on land environment. Well established Dust suppression measures are available for the existing coal stockyard as well as at Ash pond which will be continued to control the fugitive dusts.

6.1.2 Due to Indigenous Coal Transportation

Indigenous coal transportation from Neyveli to ITPCL Plant site is proposed through existing preferred road network (Mandarakuppam/Neyveli- Vadalur- Kurinjipadi- kullanchavadi – alapakkam petrol bunk - Villiyanallur then plant). This land use abutting this existing road network is cropland/plantations/barren/habitations/water Bodies/Streams etc.,

It is estimated that about 1.25 MMTPA of Indigenous coal for 1200 MW will need to be transported considering the blend ratio of 25 (Indigenous):75 (Imported). The number of trucks requirement to transport this quantity will be around 6-7 trucks per hour. Trucks transporting coal will have impact on enroute land environment if not adequately managed due to fugitive dust generation, accidental spill if any.

6.1.2.1 Mitigation Measures

- Trucks will be covered with tarpaulin or any other effective measure/device completely
- Trucks shall ensure that are not over loaded as well as there is no spillage during transportation
- Drivers should be sensitized with respect to need to drive carefully.

- Speed is one of the main causes for accidents. So, speed of the trucks have to be controlled especially when they are passing through villages by providing speed breakers, sign boards and other appropriate speed control techniques
- Containment, cleaning of the spills at the accidental site shall be as quick as possible. Recovered coal materials shall be sent to ITPCL TPP site for better management.

6.2 Air Environment

6.2.1 Due to Use of Blended Coal

The details emission committed with respect to 1200 MW (Imported Coal) during the EIA study for which Environmental Clearances is granted are given below.

- SO_2 – 196 g/s (for each 600 MW)
- NO_2 – 340.7 g/s (for each 600 MW)
- PM – 45.5 g/s (for each 600 MW)

In addition, during the Rapid Cumulative Impact Assessment Study (RCEIA) study, Flue gas Desulphurization (FGD) Unit was suggested by MoEF&CC to bring down the overall SO_2 emissions. Accordingly, FGD unit was considered by ITPCL and applied for EC amendment to have flexibility in S% in imported coal up to 0.8% and granted by MoEF&CC. The SO_2 Emissions was estimated at about 181 g/s considering the FGD for Maximum of 0.8% Sulphur in coal.

It is pertinent to mention that No Other major industries have come up within 25.0 km radius which was proposed and considered during RCEIA study such as Cuddalore Power Company Limited (2X660 MW), Nagarjuna Oil Corporation Limited (6.5 MTPA), SRM Energy Limited (3x660 MW).

Later the New TPP Emission standards released by MoEF&CC, GoI during December 07, 2015, all existing TPPs should meet the stipulated standards by adopting suitable pollution control measures. Accordingly, for ITPCL 2X600 MW units the following emissions are supposed to be met (**TPPs installed upto December 2016**).

- SO_2 @ 200mg/Nm^3
- NO_2 @ 300mg/Nm^3
- PM @ 50mg/Nm^3

Accordingly the revised emissions from ITPCL 2X600 MW are estimated and provided below in **Table 6-1 .**

Table 6-1: Comparison between Emissions due to Blended Coal and 100 % Imported Coal

S. No	Unit (MW)	Flue Gas Flow Rate NM^3/Hr	Emissions - Imported Coal (Lowest in Band Coal Scenario-4200 Kcal/kg) / Blended Coal		
			SO_2 @ 200 mg/Nm^3	NO_2 @ 300 mg/Nm^3	PM @ 50 mg/Nm^3
1	600	25,63,167	142.4	213.6	35.6
2	600	25,63,167	142.4	213.6	35.6
			284.8	**427.2**	**71.2**

The emission due to the use of blended coal will remain same as for imported coal use as there is no additional coal requirement, no change in coal parameters, no change in calorific value.

The following observations are made for impact on air environment due to the use of Blended Coal.

- There is no Increase in SO_2, NO_2 and PM emissions due to use of Blended Coal **which is equivalent to use of 100% Imported Worst Coa**l (4200 Kcal/Kg).
- The stack monitoring results of the existing units (2x600 MW) using imported coal reveals that all the emissions are well within stipulated standards. i.e., SO_2 emissions are observed between 169 to 187.4 mg/Nm^3 which is less than 200 mg/Nm^3, NO_2 emissions are observed between 158.4 to 230 mg/Nm^3 which is less than 300 mg/Nm^3 and PM emissions are observed between 18.9 to 29.7 mg/Nm^3 which is less than 50 mg/Nm^3.
- ITPCL is committed to adhere the standards by MoEF&CC, GoI during December 07, 2015 applicable for both Blended Coal and 100% imported Coal Scenarios.
- No Exceedance in the Ambient Air Quality is observed in the locations that are being monitored by ITPCL as part of Existing EMP.

Hence no additional impact due to use of blended coal on Air Environment is envisaged..

6.2.1.1 Mitigation Measures

- Continuous Stack monitoring as well as Ambient Air Quality Monitoring being followed by ITPCL shall be continued.

6.2.1.2 Pollution Control Measures Available

The following are the pollution control measures available at ITPCL.

- For Particulate Matter: ESP
- For SO_2: FGD (Wet) Lime stone based
- For NO_2: Low Nox Burners
- For Fugitive Emissions: Wind Barrier, Covered Conveyor, Covered Transfer Points, Water Sprinklers, Silos, Track Hopper fitted with Dust Suppression etc.,

6.2.2 Due to Indigenous Coal Transportation, Unloading and Storage

The indigenous coal is proposed to be sourced from NLC India Limited mines located at Neyveli and the Environment Management at the Mines will be taken care by NLC.

Transportation of Indigenous coal (Lignite) results in use of public infrastructure such as roads. The NLC Neyveli mines can be accessed through existing/developed road network (Preferred option) consisting of NH- 532 (Mandarakuppam//Neyveli-Vadalur- Kullanchavadi), Major Road (Kullanchavadi- Alapakkam), NH45 A (Alapakkam to Villiyanallur) and Village Road (Villiyanallur to Puduchatiram Road).

During Coal transportation, there is a possibility of impact on air quality along the route due to exhaust emissions, fugitive dust suspension and traffic congestion. As the truck is proposed to be covered, the fugitive dust emission is not envisaged during transportation. The windblown dust during the coal movement could impact the road users and also habitations enroute.

The ambient air quality monitoring was carried out in enroute habitations as well as plant site. The baseline concentrations of Particulate Matter PM, SO_2, NO_2 and others are within the limits of NAAQS stipulated by MoEF&CC/CPCB. With the present background concentrations of air quality parameters, it is expected that there will only be a mild build-up of air pollutants.

Fugitive dust could arise during Truck unloading. This can contribute towards slight build up of pollutant concentration over the baseline levels.

6.2.2.1 Mitigation Measures

- Truck Unloading points at ITPCL shall be provided with Dust Suppression system such as 'Ultrasonic dust suppression system' or Foggers or Fixed cone nozzles as appropriate.
- Use of PUC certified vehicles, Adequate vehicle maintenance and not to use adulterated fuels shall be confirmed with the contractors.
- Ambient air quality monitoring at regular intervals at enroute habitations of preferred road network.
- All trucks before leaving the mine storage yard as well as ITPCL Storage yard will be showered with water with adequate system
- Usage of less traffic density / good level of service road network to ensure free flow of traffic.

6.2.3 Air Quality Modelling Study

As there is no additional impact envisaged due to the use of blended coal compared to Imported coal use, only the impact on air environment due to transportation of indigenous coal from NLC India Limited mines located at Neyveli has been predicted based on air quality modelling studies.

The details of inputs used, model details, assumptions and results etc., are provided in **Appendix G** and the summary of the same is given below.

Location No.	Receptors	24 Hour Average Resultant Concentration (µg/m³)			
		PM_{10}	$PM_{2.5}$	SO_2	NO_2
Receptors along Preferred Coal Transportation Route					
AR 1	Neyveli	70.62	26.21	15.51	17.68
AR 2	Vadalur	65.21	22.66	11.28	23.95
AR 3	Kurinjipadi	66.94	24.06	12.63	18.14
AR 4	Tambipettai	61.22	20.89	10.55	20.41
AR 5	Kullanchavadi	57.62	18.09	9.24	17.23
AR 6	Alapakkam	60.50	20.84	10.13	16.66
AR 7	Villiyanallur	62.49	21.34	11.63	17.92
Receptors along Alternate Coal Transportation Route					
AR 8	Maruvai	58.71	19.75	9.93	16.16
AR 9	Pinnalur	55.86	18.06	8.85	15.55
AR 10	Odaiyur	56.51	19.95	8.54	13.59
AR 11	Seithyathope Near X Road	55.28	18.33	8.03	12.73
AR 12	Bhuvanagiri	63.95	21.60	10.88	20.21

6.2.3.1 Summary of AQM Study

It is pertinent to mention that the existing ambient air quality status presented in the baseline chapter is inclusive of emissions from existing 1200 MW Imported coal based units as well as present traffic emissions in the Route 1 and 2.

The predicted 1st highest 24 hour average incremental concentrations of PM_{10}, $PM_{2.5}$, SO_2 and NO_2 for AAQ monitoring receptors locations as well as resultant concentrations are found to be well within the National Ambient Air Quality Standards (NAAQS), 2009 due to the transportation of indigenous coal.

6.3 Noise Environment

6.3.1 Due to Use of Blended Coal

There will not be any additional noise generation than the normal operation is envisaged due to the use of blended coal. Hence the additional noise generation is not envisaged.

6.3.1.1 Measures

- Use of appropriate Personal Protecting Equipment (PPE) including ear plugs, muffs etc., by the Workers exposed to excessive noise level at ITPCL Plant site will be continued.
- Existing Ambient Noise Quality Monitoring in and around the Plant Site shall be continued.
- Periodic maintenance of the equipment that is being used will be continued.

6.3.2 Due to Indigenous Coal Transportation, Unloading and Storage

Indigenous coal transportations through trucks will generate the noise and may affect the enroute habitations and during Unloading at ITPCL premises. Number of additional truck movement for ITPCL's indigenous coal transport is estimated about 6-7 numbers per hour only over and above existing traffic on these roads. The preferred existing road network has less number of habitations and the people in this road stretch are habituated to traffic movements. The impact due to increased noise level will be on nearby settlements which will be in the order of less significant.

6.3.2.1 Mitigation Measures

- Use of Bye pass road (Near Kurinjipadi)
- Drivers shall be sensitized to follow traffic rules especially restrictions on horn at sensitive locations like schools along the road etc.,
- All haul roads (for truck transport and other vehicles) within the boundary will be maintained properly to avoid excessive noise levels from Engine acceleration and deceleration.
- Additional Ambient Noise Quality Monitoring along enroute habitations shall be carried out

6.4 Water Environment

6.4.1 Due to Use of Blended Coal

The desalinated water requirement for the 1200 MW Imported coal based units is about 10 MLD against approved 40 MLD for entire 3180 MW and Sea water requirement (For both Cooling and desalination Plant) is about 11535 m^3/hr for 1200 MW against approved 33,000 m^3/hr for entire 3180 MW. The discharges (Reject brine and Return cooling water) through marine outfall are about 8539 m^3/hr for 1200 MW against approved 24,062 m^3/hr for Entire 3180 MW.

For the proposed use of blended coal at 1200 MW TPP, there will not be any additional requirement of Seawater, Desalinated water and also no additional discharges. Also no additional generation of wastewater also envisaged.

Hence, Impact on the Water environment due to use of blended coal is insignificant.

6.4.2 Due to Indigenous Coal Transportation, Unloading and Storage

During the Indigenous coal transportation, truck accidents, although the probability is very less, can result in spillage of coal from the Trucks, which may pollute nearby water bodies, which will have chain of reaction with seepage into connecting water bodies. The preferred or selected road network for Indigenous coal transportation is crossing streams such as kanyakovil odai/Neyveli river near Rajkuppam, Uppanar River near Gopalapuram, Buckingham Canal near Plant site, Perumal lake Flood Channel near Anaiyampettai and Tank near Vadalur.

If the storm water runoff from Truck Unloading area at Plant Site if any, directed to nearby water bodies, it will deteriorate the water quality.

6.4.2.1 Mitigation Measures

- Truck washing in the enroute water bodies shall be strictly prohibited and awareness to drivers shall be imparted.
- Frequent check of conditions of Truck deputed for coal transport
- Checking of Trucks and closing of any gaps or openings to prevent coal discharges
- Covering of Trucks using tarpaulin covers will reduce windblown dust deposition into water bodies
- Accidental spills if any cleaning will be attempted and containment and recovery will be faster.

6.5 Terrestrial Ecology

6.5.1 Due to Use of Blended Coal

There is no additional emission due to use of blended coal and hence no significant impact due to use of Blended coal on the ecology environment in and around the ITPCL TPP.

6.5.1.1 Measures

- ITPCL shall ensure proper functioning of pollution abatement measures such as ESP, FGD, Low NO_X, Dust Suppression System at Coal Stockyard, Wind Barrier etc.,
- ITPCL shall ensure that new Emission Standards are met.

6.5.2 Due to Indigenous Coal Transportation, Unloading and Storage

This land use abutting the preferred indigenous coal transportation (existing) road network is cropland/plantations/barren/habitations/water Bodies/Streams etc., There is no ecological sensitive area present in the preferred indigenous coal transportation route.

Trucks transporting coal will have impact on abutting enroute ecology if not adequately managed due to fugitive dust generation, accidental spill if any. Movement of Coal trucks may cause some disturbance to the fauna due to noise. As trucks will be using for the coal transport exhaust emissions and coal dust from the trucks may be respired by the fauna and ingested by herbivorous species since the coal dust may coat the surface of vegetation. Coal dust coating the leaf surfaces of vegetation results in blockage stomata (leaf pores responsible for gaseous exchange and water vapour exchange) and reduced photosynthetic performance.

The internal roads are well paved and truck unloading area at the stockyard is having adequate Dust Suppression (Water Sprinklers) and containment systems (Wind Barrier). In addition green belt is being developed which ensures impact on Flora and Fauna abutting plant site is insignificant.

6.5.2.1 Mitigation Measures

- Trucks will be covered with tarpaulin, not over loaded, no spillage, Speed restrictions to avoid accidents etc.,
- Use of PUC Certified Trucks for coal transportation
- As the existing routes are proposed to be used, the Flora and Fauna abutting this route are already acclimatised to this traffic changes.

6.6 Marine Environment

6.6.1 Due to Use of Blended Coal

The Sea water requirement (For both Cooling and desalination Plant) is about 11535 m^3/hr for 1200 MW against approved 33,000 m^3/hr for entire 3180 MW. The discharges (Reject brine and Return cooling water) through marine outfall are about 8539 m^3/hr for 1200 MW against approved 24,062 m^3/hr for Entire 3180 MW.

For the proposed use of blended coal at 1200 MW TPP, there will not be any additional requirement of Seawater, Desalinated water and also no additional discharges.

Hence, Impact on the marine environment due to use of blended coal is insignificant.

6.6.1.1 Measures Available

The intake structure is constructed to receive the water from the sea and outfall structure is constructed to discharge the return cooling water and reject brine. The locations of intake and outfall structures have been selected based on modelling results. The outfall is located in such a way that the resultant temperature of sea water will be less than the stipulated norms of MoEF/CPCB apart from the economic considerations of the proposed project.

The seawater is drawn through submarine pipelines to an intake sump located at shore. A desilting basin is provided upstream of the sump to remove sand and silt. A dedicated stop log gate, bar screen, travelling water screen are provided at each pump sump. The screens are provided to avoid large scale debris, etc. Stop log gates are provided for isolation. To prevent the blocking of openings of travelling water screens by debris of sea water, screen wash pumps, tapping the water from the intake pump discharge header and re-circulating the same on the screen for back washing to make the system efficient has been provided. The trash screens are provided with automatic trash raking system. The sizing of intake, screen and pumping unit have built-in margins to ensure the ability to pass the required flow except in an extreme case of large scale fouling of the screen mesh. The submergence of the pump, the sump dimensions and wall clearances are designed in accordance with standards prescribed by the hydraulic institute. Low tide level and hydraulic losses in the intake system and the screens have also been taken into consideration.

The outfall is more than 1500 meters distance into the sea. The cooling water blowdown from the power plant is discharged to sea. The reject brine from desalination plant is pumped into to the cooling water blowdown. The cooling water blowdown together with the brine reject is pumped to outfall system through submarine pipelines.

6.6.2 Due to Indigenous Coal Transportation, Unloading and Storage

As the preferred route for indigenous coal transportation well away from the sea coast no direct impact on the marine environment is envisaged. However accidental spill if any in the water bodies connected to sea (Buckingham canal) may reach marine environment. Necessary measures are proposed in the **Section 6.4.2.1** to take care of such accidental spills.

During unloading at Stockyard, storage at ITPCL Site sufficient measures such as Dust suppression, Wind Barrier, Green belt are available which will ensure the containment of coal dust within TPP premises and rendered insignificant impact on Marine environment.

6.7 Solid Waste Management

6.7.1 Due to Use of Blended Coal

No other additional solid waste generation is envisaged due to use of blended coal.

6.7.2 Due to Indigenous Coal Transportation, Unloading and Storage

As the coal will be transported through covered trucks, and washing of tyres before leaving stockyard, no spills are envisaged during normal operations within the ITPCL site. However, accidental spills if any, it will be attempted to recover and then recovered material will be sent back to stockyard.

Municipal Solid waste (MSW) generation of about 84 Kg/day (168 Trucks per day X 2 Persons per truck X 0.25 kg per person) is expected as the truck drivers and cleaners are expected to use Plant User facility in the Truck parking Area. Mostly the MSW will be biodegradable and fraction of recyclables. Currently ITPCL is managing all bio degradable waste within plant boundary through vermicomposting and recyclable through local vendors. The same will be followed for this additional MSW generation at Truck Parking Facility and hence no significant impact.

6.7.2.1 Mitigation Measures

- Efficient Entry/Exit clearance procedure shall ensure minimising queuing of Trucks and using truck parking area and there by reduction in MSW generation.
- Provision of Truck Parking area with adequate User Facility.
- Provision of MSW Collection Bins at the truck parking area.

6.8 Traffic and Transportation

6.8.1 Traffic Additions due to Indigenous Coal Transport

Due to the proposed use of blended coal, the Indigenous coal requirement is estimated at 1.25 MMTPA, will need to be transported from NLC India Limited mines located at Neyveli. The number of trucks requirement to transport this quantity will be around 6-7 trucks per hour. Two alternate route have been assessed and based on their merits and demerits as discussed in **Section 4.1.2**, the Route Mandarakuppam//Neyveli (NH 532) – Vadalur (NH 532) – Kurinjipadi (NH 532) – Kullanchavadi (NH 532) – Alapakkam – Villiyanallur – Plant Site is selected.

The existing traffic density is less and having Level of Service greater than C (Good, Very Good and Excellent) in the route proposed to be used for Indigenous coal Transportation.

The generated traffic due to ITPCL Indigenous coal Transportation will be about 31.5 PCUs/ Hr assuming 6-7 Trucks Per Hour with 4.5 as PCU Factor for Multi-Axle Vehicle.

Based on the Traffic studies and projections till the year 2025 covering both Normal and Generated Traffic, the following are observed.

Road Name	Road Stretch	Total PCUs and PCUs/Hr (V)	IRC Standards Capacity (C) PCUs/hr	V/C (Level of Service)
NH-532/ Vadalur Junction	Vadalur – Neyveli Total	21342 / **889.25**	**2400** for 4 lane undivided	0.37 **(B – Very Good)**
Kurinjipadi	Kurinjipadi – Vadalur Total	13198/ **549.90**	**1500** for 2 lane two way	0.37 **(B – Very Good)**
Kullanchavadi	Kullanchavadi – Kurinjipadi Total	14053 / **585.55**	**1500** for 2 lane two way	0.39 **(B – Very Good)**
Alapakkam (NH 45 – A)	Kullanchavadi – Alapakkam Total	7514 / **313.10**	**1500** for 2 lane two way	0.21 **(B – Very Good)**
Villiyanalur	Villiyanallur – Alapakkam Total	21545 / **897.72**	**1500** for 2 lane two way	0.60 **(C – Good)**

Considering the Traffic growth pattern, these roads will be able to maintain the same level of service till the year 2025 without any strengthening/ widening requirements. This will meet the Interim requirement of ITPCL Coal transportation by road.

As the existing roads are able to accommodate the truck traffic to be generated by ITPCL, the impact on existing roads is insignificant.

However, considering more two wheelers are observed in the vehicle composition of preferred routes, the necessary road safety measures should be strictly followed by the Coal Carrying Truck Drivers to avoid accidents if any.

6.8.1.1 Mitigation Measures

The chances of accidents would be reduced by ensuring the following

- Traffic control measures including speed limits to be enforced strictly
- Minimising truck movements during Peak Hours
- Training/Awareness to drivers on Road Safety, typical Accident Prone Areas, Speed Limit restrictions, Do and Don'ts while driving etc.,
- Use of Bye Pass road near Kurinjipadi
- Drivers should be sensitized with respect to need to drive carefully while passing through the villages.
- Activities to implement proper precautionary measures such as honking, lighting etc., wherever required.

6.8.2 Traffic deductions due to Reduced Imported Coal Transport

Currently the Imported Coal is being transported from Karaikal Port to ITPCL site by rail which is about 5 rakes per day to meet the 1200 MW coal requirements. In current proposal, about 25% of Indigenous coal is proposed to be blended with imported coal and used, and hence imported coal requirement will be less than that currently being used. Hence accordingly the number of trains visiting the ITPCL will also be less (approximately 4 trains only). The impacts will also be minimised.

Also Once NLCIL develops Rail sidings then the indigenous coal of 1.25 MMTPA can be transported through Rail from Neyveli to Plant site. The distance to be travelled from Neyveli to Plant site by train/rake is estimated to be about 60 km which is shorter than the current imported coal transport from Karaikal Port (128 km).

6.9 Socio-economic Environment

6.9.1 Due to Use of Blended Coal

Based on the points discussed above it can be observed that there is no significant additional impact on the social environment than predicted during the EIA. Following points are observed with respect to social environment due to the use of blended coal for 1200 MW.

- No Additional land requirement and hence no land acquisition and No R&R
- No additional emissions except the emissions from trucks during transportation of indigenous coal. This will be offset by reduction in emission from diesel engine of railway rakes and emissions from ocean going vessels.
- No additional water requirement and discharges in the marine environment.

6.9.2 Due to Indigenous Coal Transportation, Unloading and Storage

Due to indigenous coal transportation (6-7 Trucks per Hour), the likely impacts envisaged are on the enroute habitations are mild build-up of air pollutants due to exhaust emissions, coal dust, coal spills, increase in noise, traffic congestion, etc.,

The degree of air pollution is likely to be on a lower scale with improvement in road surface & with better maintenance

The truck plying will ensure increase in road as well as social safety. The control measures to be adopted are that employment will be given to the contractor who will deploy trained personnel for the work. The verification of the employed personnel will be conducted to ensure the terms of safety and security.

Additional Jobs will be generated as the indigenous coal is proposed to be transported through trucks. The project is expected to increase employment in tertiary sector with increase in direct and indirect employment in the region. The local eateries, repair shops, provisional stores, budget guest houses etc business is likely to increase.

6.9.2.1 Mitigation Measures

- Public awareness programmes to be launched for the enroute habitations in the preferred alignment.

6.10 Corporate Social Responsibility

The CSR activities IL&FS Group has been involved in are given in **Appendix H**.

6.11 Corporate Environment Responsibility (CER)

No additional investment involvement for this proposal of use of blended coal and hence this proposal shall be classified under amendment with no additional investment and hence doesn't warrant fund allocation Under Corporate Environment Responsibility (CER).

7 Environmental Monitoring Programme

Environmental monitoring programme is an important component during environmental management of the project. Regular monitoring of environmental parameters is of immense importance to assess the status of environment during project operation. With the knowledge of baseline conditions, the monitoring programme will serve as an indicator for any deterioration in environmental conditions due to operation of the project and enables the

project proponent to take up suitable steps of mitigation in time to safeguard the environment.

As a part of compliance monitoring, the environmental attributes such as Ambient Air, Ambient Noise & Source Noise, Water Quality, Stack Emissions (CEMS) and Marine Environment, Discharges (STP Outlet, CMB Outlet, ETP Outlet) and Ash pond effluent etc., are being monitored by ITPCL which shall be continued to take care of the Blended Coal use requirements also.

However, considering the additional project activity such as indigenous coal transportation through preferred route from NLCIL coal mines to ITPCL site, the following additional environmental monitoring programme is proposed.

Table 7-1: Additional Environmental Monitoring Programme

Environmental Attributes	Parameters to be monitored	No. of Sampling Locations	Frequency of Monitoring
Ambient Air Quality	As per NAAQS, CPCB 2009.	• Kurinjipadi • Tambipettai • Kullanchavadi • Alapakkam • Villiyanallur	Once in a quarter of the year
Water Quality	Physical, Chemical and Biological	**Groundwater (06)** • Vadalur • Kurinjipadi • Tambipettai • Kullanchavadi • Alapakkam • Villiyanallur **Surface water (06)** • Water body Near Nattalkuppam • Kanyakvil Odai/ Neyveli River Near Andikuppam • Perumal Eri Near Palliodai • Perumal Eri Overflow Channel Near Anaiyampettai • Stream (Uppanar) Near Gopalapuram • Buckingham Canal Near ITPCL Site	Half yearly Once
Ambient Noise Quality	Day and night noise levels	• Vadalur • Kurinjipadi • Tambipettai • Kullanchavadi • Alapakkam • Villiyanallur	Half yearly Once
Soil Quality	Physical & Chemical Parameters	• Vadalur • Kurinjipadi • Tambipettai • Kullanchavadi • Alapakkam • Villiyanallur	Once in the Year
Truck Movements	No. of Vehicles	• At Plant Entry/Exit Gate	Daily log

8 Summary and Conclusions

Considering the availability of Indigenous Coal (Lignite) at Neyveli NLC India Limited mines which is located about 25 km West (aerial distance), ITPCL proposes to use the Indigenous Coal along with Imported Coal (blend ratio of 25:75) in the existing 2X600 MW units in order to derisk the company from coal supply /availability risk in Operation with Insignificant or minimal additional environmental/social impacts

Accordingly ITPCL has proposed the use of blended coal in addition to use of 100% Imported at their existing 2X600 MW and Indigenous Coal transport by Road as an interim arrangement and seeks amendment to EC from EAC (T) MoEF&CC. The impacts related to Use of Blended Coal and Indigenous Coal Transportation by road was analysed and summarised below.

8.1.1 Comparison of Parameters for use of Imported and Blended Coal

S.No	Parameters	Units	For Imported Coal alone	For Blended Coal	Remarks
1.	Coal Requirement	TPH (Each 600 MW)	336	335.8	No Change
2.	Sulphur	%	0.8 with FGD	0.8 with FGD	No Change
3.	Ash	%	6	6	No Change
4.	Calorific Value (GCV)	Kcal/Kg	4200-4600	Average: 4200	Meets Imported Coal Lower in band GCV
5.	Station Heat Rate	Kcal/Kwh	2350	2350	
6.	Ash Generation	Lakh TPA	299967.43	299967.43	No Change-
7.	Fly Ash	Lakh TPA	2.399	2.399	No Change -
8.	Bottom Ash	Lakh TPA	0.599	0.599	No Change -
9.	Ash Pond Area	Acres	107 For 3180 MW	107	No Change -
10.	Coal Storage Requirements	Duration	30 days For Entire 3180 MW	Remain Same	No Change
11.	Lime Requirement for FGD	Tones/Day (Each 600 MW)	15	15	No Change
12.	Gypsum generation from FGD	Tones/Day (Each 600 MW)	20	20	No Change
13.	CW Requirements (Intake)	M3/Hr	11535 for 1200 MW 33,000 for Entire 3180 MW	Remain Same	No Change
14.	Discharges / Outfall	m3/hr	8539 for 1200 MW 24062 for Entire 3180 MW	Remain Same	No Change
15.	Freshwater Requirement	MLD	10 for 1200 MW 40 for Entire 3180MW	Remain Same	No Change
16.	Furnace/Boiler Specifications/ Modifications if any	-	Tangential Fired Water Tube Furnace	Remain Same	As the plant is already designed for worst coal.
17.	Pollution Control Measures Provided/Considered	-	ESP, FGD, Low NOX Burners	ESP, FGD, Low NOX Burners	No Change
18.	Emissions PM SO2 NOx	mg/Nm3	 <50 <200 <300	 <50 <200 <300	No Change
19.	Traffic Additions/Reductions	Nos	5 trains per day	6-7 Truck Per Hours and 4 trains per day	-
20.	Total Plant Area	Acres	1181	1181	No Change in Area

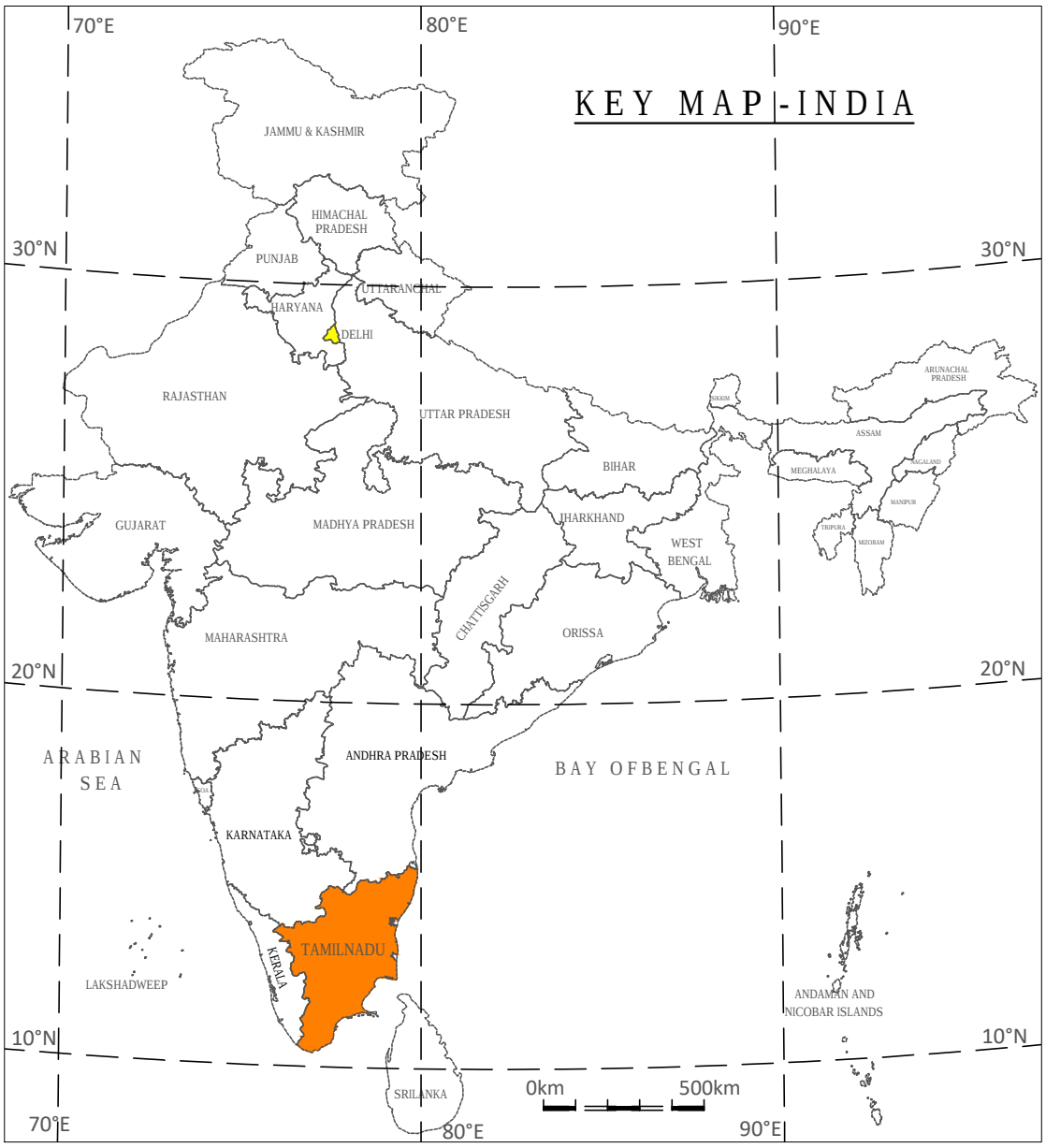
Keeping in view of the above, the Environmental & Social aspects of proposed use of blended coal and transportation of indigenous coal by road is given below:

- No change in Plant configuration, output, equipment, technical parameterts etc., as the plant is already designed for worst coal of 4200 Kcal/kg GCV which will accommodate the blended coal use requirement also.
- No Additional Land is required.
- No Additional emissions due to the use of blended coal except emissions from trucks due to the intermittent transportation indigenous coal by road. This will be offset by reduction in emission from diesel engine of railway rakes and emissions from ocean going vessels. The predicted resultant concentrations at all receptors are well within the NAAQS.
- No additional water requirements
- No Additional Discharges are envisaged.
- Existing pollution control measures are adequate
- Though the number of trucks required to transport the indigenous coal is low, there will be minimal impact on the enroute habitation and surrounding environment. However, prudent selection of Route (Preferred) after analysing the abutting land use, population, water bodies, stream crossings, lesser travel distance, less and free flow traffic route, good level of service etc., render the impacts minimal.
- In addition, the trucks are proposed to be covered with tarpaulin and hence fugitive emissions are not envisaged.

Considering the below beneficial aspects, use of Blended coal (Imported Coal/Indigenous coal) along with Imported Coal at ITPCL 1200 MW units may be considered by Statutory authority.

- Technically, Economically Feasible & Environmentally appropriate
- Adequate Lignite Availability at Neyveli through E-Auction
- Nearness to ITPCL TPP (~25.0 Km)
- Lesser transportation distance, Cost and related emissions
- Due to volatility in the availability of imported coal at reasonable price, foreign exchange fluctuations, frequent changes in sovereign laws of coal producing countries and shipping & transportation bottlenecks, the availability of coal for power plants at reasonable cost is looking difficult.
- In line with GoI Policy to reduce the dependence on imported coal and promote usage of indigenous coal. Reduction of import would also improve the balance of trade for the country.
- Encourage indigenous coal production

Figures



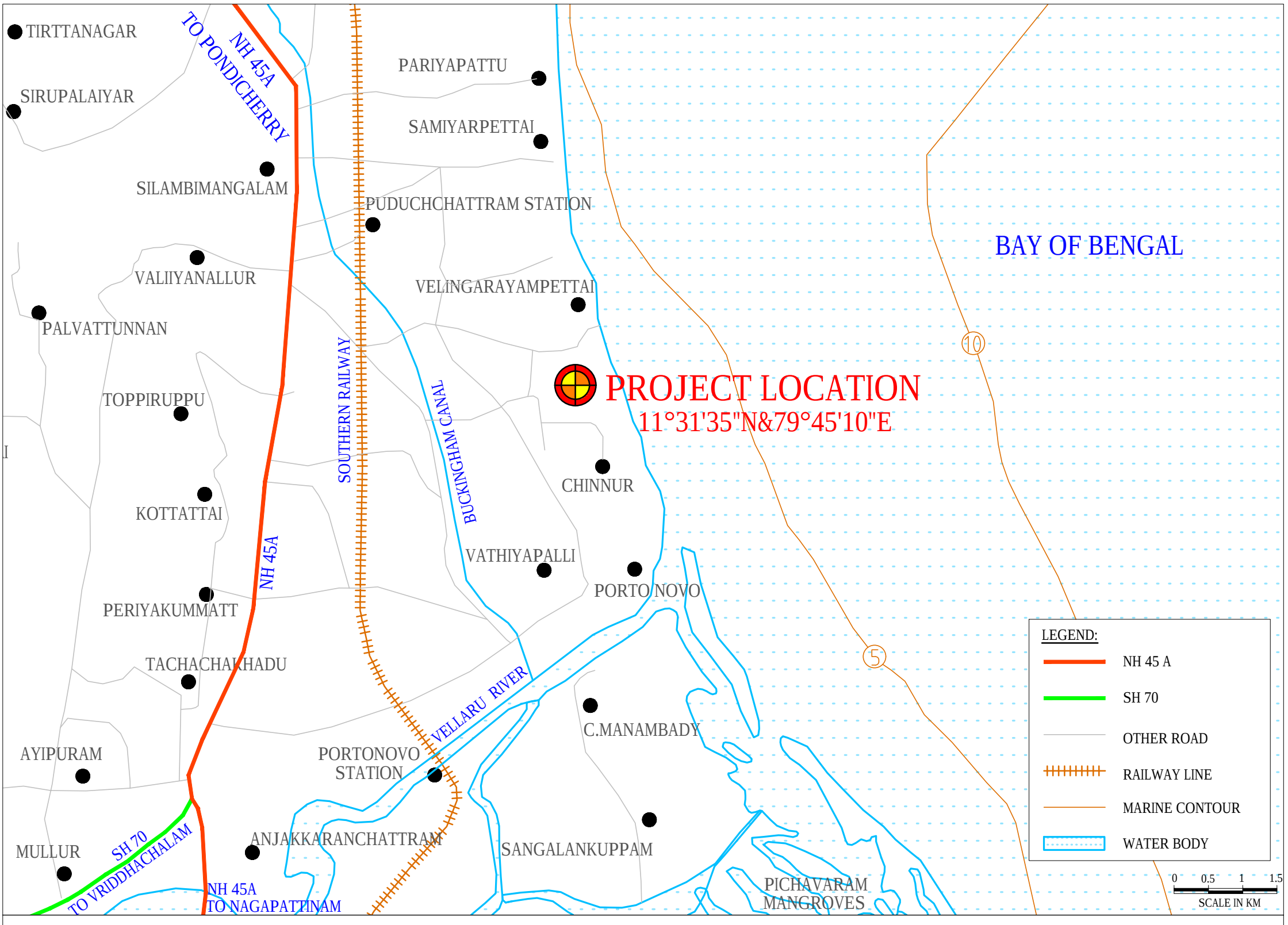
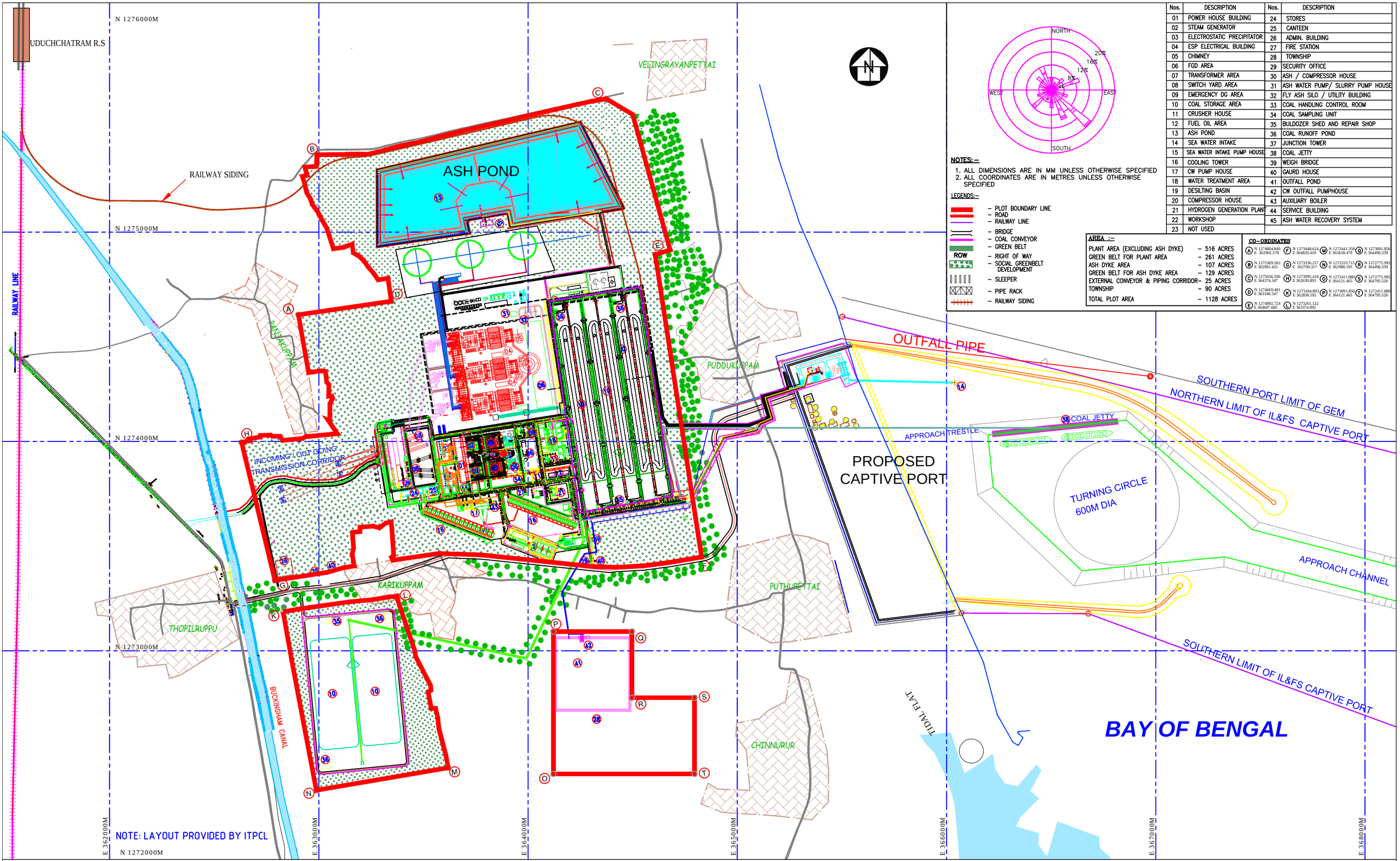


Figure 1: Location Map



Nos.	DESCRIPTION	Nos.	DESCRIPTION
01	POWER HOUSE BUILDING	24	STORES
02	STEAM GENERATOR	25	CANTEEN
03	ELECTROSTATIC PRECIPITATOR	26	ADMIN. BUILDING
04	ESP ELECTRICAL BUILDING	27	FIRE STATION
05	CHIMNEY	28	TOWNSHIP
06	FGD AREA	29	SECURITY OFFICE
07	TRANSFORMER AREA	30	ASH / COMPRESSOR HOUSE
08	SWITCH YARD AREA	31	ASH WATER PUMP/ SLURRY PUMP HOUSE
09	EMERGENCY DG AREA	32	FLY ASH SILO / UTILITY BUILDING
10	COAL STORAGE AREA	33	COAL HANDLING CONTROL ROOM
11	CRUSHER HOUSE	34	COAL SAMPLING UNIT
12	FUEL OIL AREA	35	BULDOZER SHED AND REPAIR SHOP
13	ASH POND	36	COAL RUNOFF POND
14	SEA WATER INTAKE	37	JUNCTION TOWER
15	SEA WATER INTAKE PUMP HOUSE	38	COAL JETTY
16	COOLING TOWER	39	WEIGH BRIDGE
17	CW PUMP HOUSE	40	GAURD HOUSE
18	WATER TREATMENT AREA	41	OUTFALL POND
19	DESILTING BASIN	42	CW OUTFALL PUMPHOUSE
20	COMPRESSOR HOUSE	43	AUXILIARY BOILER
21	HYDROGEN GENERATION PLANT	44	SERVICE BUILDING
22	WORKSHOP	45	ASH WATER RECOVERY SYSTEM
23	NOT USED		

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED
2. ALL COORDINATES ARE IN METRES UNLESS OTHERWISE SPECIFIED

LEGENDS:-

- PLOT BOUNDARY LINE
- ROAD
- RAILWAY LINE
- BRIDGE
- COAL CONVEYOR
- GREEN BELT
- ROW – RIGHT OF WAY
- SOCIAL GREENBELT DEVELOPMENT
- SLEEPER
- PIPE RACK
- RAILWAY SIDING

AREA :-

PLANT AREA (EXCLUDING ASH DYKE)	– 516 ACRES
GREEN BELT FOR PLANT AREA	– 261 ACRES
ASH DYKE AREA	– 107 ACRES
GREEN BELT FOR ASH DYKE AREA	– 129 ACRES
EXTERNAL CONVEYOR & PIPING CORRIDOR	– 25 ACRES
TOWNSHIP	– 90 ACRES
TOTAL PLOT AREA	– 1128 ACRES

CO-ORDINATES

A	N 1274604.840 E 362902.578	F	N 1273448.624 E 364829.410	M	N 1272441.350 E 363618.479	Q	N 1273091.856 E 364496.339
B	N 1275369.502 E 362991.425	G	N 1273336.237 E 362790.317	N	N 1272333.715 E 362988.195	R	N 1272775.992 E 364496.339
C	N 1275636.596 E 364374.347	H	N 1273995.418 E 362630.893	O	N 1272411.880 E 364121.465	S	N 1272775.992 E 364795.520
D	N 1274669.481 E 363346.547	K	N 1273184.893 E 362830.592	P	N 1273091.856 E 364121.465	T	N 1272411.880 E 364795.520
E	N 1274892.724 E 364607.685	L	N 1273261.122 E 363374.892				

Figure 2: Integrated Layout Showing TPP, Captive Desalination Plant and Captive Port

Appendices

Appendix A: Environmental/ CRZ Clearances, Corrigendum, Amendments, Validity Extension etc.

BY SPEED POST

J 13012/34/2008-IA.II (T)
Government of India
Ministry of Environment & Forests

Paryavaran Bhawan
CGO Complex, Lodi Road
New Delhi-110 003
E-mail: plahujarai@yahoo.com
Tele/fax: 011-2436 3973
Dated: May 31, 2010

To

M/s IL&FS Tamil Nadu Power Company Ltd.
B-Block, Navin's Presidium, 4th Floor
103, Nelsom Manickam Road, Aminjikarai
Chennai – 600 029.

Sub: 2x600 MW and 3x800 MW Coal Based TPP at villages Kottatai, Ariyagosthi, Villianallur & Silambimangalam, in Chidambaram Taluk, in Cuddalore, District, in Tamil Nadu - reg. Environmental Clearance.

Sir,

The undersigned is directed to refer to letter dated 19.03.2010 alongwith copies of EIA/EMP, public hearing and Marine Impact Assessment Study reports 16.04.2010 on the subject mentioned above and subsequent communication dated 29.04.2010 seeking environmental clearance under the provisions of EIA Notification, 2006.

2. The Ministry of Environment & Forests has examined the application. It has been noted that the proposal is for setting up of 2x600 MW and 3x800 MW Imported Coal Based TPP at villages Kottatai, Ariyagoshti, Villianallur & Silambimangalam, in Chidambaram Taluk, Cuddalore District, Tamil Nadu. The land requirement will be 1181 acres. Cooling water requirement will be obtained from the Bay of Bengal by gravity through pipe line and further pumped through a seawater intake pumping system. Proposed cooling towers would operate with 1.3 Cycles of Concentration (COC). The blow down would be discharged deeper into the sea through a 1.5 km long marine diffuser. A 30 MLD desalination plant is proposed to meet fresh water demand. Reverse Osmosis (RO) rejects will be disposed through the same marine diffuser. The site elevation will be leveled to +2.2 m above the Mean Sea Level. The sulphur and ash content will be 0.2% Maximum and 6% respectively. Imported Coal from Indonesia will be used. River Vellar is located at a distance of 1.5 km from the southern boundary of the proposed site. CRZ demarcation has been done by NIO, Visakhapatnam. Pichvaram mangroves are located at 8.0 km from the southern boundary of the proposed site. Public hearing was held out for 3600 MW on 05.02.2010.

3. The project has been considered in accordance with the provisions of the EIA notification issued by the Ministry of Environment & Forests vide S.O. 1533 (E), dated September 14, 2006.

4. Based on the information submitted by you, as at Para 2 above and others, the Ministry of Environment and Forests hereby accords environmental clearance to the above project under the provisions of EIA notification dated September 14, 2006, subject to the compliance of the following Specific and General conditions:

A. Specific Conditions:

(i) Environmental clearance is subject to obtaining CRZ clearance for permissible activities to be located in CRZ areas.

(ii) It is noted that the on the western side of the plant area, Buckingham Canal is almost touching the plot area at some of the locations even though a distance of 100 m as per the provisions of CRZ notification is reported to be maintained. The company shall ensure that the distance from the Buckingham Canal shall not be less than 150 m. Building and permanent structures on the western side of the canal shall be designed accordingly.

(iii) In case source of fuel supply, now proposed to be run on imported coal from Indonesia, is to be changed at a later stage, the project proponent shall intimate the Ministry well in advance along with necessary requisite documents for its concurrence for allowing the change. In that case the necessity for re-conducting public hearing shall be determined by the Ministry in consultation with the Expert Appraisal Committee (Thermal).

(iv) The project proponent should keep space provision for providing the FGD system with all the five units of power plant, so that the systems can be installed when ever required. Sulphur content in the imported coal shall not exceed 0.20%.

(v) A detailed coal analysis from a reputed lab for all contracted coal sources for the project shall be submitted **within three months**.

(vi) High Efficiency Electrostatic Precipitators (ESPs) shall be installed to ensure that particulate emission does not exceed 50 mg/Nm3. Two stack of 275 m each and having exit velocity not less than 22 m/s shall be installed.

(vii) Adequate dust extraction system such as cyclones/ bag filters and water spray system in dusty areas such as in coal handling and ash handling points, transfer areas and other vulnerable dusty areas shall be provided.

(viii) The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MOEF, the respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely; SPM, RSPM ($PM_{2.5}$ & PM_{10}), SO_2, NOx (ambient levels as well as stack emissions) shall be displayed at a convenient location near the main gate of the company in the public domain.

(ix) The project proponent shall examine in detail the possibility to adopt NIOT technology of desalination through Low Temperature Thermal Desalination (LTTD) process. In case the same is not feasible detailed explanation shall be submitted to the Ministry within six months.

(x) The water containing brine shall be discharged only after cooling at ambient temperature in a guard pond such that after the same is made to meet the average salinity of sea water.

(xi) The project proponent shall develop a monitoring mechanism for marine/coastal water at its own expenses by an independent government organization location in the region such as Annamalai University. A comprehensive marine biological quality monitoring programme and mitigation measures shall be prepared and submitted **within six months** to the Ministry.

(xii) Suitable screens (in stages) shall be placed across intake channel to prevent entrainment of life forms including eggs, larvae, juvenile fish, plankton etc. during extraction of sea water.

(xiii) COC of at least 1.3 shall be adopted. The treated effluents conforming to the prescribed standards only shall be re-circulated and reused within the plant (as may be required).

(xiv) No ground water shall be extracted for use in operation of the power plant even in lean season.

(xv) No water bodies including natural drainage system in the area shall be disturbed due to activities associated with the setting up / operation of the power plant.

(xvi) There should not be any contamination of soil, ground and surface waters (canals & village pond) with sea water in and around the project sites. In other wards necessary preventive measures for spillage from pipelines, such as lining of guard pond used for the treatment of outfall and intake should be adopted. This is just because the areas around the projects boundaries fertile agricultural land used for paddy cultivation.

(xvii) To absorb the ground level pollutants, to act buffer against strong winds arising out of tropical cyclones/ storms, to reduce heat load and ameliorate environment, there is a need for shelterbelts/greenbelts/ tree cover along the coastline, bunds around marshy areas, roadsides, around the project protected monuments, forts, waste places, School Campuses and other vacant lots. Coconut plantations can be developed along the coastline and near villages, School and forts. Stands of Casuariana should also be developed on some dunes and along coasts. Bamboos, neem and other native trees should be planted in and around at the villages.

(xviii) No waste water should be discharged onto channel systems, backwaters, marshy areas and seas without treatment. The outfall should be first treated in guard pond and then discharge into deep sea (12 to 15 m depth). Similarly, the intake should be from deep sea to avoid aggregation of fish. The brine that comes out from desalinization plants should not be discharged into sea but shall be recycled.

(xix) Utilisation of 100% Fly Ash generated for Phase-III shall be made from 4th year of operation of the plant. Status of implementation shall be reported to the Regional Office of the Ministry from time to time.

(xx) Fly ash shall be collected in dry form and storage facility (silos) shall be provided. Unutilized fly ash shall be disposed off in the ash pond in the form of slurry form. Mercury and other heavy metals (As,Hg, Cr, Pb etc.) will be monitored in the bottom ash as also in the effluents emanating from the existing ash pond. No ash shall be disposed off in low lying area.

(xxi) Ash pond shall be lined with HDP/LDP lining or any other suitable impermeable media suh that no leachate takes place at any point of time. Adequate safety measures shall also be implemented to protect the ash dyke from getting breached.

(xxii) Additional soil for leveling of the proposed site shall be generated within the sites (to the extent possible) so that natural drainage system of the area is protected and improved.

(xxiii) Green Belt shall consist of 3 tiers of plantations as cited above and largely comprising of native species around the power plant and at least 100 m width shall be raised. Wherever 100 m width is not feasible a 50 m width shall be raised and adequate justification shall be submitted to the Regional office of the Ministry. Tree density shall not less than 2500 per ha with survival rate not less than 70 %.

(xxiv) To meet the expenditure on plantations and their management, a common Green Endowment fund should be created by the project proponents out of EMP budgets the interest earned out of it should be used for the development and management of green cover of the area.

(xxv) The project proponent shall submit a time bound implementation plan for re-generation/ preservation of Pichavaram Mangroves and others, if any, and the fund earmarked and committed for the same amounting to Rs 6.0 Crores shall not be diverted for any other activity. Road map for implementation shall be submitted **within six months** to the Ministry.

(xxvi) A dedicated Environment management Cell with suitable qualified personnel constituting of Marine Biologist and an ecologist shall be set-up under the control of a Senior Executive, who will report directly to the Head of the Organization.

(xxvii) The project proponent shall not hamper the vocation of the fishing community in the area and it shall be ensured that local fishing community shall be allowed to carry out their vocation. The project proponent shall adopt the fishing communities displaced / affected by the power plant and in particular those residing in and around 3.0 km of the site.

(xxviii) An endowment of Fishermen Welfare Fund shall be created not only of enhance their quality of life through creation of facilities for fish landing platforms/ fishing harbour/ cold storage, but also to provide relief in case of emergency situations such as missing of fishermen on duty due to rough seas, tropical cyclones and storms etc.

(xxix) Local employable youth shall be identified and trained in skills relevant to the project for eventual employment in the project itself. The action taken report and details thereof to this effect shall be submitted to the Regional Office of the Ministry and the State Govt. Department concerned from time to time.

(xxx) Two nearest villages shall be adopted and basic amenities like development of roads, drinking water supply, primary health centre, primary school etc shall be developed by the project proponent at its own cost in co-ordination with the district administration.

(xxxi) A good action plan for R&R (if applicable) with package for the project affected persons be submitted and implemented as per prevalent R&R policy within three months form the date of issue of this letter.

(xxxii) An amount of Rs 80.0 Crores shall be earmarked as one time capital cost for CSR programme. Subsequently a recurring expenditure of Rs 16.0 Crores per annum shall be earmarked as recurring expenditure for CSR activities. Details of the activities to be undertaken shall be submitted within one month along with road map for implementation.

(xxxiii) While identifying CSR programme the company shall conduct need based assessment for the nearby villages to study economic measures with action plan which can help in upliftment of poor section of society. Income generating projects consistent with the traditional skills of the people besides development of fodder farm, fruit bearing orchards, vocational training etc. can form a part of such programme. Company shall provide separate budget for community development activities and income generating programmes. This will be in addition to vocational training for individuals imparted to take up self employment and jobs. In addition a special scheme for upliftment of SC/ST's and mariginalised population in the study area out of CSR programme shall be formulated and submitted to the Ministry **within six months** along with firm commitment of implementation. The scheme shall have an in-built monitoring mechanism.

(xxxiv) It shall be ensured that in-built monitoring mechanism for the schemes identified is in place and annual social audit shall be got done from the

nearest government institute of repute in the region. The project proponent shall also submit the status of implementation of the scheme from time to time

B. General Conditions:

(i) A sewage treatment plant shall be provided (as applicable) and the treated sewage shall be used for raising greenbelt/plantation.

(ii) Rainwater harvesting should be adopted. Central Groundwater Authority/ Board shall be consulted for finalization of appropriate rainwater harvesting technology within **a period of three months** from the date of clearance and details shall be furnished.

(iii) Adequate safety measures shall be provided in the plant area to check/minimize spontaneous fires in coal yard, especially during summer season. Copy of these measures with full details along with location plant layout shall be submitted to the Ministry as well as to the Regional Office of the Ministry.

(iv) Storage facilities for auxiliary liquid fuel such as LDO and/ HFO/LSHS shall be made in the plant area in consultation with Department of Explosives, Nagpur. Sulphur content in the liquid fuel will not exceed 0.5%. Disaster Management Plan shall be prepared to meet any eventuality in case of an accident taking place due to storage of oil.

(v) Regular monitoring of ground water level shall be carried out by establishing a network of existing wells and constructing new piezometers. Monitoring around the ash pond area shall be carried out particularly for heavy metals (Hg,Cr,As,Pb) and records maintained and submitted to the Regional Office of this Ministry. The data so obtained should be compared with the baseline data so as to ensure that the ground water quality is not adversely affected due to the project.

(vi) First Aid and sanitation arrangements shall be made for the drivers and other contract workers during construction phase.

(vii) Noise levels emanating from turbines shall be so controlled such that the noise in the work zone shall be limited to 75 dBA. For people working in the high noise area, requisite personal protective equipment like earplugs/ear muffs etc. shall be provided. Workers engaged in noisy areas such as turbine area, air compressors etc shall be periodically examined to maintain audiometric record and for treatment for any hearing loss including shifting to non noisy/less noisy areas.

(viii) Regular monitoring of ground level concentration of SO_2, NOx, $PM_{2.5}$ & PM_{10} and Hg shall be carried out in the impact zone and records maintained. If at any stage these levels are found to exceed the prescribed limits, necessary control measures shall be provided immediately. The location of the

monitoring stations and frequency of monitoring shall be decided in consultation with SPCB. Periodic reports shall be submitted to the Regional Office of this Ministry. The data shall also be put on the website of the company.

(ix) Provision shall be made for the housing of construction labourers within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.

(x) The project proponent shall advertise in at least two local newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality concerned within seven days from the date of this clearance letter, informing that the project has been accorded environmental clearance and copies of clearance letter are available with the State Pollution Control Board/Committee and may also be seen at Website of the Ministry of Environment and Forests at http://envfor.nic.in.

(xi) A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zila Parisad / Municipal Corporation, urban local Body and the Local NGO, if any, from whom suggestions/representations, if any, received while processing the proposal. The clearance letter shall also be put on the website of the Company by the proponent.

(xii) A separate Environment Management Cell with qualified staff shall be set up for implementation of the stipulated environmental safeguards.

(xiii) The project proponent shall also submit six monthly reports on the status of compliance of the stipulated environmental clearance conditions including results of monitored data (both in hard copies as well by e-mail) to the respective Regional Office of MOEF, the respective Zonal Office of CPCB and the SPCB.

(xiv) The environment statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of the Ministry by e-mail.

(xv) The project proponent shall submit six monthly reports on the status of the implementation of the stipulated environmental safeguards to the Ministry of Environment and Forests, its Regional Office, Central Pollution Control Board and State Pollution Control Board. The project proponent shall upload the status of compliance of the environment of the environmental clearance conditions on their website and update the same periodically and

simultaneously send the same by e-mail to the Regional Office, Ministry of Environment and Forests.

(xvi) Regional Office of the Ministry of Environment & Forests will monitor the implementation of the stipulated conditions. A complete set of documents including Environmental Impact Assessment Report and Environment Management Plan along with the additional information submitted from time to time shall be forwarded to the Regional Office for their use during monitoring. Project proponent will up-load the compliance status in their website and up-date the same from time to time at least six monthly basis. Criteria pollutants levels including NOx (from stack & ambient air) shall be displayed at the main gate of the power plant.

(xvii) Separate funds shall be allocated for implementation of environmental protection measures along with item-wise break-up. These cost shall be included as part of the project cost. The funds earmarked for the environment protection measures shall not be diverted for other purposes and year-wise expenditure should be reported to the Ministry.

(xviii) The project authorities shall inform the Regional Office as well as the Ministry regarding the date of financial closure and final approval of the project by the concerned authorities and the dates of start of land development work and commissioning of plant.

(xix) Full cooperation shall be extended to the Scientists/Officers from the Ministry / Regional Office of the Ministry at Bangalore / CPCB/ SPCB who would be monitoring the compliance of environmental status.

4. The Ministry of Environment and Forests reserves the right to revoke the clearance if conditions stipulated are not implemented to the satisfaction of the Ministry. The Ministry may also impose additional environmental conditions or modify the existing ones, if necessary.

5. The environmental clearance accorded shall be valid for a period of 5 years to start operations by the power plant.

6. Concealing factual data or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract action under the provisions of Environment (Protection) Act, 1986.

7. In case of any deviation or alteration in the project proposed including coal transportation system from those submitted to this Ministry for clearance, a fresh reference should be made to the Ministry to assess the adequacy of the condition(s) imposed and to add additional environmental protection measures required, if any.

8. The above stipulations would be enforced among others under the Water (Prevention and Control of Pollution) Act, 1974, the Air (Prevention and Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and rules there under, Hazardous Wastes (Management and Handling) Rules, 1989 and its amendments, the Public Liability Insurance Act, 1991 and its amendments.

9. Any appeal against this environmental clearance shall lie with the National Environment Appellate Authority, if preferred, within 30 days as prescribed under Section 11 of the National Environment Appellate Act, 1997.

Yours faithfully,

P. Ahujarai.

(**Dr. P.L. Ahujarai**)
Scientist 'F'

Copy to:

1. The Secretary, Ministry of Power, Shram Shakti Bhawan, Rafi Marg, New Delhi 110001.
2. The Secretary (Environment), Environment Department, Government of Tamil Nadu.
3. The Chairman, Central Electricity Authority, Sewa Bhawan, R.K. Puram, New Delhi-110066.
4. The Chairman, Tamil Nadu State Pollution Control Board, No. 76, Mount Road, Mount Salai, Guindy, Chennai - 600 032
5. The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi- 110032.
6. The Chief Conservator of Forests, Regional Office (SZ), Kendriya Sadan, 4th Floor E&F Wings 17th Main Road, 1 Block , Koranmangala, Bangalore -560 034.
7. The District Collector, Cuddalore District, Govt. of Tamil Nadu.
8. Guard file.
9. Monitoring file.

(**Dr. P.L. Ahujarai**)
Scientist 'F'

F. No. 11-43/2010-IA.III
Government of India
Ministry of Environment & Forests
(IA-III Division)

Paryavaran Bhawan,
CGO Complex, Lodhi Road,
New Delhi - 110 003,

Dated: 29th October 2010

To
M/s Infrastructure Leasing & Financial Services Ltd.
Tamil Nadu Power Company Ltd.,
B-Block, 4th Floor, Navin's Presidium,
103, Nelson Manickam Road, Aminjikarai,
Chennai – 600 029

Subject: Environmental and CRZ clearance for Captive port and desalination plant at Kohatai, Cuddalore District, Tamil Nadu by M/s Infrastructure Leasing and Financial services Ltd., Tamil Nadu – Reg.

This has reference to your letter dated 12.05.2010 seeking Environmental Clearance under the Environment Impact Assessment Notification, 2006 and Coastal Regulation Zone (CRZ) Notification, 1991. The proposal has been appraised as per prescribed procedure in the light of provisions under the Environment Impact Assessment Notification, 2006 and Coastal Regulation Zone Notification, 1991 on the basis of the mandatory documents enclosed with the application viz., the Form 1, EIA, EMP, recommendation State Coastal Zone Management Authority and the additional clarifications furnished in response to the observations of the Expert Appraisal Committee constituted by the competent authority in its meetings held on 18th – 20th August, 2010.

2. It is interalia, noted that the proposal involves establishment of Captive port and desalination plant at Kohatai, Cuddalore District, Tamil Nadu for handling of coal for the proposed 3600 MW (2 x 600 MW sub-critical technology and 3x800 MW super critical technology) thermal power plant near Parangipettai in Cuddalore District, Tamil Nadu, India. Handling capacity of the Captive Port is 15 MTPA and Desalination Plant capacity is 30 MLD. The proposed Captive port is situated towards East & adjacent to the proposed thermal power plant and Captive Desalination Plant is proposed within the power plant premises. Total seawater required for the thermal power plant and captive desalination plant is 34,100 m^3/hr which will be sourced from Bay of Bengal. Seawater intake and marine outfall locations are identified based on mathematical model studies and seawater intake is proposed between the break waters towards Northern side. The total quantity of hot water discharge from proposed power plant will be 25886 m^3/hr and total quantity of reject brine from the proposed desalination plant will be 2381 m^3/hr and the marine outfall is proposed towards North of northern breakwater, at 1500 m distance into the sea. Pipelines are proposed for intake & outfall arrangements of the power plant. The proposed port facilities

include Two breakwaters (Northern Breakwater - 2,100 m and a Southern Breakwater- 1,150 m), Dredged approach channel (3,300 m long, 160 m wide, -16.1 m CD to cater 80,000 DWT and facilities enhanced in future to receive 200,000 DWT vessels), Turning Circle (Dia 500 m and depth - 15.5 m CD), Two coal berths (total length 600 m and depth -15.5 m CD), Mechanical unloaders of rated capacity 4000 TPH on each berth and covered conveyor system for transport of coal to the power plant stack yard area. Coal will be unloaded using mechanical unloaders and will be conveyed using covered coal conveyors to the storage area proposed in the power plant area. The quantity of capital dredging is estimated as 11million cubic meter (MCM). The existing ground levels at the project site are about +1.5 m to +2.0 m CD. This needs to be raised to about +4.5 m CD in port area. About 1 MCM of suitable material from capital dredging will be used for dumping along the waterfront for leveling purposes and the balance shall be disposed off to Sea beyond 30 m contour at the disposal area that has been identified by mathematical model study carried out by DHI. Mathematical modeling studies for the littoral drift were carried out by HR Wallingford using COSMOS-2D. Based on this study, about 10,000 m^3 per annum of siltation is expected at the channel and will be disposed off at the offshore dumping ground. Sand accretion of the order of 150,000 m^3 per annum is expected on the south of south breakwater & this will be periodically dredged and transported to nourish the shoreline to the northern side of the port. The drift material could be accumulated in a sand trap provided on south of south breakwater but as the likely quantity is very small model studies recommended that the sand trap requirement is firmed up after monitoring in initial few years. If required, the sand trap of about 250,000 cum capacity would be provided. It would be periodically dredged during fair weather season of January to April using a small cutter suction dredger. A 40 KLD capacity of Sewage Treatment Plant (STP) is proposed to treat wastewater generated from canteen and port operations. Coal storage area of 208 acres considering 60 days storage requirement for the proposed thermal power plant is estimated. The maximum stack height of 10 m will be maintained from the point of view of safety against fires. In addition to this, dust suppression measures will be adopted to control fugitive dust emissions from coal storage areas.

Shoreline changes study for the project coast has been carried out by INCOIS, Hyderabad and the study using Landsat data depicts that the coastlines of the area are under "no change to accretion" effects & free from erosion. The same trend has prevailed from 1979 to 2008. National Institute of Oceanography (NIO), an authorized agency was engaged for demarcation of HTL, LTL and CRZ. As per the NIO report, the port boundary falls within 500 m setback line and the proposed project site boundary is 100 m away from the Buckingham canal on the West. The project development area does not fall or contain any environmentally sensitive areas. A detailed EMP has been prepared for the project and among other measures to mitigate the environmental impact, it is proposed to utilize the accretion quantity on the southern side and dredge spoil generated out of maintenance dredging for beach nourishment as required. The District and State Coastal Zone Management Committees of Tamilnadu considered the proposal for undertaking activities like intake-outfall pipelines, conveyor gallery structure

and other allied infrastructures within CRZ area and recommended the proposal vide their letter No 8209/EC-3/2010-1 dated 29-04-2010.

3. The TOR for the project was issued vide letter no. J-13012/34/2008-IA.II (T), dated July 9, 2008 for the integrated project. Public hearing was conducted on 05.02.2010 for the thermal power plant including the marine facility. The major issues raised are disturbance to the Pitchavaram and employment. It is proposed to conserve the mangroves through Department of Ocean Management, Annamalai University.

4. The Expert Appraisal Committee, after due consideration of the relevant documents submitted by the project proponent and additional clarifications furnished in response to its observations, have recommended for the grant of Environmental and CRZ Clearance for the project. Accordingly, the Ministry hereby accords necessary Environment Clearance and CRZ Clearance for the above project as per the provisions of Environment Impact Assessment Notification, 2006 and CRZ Notification, 1991 and its subsequent amendments, subject to strict compliance of the terms and conditions as follows:

5. SPECIFIC CONDITIONS:

i) "Consent for Establishment" shall be obtained from Tamil Nadu Pollution Control Board under Air and Water Act and a copy shall be submitted to the Ministry before start of any construction work at the site.

ii) No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area.

iii) The area selected for dumping of dredge spoil at a depth of 30 m contour shall be adequate to ensure that reduction in depth is not more than 0.50 m and appropriately demarcated during execution and a suitable field monitoring programme shall be submitted.

iv) Once the breakwater is constructed, the Vellar river mouth is vulnerable to accretion and the mouth is likely to get closed due to prevailing coastal processes. The mouth also helps to drain large flood during northeast monsoon rain and cyclone. The tidal exchange through Vellar river mouth also supports the mangroves nested with Pitchavaram. The river mouth has to be maintained along with its natural hydrology and tidal prism and hence appropriate remedial action programme to keep the mouth open shall be monitored regularly and details shall be submitted to the Ministry.

v) The volume of annual gross and net littoral drift reported for this coastal region where the breakwaters are proposed appear to be very low and probably needs to be confirmed by actual field data on waves and other accepted software tools. It is suggested to

undertake one year directional wave measurements to evaluate actual volume of littoral drift

vi) Programme for preservation of the existing mangrove on the southern side of the plant area lying within 10 km radius and proposed additional plantation shall be developed together with EMP and submitted.

vii) The present EIA study is confined to the proposed project and does not cover the possible environmental issues arising out of developments at the adjacent areas. A comprehensive EIA study shall be taken up in future at each and every stage of expansion considering new developments in the close proximity of the ILFS project and the project proponent shall initiate action in this regard at appropriate time.

viii) Proponent shall explore the possibility of sharing common facilities such as breakwater with immediate neighbor so as to optimize the resources and minimize cost on development and also impact on marine environment. Report shall be submitted within 3 months.

ix) The project proponent confirmed that there would be no further developments apart from what has been shown in the layout (an approach trestle and two coal berths of 600m long on the seaward side within the enclosed basin formed by two breakwaters) and as such no development will be allowed without the prior environmental clearance.

x) Wherever coastal front is available adjacent to the project site, Tsunami bund with natural beach sand / dredged sand shall be constructed to avoid flooding due to storm surge and similar natural causes.

xi) A detailed monthly field monitoring programme by a reputed organization shall be carried out on the coastal process and marine environment for 10 km radius including Vellar river during construction and operational stages.

xii) All the socio-economic factors such as medical facilities, employment opportunities, educational facilities etc. for the local people shall be implemented in full and reported to the Ministry in its regular reports on six-monthly basis.

xiii) There shall be no intermediate coal storage facilities and the conveyor from the coal berths to the plant site shall be enclosed conveyor system to ensure minimum pollution due to coal dust and other suspended matter.

xiv) All the recommendations of the EIA, EMP, Risk Assessment and Disaster Management Plan shall be strictly complied with.

xv) The project proponent shall set up separate environmental management cell for effective implementation of the stipulated

environmental safeguards under the supervision of a Senior Executive.

xvi) Sand by pass and nourishment of the coast on the northern side shall be carried out periodically and monitoring shall be conducted on the shore line changes.

xvii) The project proponent shall take up mangrove plantation/ green belt in the project area, wherever possible. Adequate budget shall be provided in the Environment Management Plan for such mangrove development.

xviii) The funds earmarked for environment management plan shall be included in the budget and this shall not be diverted for any other purposes.

6. GENERAL CONDITIONS:

i) Adequate provision for infrastructure facilities including water supply fuel and sanitation must be ensured for construction workers during the construction phase of the project to avoid any damage to the environment.

ii) Full support shall be extended to the officers of this Ministry/Regional Office at Bangalore by the project proponent during inspection of the project for monitoring purposes by furnishing full details and action plan including action taken reports in respect of mitigation measures and other environmental protection activities.

iii) A six-Monthly monitoring report shall need to be submitted by the project proponents to the Regional Office of this Ministry at Bangalore regarding the implementation of the stipulated conditions.

iv) Ministry of Environment & Forests or any other competent authority may stipulate any additional conditions or modify the existing ones, if necessary in the interest of environment and the same shall be complied with.

v) The Ministry reserves the right to revoke this clearance if any of the conditions stipulated are not complied with the satisfaction of the Ministry.

vi) In the event of a change in project profile or change in the implementation agency, a fresh reference shall be made to the Ministry of Environment and Forests.

vii) The project proponents shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of land development work.

viii) A copy of the clearance letter shall be marked to concerned Panchayat/local NGO, if any, from whom any suggestion/ representation has been made received while processing the proposal.

ix) Tamil Nadu Pollution Control Board shall display a copy of the clearance letter at the Regional Office, District Industries Centre and Collector's Office/Tehsildar's office for 30 days.

7. These stipulations would be enforced among others under the provisions of Water (Prevention and Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance) Act, 1991 and EIA Notification 2006, including the amendments and rules made thereafter.

8. All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department, Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.

9. The project proponent shall advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environmental Clearance and copies of clearance letters are available with the Tamil Nadu Pollution Control Board and may also be seen on the website of the Ministry of Environment and Forests at http://www.envfor.nic.in. The advertisement should be made within 10 days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Bangalore.

10. Environmental clearance is subject to final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation Vs. Union of India in Writ Petition (Civil) No.460 of 2004 as may be applicable to this project.

11. Any appeal against this Clearance shall lie with the National Environment Appellate Authority, if preferred, within a period of 30 days as prescribed under Section 11 of the National Environment Appellate Act, 1997.

12. A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zilla Parisad/Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.

13. The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB.

14. The project proponent shall also submit six monthly reports on the status of compliance of the stipulated EC conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB.

15. The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of MoEF by e-mail.

(Bharat Bhushan)
Director (IA-III)

28.10.2010

Copy to:

1 The Principal Secretary, Department of Environment and Forests, First Floor, Panagal Building, Saidapet, Chennai – 600 015, Tamil Nadu.
2 The Chairman, CPCB, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi – 32.
3 The Director, Department of Environment, Government of Tamilnadu, Panagal Building, Ground Floor, Saidapet, Chennai-15.
4 The Chairman, Tamil Nadu Pollution Control Board, No. 76, Mount Salai, Gundy, Chennai.
5 The Chief Conservator of Forests, Ministry of Environment and Forests, Regional Office, Western Region, Kendriya Paryavaran Bhavan, Link Road No. 3, Ravishankar Nagar, Bangalore – 462016 (M.P.)
6 Guard File.
7 Monitoring Cell.

(Bharat Bhushan)
Director (IA-III)

J-13012/34/2008 - IA. II (T)
Government of India
Ministry of Environment & Forests

Paryavaran Bhavan, C.G.O. Complex,
Lodi Road, New Delhi -110003.
Dated: 14.08.2012

CORRIGENDUM

Sub: 2x600 MW and 3x800 MW Coal Based TPP at villages Kottatai, Ariyagosthi, Villianallur & Silambimangalam, in Chidambaram Taluk, in Cuddalore District, in Tamil Nadu - amendment of environmental clearance reg.

The Ministry of Environment & Forests had accorded environmental clearance to the above project on 31.05.2010 as per the procedure laid in the EIA Notification, 2006.

2. Subsequently, the environmental clearance granted was challenged before the National Green Tribunal (NGT) in the Appeal No. 17 of 2011(T).

3. The Hon'ble National Green Tribunal in its judgement dated 23.05.2012 had directed the Ministry to "review the Environmental Clearance based on Cumulative Impact Assessment Study and stipulate any additional environmental conditions, if required. Updated EIA report may be shared with the Appellants and they may be invited in the Expert Appraisal Committee (EAC) Meeting and may be heard before a decision is taken by EAC/MoEF, till then the EC shall remain suspended".

4. In pursuance to the directions of the Hon'ble NGT dated 23.05.2012 and 30.05.2012, Rapid Cumulative Environmental Impact Assessment (RCEIA) Study carried out M/s ITPCL was placed before the Expert Appraisal Committee in its meeting held on 25.06.2012 and 16.07.2012. The RCEIA Study covered the industrial activities/projects within a radius of 25 Km from the thermal power site of M/s ITPCL including Cuddalore Minor Port, SIPCOT Industrial Complex, Chemplast Sanmar Ltd., Cuddalore Power Co. Ltd., Nagarjuna Oil Corpn. Ltd., SRM Energy Ltd., Textile Park and Good Earth Ltd.

5. It is noted that RCEIA Study was based on data collected from the State Pollution Control Board, EIA Reports submitted to MoEF and Marine Environmental Data collected from Annamalai University. Mathematical models like MIKE 21 model for marine cumulative impact assessment, and CPCB approved OCD5 and ISCST3 models were used to assess the cumulative impacts on air quality.

6. After review of the RCEIA study, submissions made by the Appellants, oral submissions made by the project proponent and detailed deliberations during its meetings held on 25.06.2012 and 16.07.2012, the Expert Appraisal Committee has recommended to ammend/stipulation of additional conditions to the environmental clearance accorded to the project on 31.05.2010 and continuation of the project.

7. The Ministry accepts the recommendation of the EAC (Thermal Power) for amendment / stipulation of additional conditions to the environmental clearance accorded to the project on 31.05.2010 and stipulates following additional conditions for compliance by the project proponent.

8. Under para no. 4, the specific condition no (iv) read as: *'The project proponent should keep space provision for providing the FGD system with all the five units of power plant, so that the systems can be installed whenever required. Sulphur content in the imported coal shall not exceed 0.20 % '*, shall now be substituted as under:

> *'The project proponent shall install Flue Gas De-Sulphurisation (FGD) system to reduce the overall stack emissions of SO_2. It shall be ensured that waste (brine) from FGD System is disposed off in an environmentally sound manner. Sulphur content in the imported coal shall not exceed 0.20 %'.*

3. Under para no. 4, the specific condition no (xxix) read as: *'Local employable youth shall be identified and trained in skills relevant to the project for eventual employment in the project itself. The action taken report and details thereof to this effect shall be submitted to the Regional Office of the Ministry and the State Govt. Department concerned from time to time,* shall now be substituted as under:

> *'A study on the identification of local employable youth shall be immediately carried out and training shall be imparted for eventual employment in the project itself. The status of implementation shall be submitted to the Regional Office of the Ministry and the concerned Dept. in the State Govt. within six months'.*

4. Under para no.4, after specific condition no. (xxxiv) the following conditions shall be now added:

(xxxv) Sea water quality shall be continuously monitored for salinity, turbidity and temperature at selective sites across the impacted zone including estuarine waters. Mitigative measures shall be undertaken through institutes such as Annamalai University for continuous preservation of mangroves and their ecology. The monitoring data shall be uploaded on the company's website and also submit to Regional Office of the Ministry every six months.

(xxxvi) In order to preserve and improve the health of the Pichavaram mangroves, required maintenance dredging shall be undertaken to keep the Vellar river mouth open at all times to ensure good tidal exchange.

(xxxvii) To minimize entrapment of even small marine flora and fauna, state of the art low aperture intake screens with high effectiveness for impingement and entrainment and fishnet around intake shall be installed.

(xxxviii) Fish catch along the impacted zone of sea should be monitored periodically by the Department of Fisheries, Government of Tamil Nadu. The project proponent shall accordingly take up the matter with the Fishery Dept., Govt. of Tamil Nadu from time to time.

(xxxix) In order to stabilize the shoreline and control the erosion, sand bypassing shall be carried out on the northern side of the project.

(xl) The project proponent shall upload environmental quality monitored data on a regular basis on its website.

(xli) Marginalized section of society particularly traditional fishermen communities shall be identified based on 2011 population census data and socio-economic study of the various strata of families such as those carrying out subsistence fishing, commercial fishing etc. shall be carried out and impact on their livelihoods shall be assessed separately. Accordingly, sustainable welfare scheme/measures shall be undertaken and status of implementation shall be submitted to the Regional Office of the Ministry within six months.

(xlii) Since the dredged material is reported to be dumped 13 km away from the dredging site, the quality of sediments at the dumping site in sea should be monitored periodically and its impact on benthic fauna, if any, should be mitigated.

(xliii) A sate-of-the-art environmental laboratory at the project site shall be established such that the laboratory has facilities for long term monitoring of sea water quality and sediment in the impacted zone over and above and ambient air, soil quality analysis of the area. The proponent shall undertake mitigative measures if there are any negative impacts.

(xliv) A long term study on radio activity and heavy metals contents in coal to be used shall be carried out through a reputed institute. Thereafter mechanism for an in-built continuous monitoring for radio activity and heavy metals in coal and fly ash (including bottom ash) shall be put in place.

(xlv) Continuous monitoring for heavy metals in and around the existing ash pond area shall be immediately carried out by reputed institutes like IIT, Chennai.

5. All other conditions mentioned in this Ministry's letters of even no. 31.05.2010 shall remain the same.

This issues with the approval of the Competent Authority.

Yours faithfully,

(Dr Saroj)
Scientists 'F'

M/s IL&FS Tamil Nadu Power Company Ltd.
B-Block, Navin's Presidium, 4th Floor
103, Nelson Manickam Road, Aminjikarai
Chennai – 600 029.

Copy to:

1. The Secretary, Ministry of Power, Shram Shakti Bhawan, Rafi Marg, New Delhi 110001.
2. The Secretary (Environment), Environment Department, Government of Tamil Nadu.
3. The Chairman, Central Electricity Authority, Sewa Bhawan, R.K. Puram, New Delhi-110066.
4. The Chairman, Tamil Nadu State Pollution Control Board, No. 76, Mount Road, Mount Salai, Guindy, Chennai - 600 032
5. The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi- 110032.
6. The Chief Conservator of Forests, Regional Office (SZ), Kendriya Sadan, 4th Floor E&F Wings 17th Main Road, 1 Block , Koranmangala, Bangalore -560 034.
7. The District Collector, Cuddalore District, Govt. of Tamil Nadu.
8. Guard file.

(Dr Saroj)
Scientists 'F'

J-13012/34/2008 - IA. II (T)
Government of India
Ministry of Environment & Forests

Telefax: 011- 2436 4067
Paryavaran Bhavan, C.G.O. Complex,
Lodi Road, New Delhi -110003.
Dated: 4th February, 2014

To

M/s. IL&FS Tamil Nadu Power Company Ltd.
B-Block, Navin's Presidium, 4th Floor,
103, Nelson Manickam Road, Aminjikarai
Chennai – 600 029.

Sub: 2x600 MW and 3x800 MW Coal Based TPP at villages Kottatai, Ariyagosthi, Villianallur & Silambimangalam, in Chidambaram Taluk, in Cuddalore District, in Tamil Nadu by M/s IL&FS Tamil Nadu Power Company Limited - reg. Amendment in EC.

Sir,

This has reference to your letters dated 07.10.2013, 09.11.2013, 26.11.2013 and 04.01.2014 requesting the Ministry for amendment in EC accorded for the above mentioned project. The amendment sought were regarding change of capacity from 2x600 MW and 3x800 MW to 2x600 MW and 3x660 MW, sulphur content from 0.2 % to 0.8 % and relocation of ash pond area.

2. The matter was placed before the Expert Appraisal Committee (Thermal Power) in its 4th Meeting held during November 18-19, 2013. In acceptance of the recommendation of the EAC and in view of the information/ clarification furnished by you with respect to the above mentioned power project, the following amendments shall be made in the EC accorded to you vide this Ministry's letter of even no. dated 31.05.2010 and its amendment dated 14.08.2012.

(i) The TPP configuration shall be **2X600 MW and 3X660 MW** instead of 2X600 MW and 3X800 MW.

(ii) Under para no. 4, the specific condition no (iv) read as: 'The project proponent shall install Flue Gas De-Sulphurisation (FGD) system to reduce the overall stack emissions of SO_2. It shall be ensured that waste (brine) from FGD System is disposed off in an environmentally sound manner. Sulphur content in the imported coal shall not exceed 0.20 %'. shall now be substituted as under:

'The project proponent shall install Flue Gas De-Sulphurisation (FGD) system to reduce the overall stack emissions of SO_2. It shall be ensured that waste (brine) from FGD System is disposed off in an environmentally sound manner. Sulphur content in the imported coal shall not exceed 0.80 %'.

(iii) The ash pond shall be relocated to a nearby location which is contiguous to the main plant and 500 m to the East of the current location. The proposed

ash pond area will be 107 acres and the greenbelt around the ash dyke would be 129 acres.

3. Further under Para no. 4, of this Ministry's letters of even no. dated 31.05.2010 and its amendment dated 14.08.2012, after specific condition no. (xlv) the following conditions shall be added.

(xlvi) Harnessing solar power within the premises of the plant particularly at available roof tops shall be undertaken and status of implementation shall be submitted periodically to the Regional Office of the Ministry.

(xlvii) Mercury emissions from stack shall also be monitored on periodic basis.

(xlviii) Fugitive emissions shall be controlled to prevent impact on agricultural or non-agricultural land.

(xlix) Hydro geological study of the area shall be reviewed annually and report submitted to the Ministry. No water bodies including natural drainage system in the area shall be disturbed due to activities associated with the setting up / operation of the power plant.

(l) Fly ash shall not be used for agricultural purpose. No mine void filling will be undertaken as an option for ash utilization without adequate lining of mine with suitable media such that no leachate shall take place at any point of time. In case, the option of mine void filling is to be adopted, prior detailed study of soil characteristics of the mine area shall be undertaken from an institute of repute and adequate clay lining shall be ascertained by the State Pollution Control Board and implementation done in close co-ordination with the State Pollution Control Board.

(li) Three tier green belt shall be developed all around Ash Pond over and above the Green Belt around the plant boundary.

(lii) A common **Green Endowment Fund** shall be created and the interest earned out of it shall be used for the development and management of green cover of the area.

(liii) The project proponent shall formulate a well laid Corporate Environment Policy and identify and designate responsible officers at all levels of its hierarchy for ensuring adherence to the policy and compliance with the conditions stipulated in this clearance letter and other applicable environmental laws and regulations.

4. All other conditions mentioned in this Ministry's letters of even no. dated 31.05.2010 and its amendment dated 14.08.2012 shall remain the same.

5. This issues with the approval of the Competent Authority.

Yours faithfully,

(Dr. Saroj)
Director

Copy to:

1. The Secretary, Ministry of Power, Shram Shakti Bhawan, Rafi Marg, New Delhi 110001.
2. The Secretary (Environment), Environment Department, Government of Tamil Nadu.
3. The Chairman, Central Electricity Authority, Sewa Bhawan, R.K. Puram, New Delhi-110066.
4. The Chairman, Tamil Nadu State Pollution Control Board, No. 76, Mount Road, Mount Salai, Guindy, Chennai - 600 032
5. The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi- 110032.
6. The Chief Conservator of Forests, Regional Office (SZ), Kendriya Sadan, 4th Floor E&F Wings 17th Main Road, 1 Block , Koranmangala, Bangalore -560 034.
7. The District Collector, Cuddalore District, Govt. of Tamil Nadu.
8. Guard file.

(Dr. Saroj)
Director

E-mail: sanchita@nic.in
sansom_2859@yahoo.co.in
Telefax: 011-24695402

सत्यमेव जयते

भारत सरकार
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FORESTS AND CLIMATE CHANGE
इंदिरा पर्यावरण भवन, जोर बाग रोड,
अलीगंज, नई दिल्ली-110 003
INDIRA PARYAVARAN BHAWAN, JOR BAGH ROAD,
ALIGANJ, NEW DELHI-110 003
Website : moef.nic.in

2nd Level, JAL Block
Date: 27th March, 2015

F. No. J-13012/34/2008-IA.II (T)

To

M/s. IL&FS Tamil Nadu Power Company Ltd.
B Block, Navin's Presidium
4th Floor, 103, Nelson Manickam Road
Aminjikarai, Chennai-600 029
Tel. No. 044-23745564/23745565; Fax: 044-23745544

Subject: Amendment of EC for transportation of coal by rail route for 2x600 MW and 3x660 MW Coal based Thermal Power Plant at Villages Kottatai, Ariyagosthi, Vilianallur & Silambimangalam in Chidambaran Taluk of Cuddalore District in Tamil Nadu by M/s IL&FS Tamil Nadu Power Company Limited.

Sir,

This has reference to your letter dated 10.07.2014 on the above subject. It is noted that the above project (2x600 MW and 3x800 MW) was accorded Environment Clearance (EC) and CRZ Clearance on 31.05.2010 and 29.10.2010 respectively. The EC was challenged in the Hon'ble NGT which had directed for carrying out a Rapid Cumulative Environmental Impact Assessment (RCEIA) study over a 25 Km radius. Based on the RCEIA study carried out by ITPCL, a Corrigendum to the original EC was issued with additional conditions on 14.08.2012. Further, an amendment to EC was accorded on 04.02.2014 regarding revision of unit configuration (2x600 MW and 3x660 MW), sulphur content of coal and location of ash pond.

2. Hon'ble NGT vide Judgment dated 10.11.2014 in Appeal No. 50/2012 has inter-alia quashed the Corrigendum dated 14.08.2012 to the EC. However, the Hon'ble Supreme Court vide Order dated 10.02.2015 has stayed the impugned Order dated 10.11.2014 until further Orders.

3. The matter regarding amendment of EC for transportation of coal by rail route was placed before the Expert Appraisal Committee (Thermal Power) in its 18th Meeting held during 31st July and 1st August, 2014. In view of the order of Hon'ble Supreme Court and in acceptance of the recommendation of the Expert Appraisal Committee (Thermal Power) and the information/clarification submitted by you for

Nature Protects if She is Protected

the project, the Ministry now *accords amendment of EC for temporary transportation of coal by rail route till the captive port is operational* subject to the following additional conditions.

(i) The above amendment is subject to the outcome of the Appeal pending before Hon'ble Supreme Court.

(ii) The PP shall advertise in the newspaper and place on the website, the amendment issued by the Ministry for public information.

3. All other conditions mentioned in this Ministry's letters of even no. dated 31.05.2010, 14.08.2012 and 04.02.2014 shall remain the same.

4. This issues with the approval of the Competent Authority.

Yours faithfully,

(Sanchita Jindal)
Scientist 'F' & Director (T)

Copy to:

1. The Secretary, Ministry of Power, Shram Shakti Bhawan, Rafi Marg, New Delhi 110001.
2. The Secretary (Environment), Environment Department, Government of Tamil Nadu.
3. The Chairman, Central Electricity Authority, Sewa Bhawan, R.K. Puram, New Delhi-110066.
4. The Chairman, Tamil Nadu Pollution Control Board, No. 76, Mount Road, Mount Salai, Guindy, Chennai - 600 032
5. The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi-110032.
6. The Additional PCCF (Central), Regional Office, Ministry of Environment, Forests and Climate Change, 1st & 2nd Floors, HEPC Building, 34, Cathedral Garden Road, Nungambakkam, Chennai- 600034.
7. The District Collector, Cuddalore District, Govt. of Tamil Nadu.
8. Guard file.

(Sanchita Jindal)
Scientist 'F' & Director (T)

No. J-13012/34/2008-IA.II(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: 26.02.2018

To

The Chairman
IL&FS Tamil Nadu Power Company Ltd.,
4th floor, KPR Tower, Old no.21, New n.2, 1st Street,
Subba Rao Avenue, College Road, Chennai-600006.

Sub: 2x600 MW and 3x660 MW Coal based TPP at Villages Kottai, Ariyagosthi, Villianallur & Silambimangalam, Taluk Chidambaram, Distt. Cuddalore, Tamil Nadu by M/s IL&FS Tamil Nadu Power Company Ltd.- reg. extension of validity Environmental Clearance.

Sir,

This has reference to your online application no. IA/TN/THE/11883/2008 dated 30.5.2017, Ministry's letters dated 14.12.2017 & 3.1.2018 and documents submitted vide letters dated 18.12.2017 & 12.1.2018 on the above mentioned subject.

2. It has been noted that the Environmental Clearance for setting up of 2x600 MW and 3x660 MW has been issued vide Ministry's letters dated 31.5.2010 & 4.2.2014. The validity of the said EC was valid for seven years i.e. till 30.5.2017 as per the new EIA amendment notification dated 14.9.2016. Ministry vide its letter dated 14.8.2012 issued a corrigendum to EC for setting up Flue Gas De-Sulphurisation and monitoring of Sea water quality. Further amendment to EC for change in configuration of TPP from 3600 MW (2x600 MW+3x800 MW) to 3180 MW (2x600 MW+3x660 MW) and transportation of coal by rail was issued vide Ministry's letter dated 4.2.2014 and 27.3.2015 respectively. CRZ clearance for Captive port and desalination plant has also been obtained vide Ministry' letter dated 29.10.2010.

3. It has been note that you have requested for extension of validity of EC dated 31.5.2010. As submitted by you, Unit-1: 1x600 MW and Unit-2: 1x600 MW have been commissioned on 29.9.2015 and 30.4.2016 respectively. However, remaining three units (3x660 MW) could not be established within the validity period of seven years. It has been informed by you that the project was suspended for 8 months due to an NGT order which required carrying out an RCEIA and also required retroactive addition of an FGD in the design of the TPP (a requirement hitherto not imposed on almost all TPPs in operation). The construction was further suspended for 4 months due to damage caused by an unprecedented cyclone and floods.

4. All the facilities that are common to the first and second phase, and as mentioned in their latest application, are complete and will suffice for the second phase as well viz. land acquisition, coal handling system and storage facility, ash pond, pipelines and intake structures for seawater intake, marine outfall systems, service and administration buildings. BTG erection, other activities such as construction of cooling tower, desalination plant, stack, ash water recirculation

system and other Balance of Plant (BOP) activities can be initiated simultaneously and achieved within 27 months. ITPCL has been waiting for an MOU to be signed with TN Government followed by a Power Purchase Agreement (PPA) that will make their plant economically viable. They have signed the MOU in October, 2015, and are hopeful of signing the PPA in the next few months.

5. The proposal has been considered by the EAC (Thermal) in its 7th, 9th and 13th meetings held on 28.6.2017, 30.8.2017 and 28.11.2017 respectively. Sub-committee conducted the site visit on 11.8.2017 and submitted the recommendations to extend the validity of the EC for further period of three years.

6. In acceptance of the recommendations of the EAC (Thermal) in its 13th meeting held on 28.11.2017 and in view of the information/clarifications submitted by you, **the Ministry hereby extends the validity of the EC dated 31.5.2010 for further period of three years, i.e. till 30.5.2020 subject to the following additional condition.**

i. Action plan submitted vide letter dated 12.1.2018 for compliance of EC conditions shall be implemented.

Subject	Action Plan
i. Concrete action plan as to when the dredging activity is likely to start and sediment analysis may be started.	Construction of captive port and dredging is proposed to be completed by January, 2020 and the sedimentation study will commence in April, 2019 onwards.
ii. Action plan as to when long term study on radio activity and heavy metal content in coal will be conducted. Further, in-house analysis reports may be submitted.	Long term study will be carried out in September, 2018 after identifying reputed institute.
iii. Capacity and details of the solar power in addition to the 151 kW which is being installed.	Considering the safety of plant, area has been identified to install 151 kW in the first phase. Additional solar panels will be installed in FY 2020 after completing the study on safety of plant and performance after installing 151 kW in the year 2017-18.

7. All other conditions specified in the Ministry's letters of even no. dated 31.5.2010, 4.2.2014, 14.8.2012, 4.2.2014 and 27.3.2015 shall remain the same, as applicable

This issues with the approval of the Competent Authority.

Yours faithfully,

(Dr. S. Kerketta)
Director, IA-I

Copy to:-

1. The Secretary, Ministry of Power, Shram Shakti Bhawan, Rafi Marg, New Delhi 110001.

2. The Chairman, Central Electricity Authority, Sewa Bhawan, R.K. Puram, New Delhi-110066.
3. The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-O ffice Complex, East Arjun Nagar, Delhi-110032.
4. The Additional Principal Chief Conservator of Forests (C), Ministry of Environment, Forests and Climate Change, Regional Office (SEZ), Ist and IInd Floor, Handloom Export Promotion Council, 34, Cathedral Garden Road, Nungambakkam, Chennai- 600034.
5. The Principal Secretary, Environment and Forest Department, Government of Tamil Nadu, Fort St, George, Secretariat, Chennai-600009.
6. The Chairman, Tamil Nadu Pollution Control Board, No. 76, Mount Road, Mount Salai, Guindy, Chennai - 600 032.
7. The District Collector, Cuddalore District, Tamil Nadu-607001.
8. Guard file/Monitoring file.
9. Website of MoEF&CC.

(Dr. S. Kerketta)
Director, IA-I

F.No.11-43/2010-IA.III
Government of India
Ministry of Environment, Forest and Climate Change
(IA-III Section)

Indira Paryavaran Bhawan,
Jor Bagh Road, New Delhi - 3

Date: 27th February, 2018
5th March

To,

The Chairman
M/s Infrastructure Leasing & Financial Services (IL&FS) Ltd,
Tamil Nadu Power Company Limited,
4th Floor, KPR Tower, Old No. 21, New No. 2, 1st Street,
Subba Rao Avenue College Road,
Chennai - 600 006

Email: ms.srinivasan@ilfsindia.com

Subject: Environmental and CRZ Clearance for Captive Port and Desalination Plant at Kottatti, Bhuvanagiri Taluka, Cuddalore District, Tamil Nadu by M/s Infrastructure Leasing & Financial Services (IL&FS) Ltd - Extension of validity of Environmental and CRZ Clearance - reg.

Sir,

This has reference to your online proposal No. IA/TN/MIS/67122/2010 dated 1st August, 2017 submitted to this Ministry for extension of validity of Environmental and CRZ Clearance granted vide letter No. 11-43/2010-IA.III dated 29th October, 2010 for 'Captive Port and Desalination Plant at Kottatti, Bhuvanagiri Taluka, Cuddalore District, Tamil Nadu in favour of M/s Infrastructure Leasing & Financial Services (IL&FS) Ltd, in terms of the provisions of the Environment Impact Assessment (EIA) Notification, 2006 under the Environment (Protection) Act, 1986 and CRZ Notification, 2011.

2. The proposal for grant of extension of validity of Environmental and CRZ Clearance to the above referred project was considered by the Expert Appraisal Committee (Infra-2) in its 24th meeting held on 30-31 October, 2017.

3. The EAC in its 24th meeting held on 30-31 October, 2017 has recommended the project for grant of extension of the validity of EC&CRZ clearance issued vide letter dated 29th October, 2010 for a period of three years. As per recommendations of the EAC, the Ministry of Environment, Forest and Climate Change hereby extend the validity of Environmental and CRZ Clearance up to 28th October, 2020.

4. The extension of validity is being granted for the original proposals for which Environmental and CRZ Clearance was granted earlier. The project proponents will not make any changes in the project nature, structure or configuration and limit themselves to activities for which the Environmental and CRZ Clearance has been given earlier.

5. All other conditions stipulated in the Environmental and CRZ Clearance granted vide letter No. 11-43/2010-IA.III dated 29th October, 2010, shall remain unchanged.

6. This issues with the approval of the Competent Authority.

(Kushal Vashist)
Director

Copy to:

1. The Secretary, Department of Environment and Forests, First Floor, Panagal Building, Saidpet, Chennai – 600 015, Tamil Nadu.
2. The Chairman, CPCB, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi – 32.
3. The Additional Principal Chief Conservator of Forests, Ministry of Environment, Forest and Climate Change, Regional Office (SEZ), I[st] and II[nd] Floor, Handloom Export Promotion Council, 34, Cathedral Garden Road, Nungambakkam, Chennai - 34.
4. The Chairman, Tamil Nadu Pollution Control Board, 76, Mount Salai, Guindy, Chennai- 600 032, Tamil Nadu.
5. Guard File.
6. Monitoring Cell, MoEF&CC.

(Kushal Vashist)
Director

Appendix B: Fuel Analysis (Indigenous Coal)

Appendix B Fuel Analysis (Indigenous Coal)

Mitra S. K. Private Limited

MSK TESTING • INSPECTION

No. 57, West Madha Church Road
Royapuram, Chennai - 600 013
GRAM : MITRALAB
[CIN : U51909WB1956PTC023037]

T : 9144 4352 8080
E : chennai@mitrask.co.in

Certificate No. MSK/SS/CHE/2018-19/000004 *Date :* 12/04/2018

CERTIFICATE OF ANALYSIS

We hereby certify that, sample submitted to us by client IL & FS TAMILNADU POWER COMPANY LIMITED is analysed in our laboratory with the following findings:

General Information	
Job Ref. No.:	SJ/CHE/LI-2018/00001
Commodity:	Lignite
Client Sample Mark:	LIGNITE/ITPCL
Sample Receipt Date:	10/04/2018
Condition of Sample:	Crushed Sealed Marked

**** Sample not drawn by us*

Chemical Analysis		
Parameter	**Result**	**Unit**
Total Moisture (ARB)	49.56	%
ASH(ARB)	5.11	%
Volatile Matter(ARB)	24.86	%
Fixed Carbon(ARB)	20.47	%
Gross Calorific Value(ARB)	2997	KCal/KG
Sulphur (ARB)	0.76	%

Remarks: Nil

Client Details:

IL & FS TAMILNADU POWER COMPANY LIMITED

Karikuppam village, Vannaara Palayam Road, Parangipettai, Tamil Nadu India

Certificate Checked By: S. Nath

For Mitra S. K. Private Limited
S. Nath
Authorized Signatory

Page 1 of1

H.O. : Shrachi Centre (5th Floor), 74B, Acharya Jagadish Chandra Bose Road, Kolkata - 700 016, West Bengal, India
T : 91 33 22172249 / 4014 3000/ 2265 0006 / 2265 0007 F : 91 33 2265 0008 E : info@mitrask.com W : www.mitrask.com

Appendix C: Traffic Study

Appendix C Traffic Study

C.1 Indigenous Coal Transport through Road Network – Traffic Study

NLC India Limited, Neyveli mines are well connected to ITPCL's TPP site by road network. The details of road network available, existing traffic and Road conditions and suitability for the Indigenous Coal Transportation etc., are discussed below.

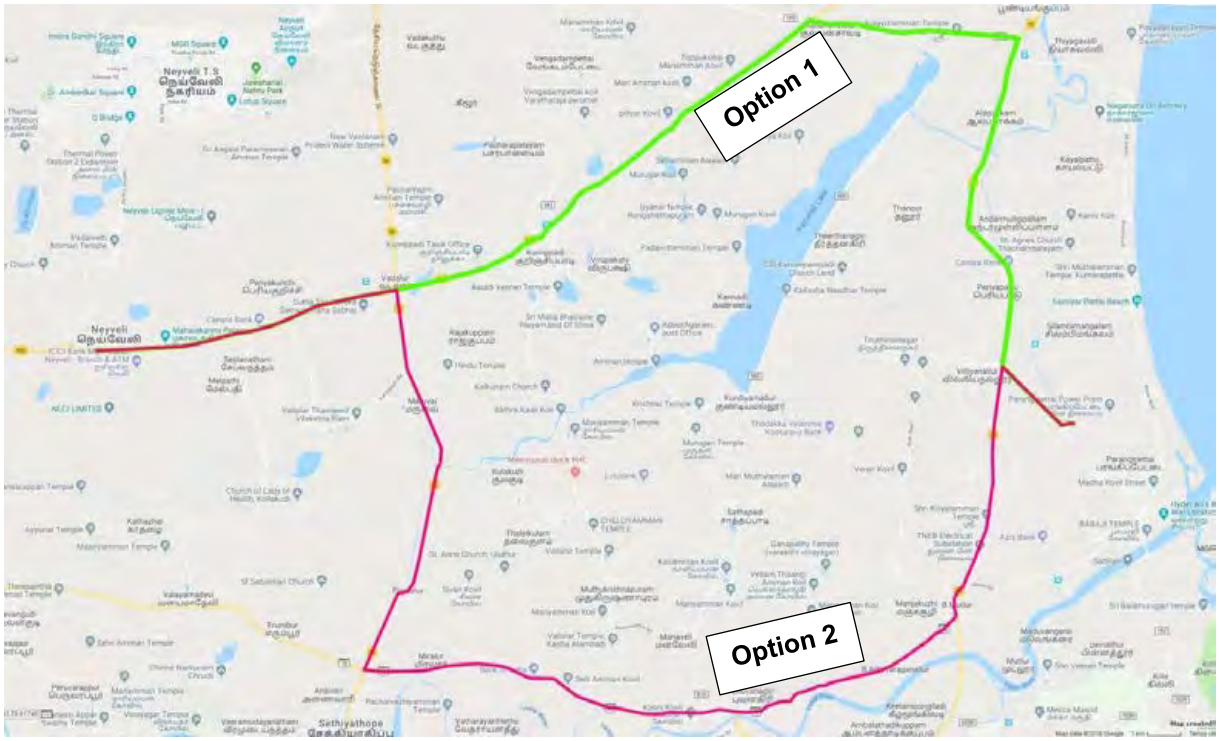
C.1.1 Alternative Routes Considered for Study

Among the available road network, two significant (02) options are studied to check the feasibility to transport the indigenous coal to ITPCL Plant Site from Neyveli mines.

Option1: Mandarakuppam/Neyveli – Vadalur – Kurinjipadi - Kullanchavadi - Alapakkam - Villiyanallur - Plant Site (About 44.2 Km)

Option2: Mandarakuppam/Neyveli – Vadalur – Maruai – Pinnalur – Seithiyathope – Bhuvanagiri – B. Muttalur - Villiyanallur - Plant Site (About 51.2 Km)

Map Showing Road route Option 1 and 2 are given below.



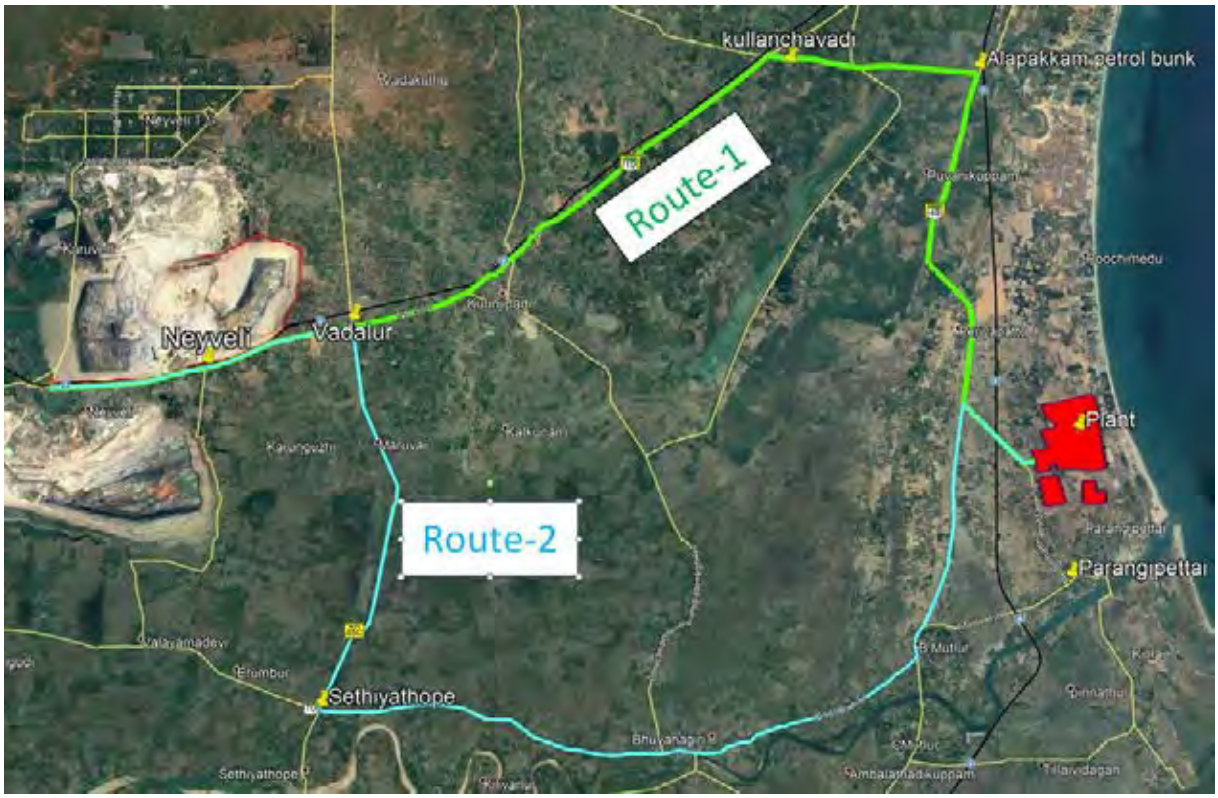


Figure C-1: Map Showing Road Network Options Available from Neyveli to ITPCL

C.1.2 Land Use of the Alternative Routes Considered for Study

The land use around the alternate routes were studied by using land use and land cover map sourced from Bhuvan (1:10000 Scale) based on 2015 Satellite imageries.

Option 1: The Land use abutting the route 1 is mining area, agricultural land, plantations, and waste land, built up area (Urban and Rural), dry tanks with few stream crossings.

Option 2: The Land use abutting the route 2 is mining area, more of agricultural land, plantations, and less waste land, built up area (Urban and Rural), wet tanks, more number of irrigation Channels, Vellar river with few stream crossings.

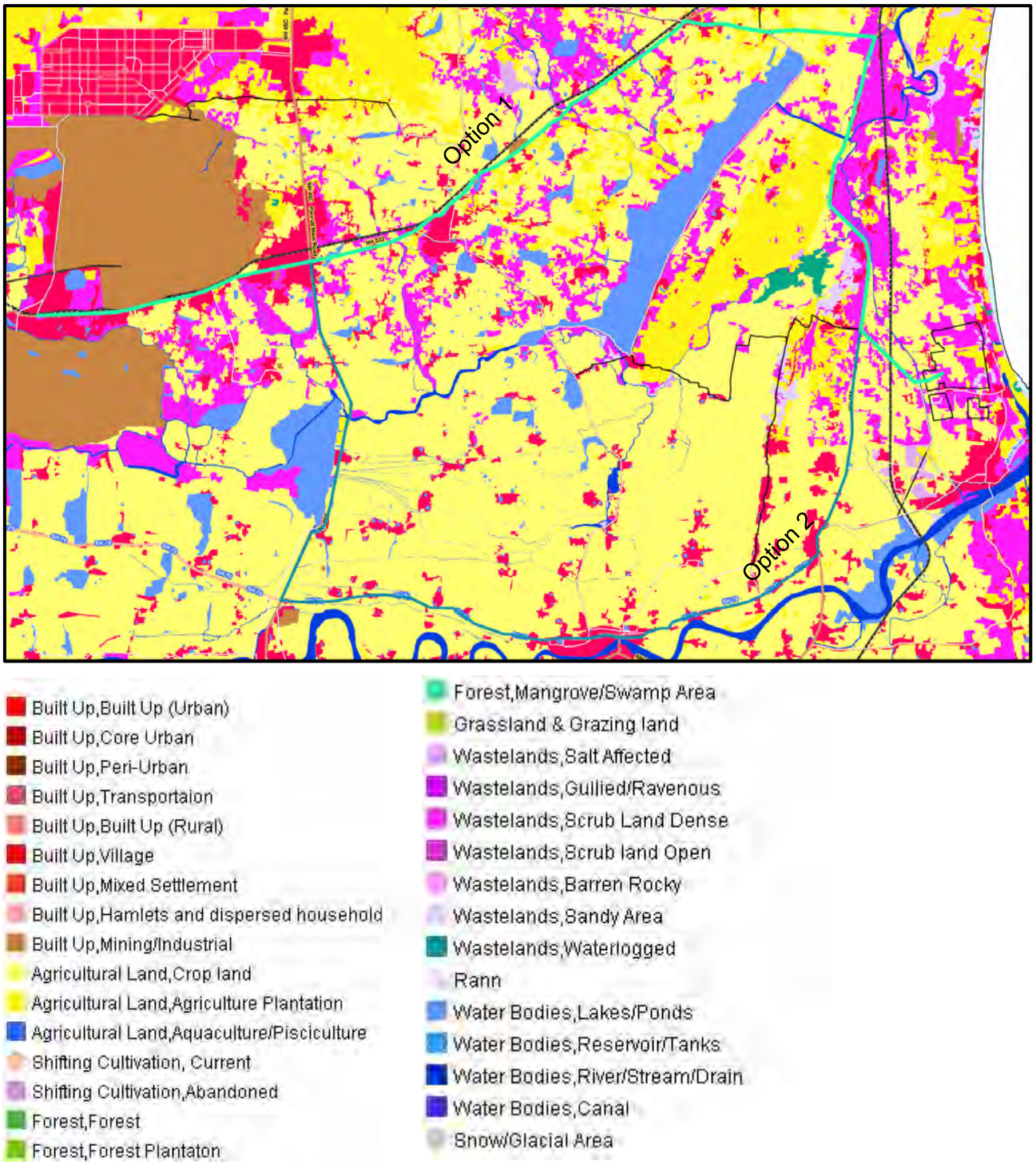


Figure C-2: Land Use abutting the Alternative Routes

C.1.3 Habitations abutting the Alternative Routes Considered for Study

The following are the habitations abutting the alternative routes considered for the study.

Table C-1: Habitations abutting the Alternative Routes

Preferred Route from NLCIL to ITPCL Site– Habitations abutting		
S.No	**LHS**	**RHS**
1.	Periyakuritchi	Old Neyveli
2.	Kuravankuppam	Melpappanpattu
3.	Pravathipuram/Vadalur	Keelpathi

Preferred Route from NLCIL to ITPCL Site– Habitations abutting		
S.No	**LHS**	**RHS**
4.	Ottandikuppam	Seplanatham Bus Stop
5.	Andikuppam	Vadakku Seppalanattam
6.	Tambipettai	Vinankeni
7.	Tambipettaipalaiyam	Vadalur
8.	Toppukkollai	Kurinjipadi
9.	Kaumachipalaiyam	Peddunayakkankuppam
10.	Alappakkam	Navakkulam (Ayikuppam)
11.	Anaiyampettai	Kullanchavadi
12.	Mettuppalaiyam	Ramanakkuppam
13.	Gopalapuram	Periyappattu
14.	Puduchattriram	Silambimangalam
15.		Ravanakuppam
16.		Villiyanallur
Alternate Route from NLCIL to ITPCL Site– Habitations abutting		
1.	Periyakuritchi	Old Neyveli
2.	Kuravankuppam	Melpappanpattu
3.	Pravathipuram/Vadalur	Keelpathi
4.	Chinna Maruvay	Seplanatham Bus Stop
5.	Karaimedu	Vadakku Seppalanattam
6.	Pinnalur	Vinankeni
7.	Miralur	Vadalur
8.	Manjakkollai	Nayinakuppam
9.	Odaiyur	Sethiathoppu
10.	Vandarayanpattu	Kilavadinattam
11.	Kil Bhuvanagiri	Allaikkudicheri
12.	Manjakkuli	Mel Bhuvanagiri
13.	Mutlur	Tambikkunallampattanam
14.	Chinna Kummatti	Vargantaikkal/ Bharaikhan taikkal
15.	Kottattai	Anaiyankuppam
16.	Villiyanallur	
17.	Puduchattriram	

The map showing the abutting enroute habitations in alternative routes are given **Figure C-3**.

Figure C-3: Map Showing Habitations abutting Alternative Routes

C.1.4 Findings of Traffic Study for Option 1 Route

Traffic studies were conducted for the selected option 1 route at major junctions to understand the present Average Daily Traffic Volumes, vehicles composition, road conditions, level of Services etc.,.Traffic Volumes are measured at major junction in the option 1 route namely NH-532/ Vadalur, Kurinjipadi, Kullanchavadi, Alapakkam and Villiyanalur. Classified Volume Count Survey was carried out May 2018 manually and counts were recorded. Each vehicle type is converted into equivalent Passenger Car Unit (PCU) based on the IRC recommended factors.

The survey locations are shown in the below **Figure C-4.**

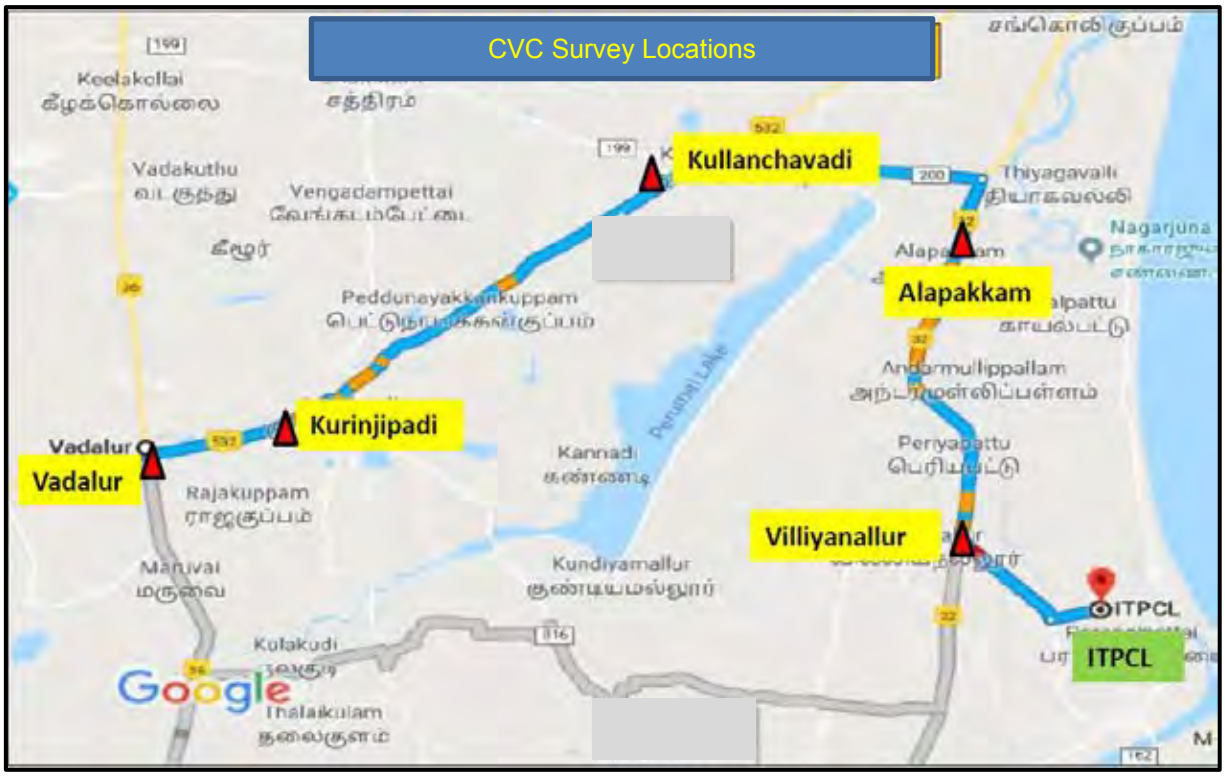


Figure C-4: CVC survey Locations on Option1 Route

Based on the surveys, the Average Daily Traffic (ADT) along Option 1 Route is arrived. The seasonal correction factor of 1.0 is considered to convert Average Daily Traffic (ADT) to Annual Average Daily Traffic (AADT) and the same is presented in below **Table C-2.**

Table C-2: Annual Average Daily Traffic (AADT) for Option 1 Route

Road Name	Road Stretch	Conditions	Current Lane width (m)	Per day						
				2W	3W	4W	6W	10W	12W	PCUS
NH-532/ Vadalur Junction	Towards Vadalur	Good	~ 30	4409	200	1886	656	142	96	6972.5
	Towards Neyveli			4395	215	1982	782	157	89	7478.5
	Vadalur – Neyveli Total			8804	415	3868	1438	299	185	14451
Kurinjipadi	Towards Kurinjipadi	Good	~ 7	4360	79	874	283	2	13	4027
	Towards Vadalur			5098	71	870	318	0	64	4636
	Kurinjipadi – Vadalur Total			9458	150	1744	601	2	77	8663
Kullanchavadi	Towards Kullanchavadi	Good	~ 10	3825	144	1038	406	87	20	4633.5
	Towards Kurinjipadi			3829	109	1048	412	63	47	4637.5
	Kullanchavadi – Kurinjipadi Total			7654	253	2086	818	150	67	9271
Alapakkam (NH 45 – A)	Towards Alapakkam	Good	~ 7	2788	16	540	19	74	68	2433
	Towards Kullanchavadi			2416	19	523	21	58	68	2191

Road Name	Road Stretch	Conditions	Current Lane width (m)	Per day						
				2W	3W	4W	6W	10W	12W	PCUS
	Kullanchavadi – Alapakkam Total			5204	35	1063	40	132	136	4624
Villiyanalur	Towards Villiyanallur	Good	~ 8	3607	188	3338	654	109	83	7867.5
	Towards Alapakkam			3268	174	2985	441	102	102	6728
	Villiyanallur – Alapakkam - Total			6875	362	6323	1095	211	185	14595.5

Summary of Traffic study of Option 1 Route is given in below **Table C-3**

Table C-3: Summary of Traffic Study Findings for Option 1 Route

Road Name	Road Stretch	Total PCUs and PCUs/Hr (V)	Vehicles Composition	IRC Standards Capacity (C) PCUs/hr	V/C (Level of Service)
NH-532/ Vadalur Junction	Towards Vadalur	6972.5/ 290.52	2W - 60%; 4W - 26%, 6W/10W/12W - 12%.	**2400** for 4 lane undivided	0.12
	Towards Neyveli	7478.5/ 311.6	2W - 58%; 4W - 26%, 6W/10W/12W - 13%.		0.13
	Vadalur – Neyveli Total	14451 / **602.12**	-		0.25 **(B – very Good)**
Kurinjipadi	Towards Kurinjipadi	4027 / 167.79	2W - 78%; 4W – 16%, 6W/10W/12W - 5%.	**1500** for 2 lane two way	0.11
	Towards Vadalur	4636 / 193.17	2W - 79%; 4W – 14%, 6W/10W/12W - 6%.		0.13
	Kurinjipadi – Vadalur Total	8663 / **360.96**			0.24 **(B – very Good)**
Kullanchavadi	Towards Kullanchavadi	4633.5/ 193	2W - 69%; 4W – 19%, 6W/10W/12W - 9%.	**1500** for 2 lane two way	0.128
	Towards Kurinjipadi	4637.5/ 193.23	2W - 70%; 4W – 19%, 6W/10W/12W - 9%.		0.128
	Kullanchavadi – Kurinjipadi Total	9271/ **386.3**			0.257 **(B – very Good)**
Alapakkam (NH 45 – A)	Towards Alapakkam	2433 / 101.37	2W - 80%; 4W – 15%, 6W/10W/12W - 5%.	**1500** for 2 lane two way	0.067
	Towards Kullanchavadi	2191 / 91.3	2W - 78%; 4W – 17%, 6W/10W/12W - 5%.		0.060
	Kullanchavadi – Alapakkam Total	4624 / **192.67**			0.127 **(A – Excellent)**
Villiyanalur	Towards Villiyanallur	7867.5/ 327.81	2W - 45%; 4W – 42%, 6W/10W/12W - 11%.	**1500** for 2 lane two way	0.218
	Towards Alapakkam	6728/ 280.33	2W - 46%; 4W – 42%, 6W/10W/12W - 8%.		0.186
	Villiyanallur – Alapakkam Total	14595.5/ **608.14**			0.405 **(C –Good)**

The level of Service is ranked from **A** to **F**, Where, **A** is freeway condition and **F** is Failure condition.

C.1.5 Findings of Traffic Study for Option 2 Route

Traffic studies were conducted for the selected option 2 route at major junctions to understand the present Average Daily Traffic Volumes, vehicles composition, road conditions, level of Services etc.,.Traffic Volumes are measured at major junction in the option 2 route namely Vadalur, Maruvai, Pinnalur, Seithiyathope, Bhuvanagiri and Villiyanalur. Classified Volume Count Survey was carried out May 2018 manually and counts were recorded. Each vehicle type is converted into equivalent Passenger Car Unit (PCU) based on the IRC recommended factors.

The survey locations are shown in the below **Figure C-5**.

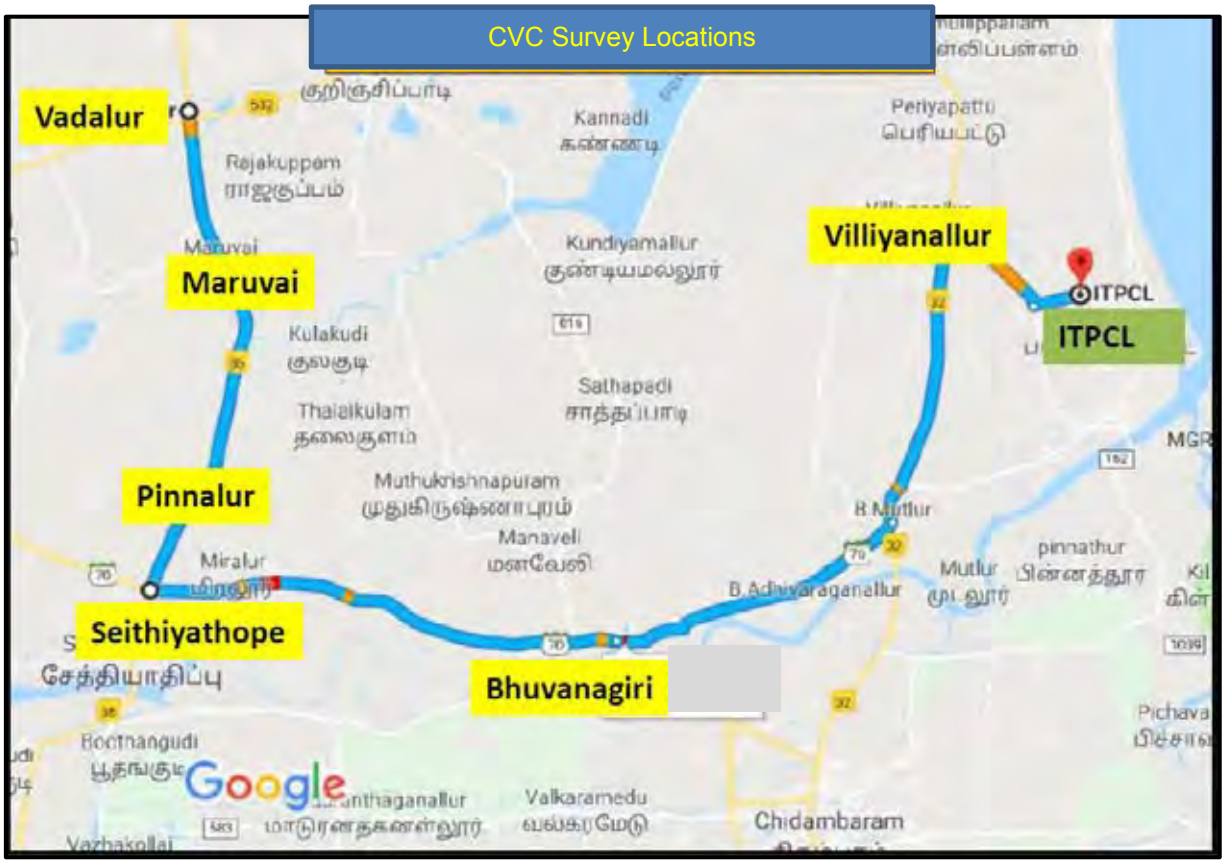


Figure C-5: CVC survey Locations on Option 2 Route

Based on the surveys, the Average Daily Traffic (ADT) along the Option 2 Route is arrived. The seasonal correction factor of 1.0 is considered to convert Average Daily Traffic (ADT) to Annual Average Daily Traffic (AADT) and the same is presented in **Table C-4.**

Table C-4: Annual Average Daily Traffic (ADT) for Option 2 Route

Road Name	Road Stretch	Conditions	Current Lane width (m)	Per day						
				2W	3W	4W	6W	10W	12W	PCUS
Vadalur	Towards Maruvai	Good	~ 14	3331	16	2658	988	92	81	7822.5
	Towards Vadalur			2737	12	1765	854	96	59	6172.5
	Maruvai – Vadalur Total			6068	28	4423	1842	188	140	13995
Maruvai	Towards Pinnalur	Good	~ 6	2799	1	2492	628	72	68	6196.5

Road Name	Road Stretch	Conditions	Current Lane width (m)	Per day						
				2W	3W	4W	6W	10W	12W	PCUS
	Towards Maruvai			2791	1	2324	626	80	66	6036.5
	Pinnalur – Maruvai Total			5590	2	4816	1254	152	134	12233
Pinnalur	Towards Seithiyathope	Good	~ 6	2403	3	2394	642	79	55	5926.5
	Towards Pinnalur			2712	0	2547	651	79	62	6279
	Seithiyathope – Pinnalur Total			5115	3	4941	1293	158	117	12205.5
Seithiyathope	Towards Bhuvanagiri	Good	~ 7	2964	26	2470	669	59	32	6258
	Towards Sethiyathope			2682	25	2076	557	54	0	5275
	Bhuvanagiri – Sethiyathope Total			5646	51	4546	1226	113	32	11533
Bhuvanagiri	Towards Villiyanallur	Good	~ 10	3537	218	2985	477	125	138	7191.5
	Towards Bhuvanagiri			3353	102	2837	837	89	45	7528.5
	Villiyanallur – Bhuvanagiri- Total			6980	320	5822	1314	214	183	14720

Summary of Traffic study of Option 2 Route is given below **Table C-5**.

Table C-5: Summary of Traffic Study Findings for Option 2 Route

Road Name	Road Stretch	Total PCUs and PCUs/Hr (V)	Vehicles Composition	IRC Standards Capacity (C) PCUs/hr	V/C (Level of Service)
Vadalur	Towards Maruvai	7822.5 / 326	2W - 46%; 4W - 37%, 6W/10W/12W - 16%.	**1500** for 2 lane two way	0.21
	Towards Vadalur	6172.5 / 257	2W - 50%; 4W - 32%, 6W/10W/12W - 18%.		0.17
	Maruvai – Vadalur Total	13995 / **583**	-		0.38 **(B – very Good)**
Maruvai	Towards Pinnalur	6196.5 / 258	2W - 46%; 4W – 41%, 6W/10W/12W - 13%.	**1500** for 2 lane two way	0.17
	Towards Maruvai	6036.5 / 252	2W - 47%; 4W – 39%, 6W/10W/12W - 13%.		0.17
	Pinnalur – Maruvai Total	12233 / **510**			0.34 **(B – very Good)**
Pinnalur	Towards Seithiyathope	5926.5 / 247	2W - 43%; 4W – 43%, 6W/10W/12W - 14%.	**1500** for 2 lane two way	0.16
	Towards Pinnalur	6279/ 262	2W - 45%; 4W – 42%, 6W/10W/12W - 13%.		0.17
	Seithiyathope – Pinnalur Total	12205.5 /**509**			0.33 **(B – very Good)**
Seithiyathope	Towards Bhuvanagiri	6258 / 261	2W - 48%; 4W – 40%, 6W/10W/12W - 13%.	**1500** for 2 lane two way	0.17
	Towards Sethiyathope	5275 /220	2W - 50%; 4W – 38%, 6W/10W/12W - 11%.		0.15
	Bhuvanagiri – Sethiyathope	11533 / **481**			0.32 **(B – very Good)**

Road Name	Road Stretch	Total PCUs and PCUs/Hr (V)	Vehicles Composition	IRC Standards Capacity (C) PCUs/hr	V/C (Level of Service)
	Total				
Bhuvanagiri	Towards Villiyanallur	7191.5 / 299.6	2W - 47%; 4W – 40%, 6W/10W/12W - 10%.	**1500** for 2 lane two way	0.20
	Towards Bhuvanagiri	7528.5 / 314	2W - 46%; 4W – 39%, 6W/10W/12W - 14%.		0.20
	Villiyanallur – Bhuvanagiri- Total	14720.5 / **613.6**			0.40 **(C –Good)**

The level of Service is ranked from **A** to **F**, Where, **A** is freeway condition and **F** is Failure condition.

C.1.6 Generated Traffic Due to proposed use of Indigenous Coal at ITPCL TPP

It is estimated at about 1.5 MMTPA of Indigenous coal for 1200 MW will need to be transported considering the Maximum blend ratio of 25 (Indigenous):75 (Imported). The number of trucks requirement to transport this quantity will be around 7 trucks per hour.

C.1.7 Traffic Forecast and Carrying Capacity of Selected Options Route

As the no rail siding at NLC India Limited mines to connect existing ITPCL rail network, the interim arrangement (for the maximum period of 7 years) of using existing road is proposed. Accordingly the traffic projections till 2025 are carried out to check the adequacy of existing road network for the transport of indigenous coal from NLC India Limited mines to ITPCL TPP Site.

The projections traffic projections till 2025 have been worked out by considering 5 % increase per year in Normal Annual Average Daily Traffic Volumes.

C.1.8 Total Traffic and Adequacy of Road Network

The traffic projection for the normal traffic for Options Route 1 taking into considering the guidelines of IRC are estimated and provided in **Table C-6**.

Table C-6: Traffic Projections for Normal Traffic on Option Route -1

Road Name	Road Stretch	Per day for 2025						
		2W	3W	4W	6W	10W	12W	PCUS
NH-532/ Vadalur Junction	Towards Vadalur	6204	281	2654	923	200	135	9811
	Towards Neyveli	6184	303	2789	1100	221	125	10523
	Vadalur – Neyveli Total	12388	584	5443	2023	421	260	20334
Kurinjipadi	Towards Kurinjipadi	6135	111	1230	398	3	18	5666
	Towards Vadalur	7173	100	1224	447	0	90	6523
	Kurinjipadi – Vadalur Total	13308	211	2454	846	3	108	12190
Kullanchavadi	Towards Kullanchavadi	5382	203	1461	571	122	28	6520
	Towards Kurinjipadi	5388	153	1475	580	89	66	6525
	Kullanchavadi – Kurinjipadi Total	10770	356	2935	1151	211	94	13045
Alapakkam (NH 45 – A)	Towards Alapakkam	3923	23	760	27	104	96	3423
	Towards Kullanchavadi	3400	27	736	30	82	96	3083
	Kullanchavadi – Alapakkam Total	7323	49	1496	56	186	191	6506
Villiyanalur	Towards Villiyanallur	5075	265	4697	920	153	117	11070
	Towards Alapakkam	4598	245	4200	621	144	144	9467
	Villiyanallur – Alapakkam -	9674	509	8897	1541	297	260	20537

Road Name	Road Stretch	Per day for 2025						
		2W	3W	4W	6W	10W	12W	PCUS
	Total							

The total traffic projections for the normal and generated traffic are provided in **Table C-7**.

Table C-7: Total Traffic Projections for Normal + Generated Traffic for Option Route 1

Road Name	Road Stretch	Per day for 2025						
		2W	3W	4W	6W	10W	12W	PCUS
NH-532/ Vadalur Junction	Vadalur – Neyveli Total	12388	584	5443	2135	533	372	21342
Kurinjipadi	Kurinjipadi – Vadalur Total	13308	211	2454	958	115	220	13198
Kullanchavadi	Kullanchavadi – Kurinjipadi Total	10770	356	2935	1263	323	206	14053
Alapakkam (NH 45 – A)	Kullanchavadi – Alapakkam Total	7323	49	1496	168	298	303	7514
Villiyanalur	Villiyanallur – Alapakkam - Total	9674	509	8897	1653	409	372	21545

The conditions of the roads in Option Route 1 based on the total traffic projections are provided in **Table C-8.**

Table C-8: Summary of Road Condition of Option Route 1 based on Total Traffic Projections

Road Name	Road Stretch	Total PCUs and PCUs/Hr (V)	IRC Standards Capacity (C) PCUs/hr	V/C (Level of Service)
NH-532/ Vadalur Junction	Vadalur – Neyveli Total	21342 / **889.25**	**2400** for 4 lane undivided	0.37 **(B – Very Good)**
Kurinjipadi	Kurinjipadi – Vadalur Total	13198/ **549.90**	**1500** for 2 lane two way	0.37 **(B – Very Good)**
Kullanchavadi	Kullanchavadi – Kurinjipadi Total	14053 / **585.55**	**1500** for 2 lane two way	0.39 **(B – Very Good)**
Alapakkam (NH 45 – A)	Kullanchavadi – Alapakkam Total	7514 / **313.10**	**1500** for 2 lane two way	0.21 **(B – Very Good)**
Villiyanalur	Villiyanallur – Alapakkam Total	21545 / **897.72**	**1500** for 2 lane two way	0.60 **(C – Good)**

The traffic projection for the normal traffic for Options Route 2 taking into considering the guidelines of IRC are estimated and provided in **Table C-9**.

Table C-9: Traffic Projections for Normal Traffic on Option Route -2

Road Name	Road Stretch	Per day for 2025						
		2W	3W	4W	6W	10W	12W	PCUS
Vadalur	Towards Maruvai	4687	23	3740	1390	129	114	11007
	Towards Vadalur	3851	17	2484	1202	135	83	8685
	Maruvai – Vadalur Total	8538	39	6224	2592	265	197	19692
Maruvai	Towards Pinnalur	3938	1	3506	884	101	96	8719
	Towards Maruvai	3927	1	3270	881	113	93	8494
	Pinnalur – Maruvai Total	7866	3	6777	1765	214	189	17213
Pinnalur	Towards Seithiyathope	3381	4	3369	903	111	77	8339
	Towards Pinnalur	3816	0	3584	916	111	87	8835
	Seithiyathope – Pinnalur Total	7197	4	6952	1819	222	165	17174
Seithiyathope	Towards Bhuvanagiri	4171	37	3476	941	83	45	8806
	Towards Sethiyathope	3774	35	2921	784	76	0	7422
	Bhuvanagiri –	7944	72	6397	1725	159	45	16228

Road Name	Road Stretch	Per day for 2025						
		2W	3W	4W	6W	10W	12W	PCUS
	Sethiyathope Total							
Bhuvanagiri	Towards Villiyanallur	4977	307	4200	671	176	194	10119
	Towards Bhuvanagiri	4718	144	3992	1178	125	63	10593
	Villiyanallur – Bhuvanagiri- Total	9695	450	8192	1849	301	257	20713

The total traffic projections for the normal and generated traffic are provided in **Table C-10**.

Table C-10: Total Traffic Projections for Normal + Generated Traffic for Option Route 2

Road Name	Road Stretch	Per day for 2025						
		2W	3W	4W	6W	10W	12W	PCUS
Vadalur	Maruvai – Vadalur Total	8538	39	6224	2704	377	309	20700
Maruvai	Pinnalur – Maruvai Total	7866	3	6777	1877	326	301	18221
Pinnalur	Seithiyathope – Pinnalur Total	7197	4	6952	1931	334	277	18182
Seithiyathope	Bhuvanagiri – Sethiyathope Total	7944	72	6397	1837	271	157	17236
Bhuvanagiri	Villiyanallur – Bhuvanagiri- Total	9695	450	8192	1961	413	369	21721

The conditions of the roads in Option Route 2 based on the traffic projections are provided in **Table C-11**.

Table C-11: Summary of Road Condition of Option Route 2 based on Total Traffic Projections

Road Name	Road Stretch	Total PCUs and PCUs/Hr (V)	IRC Standards Capacity (C) PCUs/hr	V/C (Level of Service)
Vadalur	Maruvai – Vadalur Total	20700/ **862.52**	**1500** for 2 lane two way	0.58 **(C – Good)**
Maruvai	Pinnalur – Maruvai Total	18221/ **759.21**	**1500** for 2 lane two way	0.51 **(C – Good)**
Pinnalur	Seithiyathope – Pinnalur Total	18182/**757.60**	**1500** for 2 lane two way	0.51 **(C – Good)**
Seithiyathope	Bhuvanagiri – Sethiyathope Total	17236/ **718.17**	**1500** for 2 lane two way	0.48 **(C – Good)**
Bhuvanagiri	Villiyanallur – Bhuvanagiri- Total	17236/ **905.02**	**1500** for 2 lane two way	0.60 **(C – Good)**

C.1.9 Advantages and Disadvantages of Alternative Routes Studied

The Multi-Criteria-Matrix of selection process is adopted to find out the best suited route for transporting indigenous coal from NLCIL Neyveli mines to ITPCL Site based on the Traffic studies findings and other factors.

Table C-12: MCM – Alternative Routes

S.No	Parameters	Units	Route 1	Route 2
1.	Distance from NLCIL Mines to ITPCL Plant Site	Km	44.2	51.2
2.	Road Conditions	-	Good with less Bends/Curves	Moderate with more Bends/Curves comparatively
3.	Fuel Consumption by Trucks	-	Less	More
4.	Emissions from Trucks	-	Less	More
5.	Level of Service of Existing Road for present/Normal Traffic	V/C Ratio	B,B,B,A,C (Good-Very Good-Excellent)	B,B,B,B,C (Good-Very Good)

S.No	Parameters	Units	Route 1	Route 2
6.	Level of Service of Existing Road for Projected Normal Traffic and ITPCL Generated Traffic	V/C Ratio	B,B,B,B,C (Good-Very Good)	C,C,C,C,C (Good)
7.	Enroute Habitations	Nos	27 including 2 Town Panchayats	27 including 3 Town Panchayats
8.	Land Use	-	The Land use abutting the route 1 is mining area, agricultural land, plantations, and waste land, built up area (Urban and Rural), dry tanks with few stream crossings	The Land use abutting the route 1 is mining area, agricultural land, plantations, and waste land, built up area (Urban and Rural), dry tanks with few stream crossings

C.1.10 Best Suited Route

Considering the above discussed advantages and disadvantages of Route 1 and Route 2, **Route 1** (NLCIL (Mandarakuppam/Neyveli) – Vadalur – Kurinjipadai bypass – Kullanchavadi – Alapakkam – Villiyanallur – ITPCL Site) is found suitable in all aspects (such as less distance, less emissions, good road conditions, good level of services, less enroute population) and hence **is preferred** for indigenous coal transport from NLCIL mines to ITPCL Site. This route is more or less same route which railway line is laid.

Appendix D: Surface Water Quality

Appendix D Surface Water Quality

Sl. No	Test Parameters	Unit of Measurement	SW1	SW2	SW3	SW4	SW5	SW6	IS2296-1982 Standard Class - C
1	pH	-	8.11	7.91	7.94	8.35	8.03	8.01	6.5-8.5
2	Colour	Hazen	1	2	1	3	2	7	300
3	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	--
4	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	--
5	Conductivity	µs/cm	852	1017	2630	393	993	10180	--
6	Turbidity	NTU	2	2	3	1	2	4	--
7	Total Dissolved Solids	mg/l	535	615	1590	245	632	6922	1500
8	Total Hardness as CaCO3	mg/l	217.1	200.1	646.3	100.6	223	854.6	--
9	Total Alkalinity	mg/l	135	75	315.2	68.5	215	585	--
10	Calcium as Ca+2	mg/l	62.4	44.8	152.2	26.4	48.9	91.8	--
11	Magnesium as mg+2	mg/l	14.8	21.4	64.6	8.4	24.5	151.9	--
12	Residual Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	--
13	Boron as B	mg/l	0.57	0.53	0.56	0.47	0.44	1.99	
14	Chlorides as Cl-	mg/l	129.8	198.7	509.5	56.1	118.5	3071.4	600
15	Sulphate as SO4	mg/l	101.4	142.5	261.8	41.6	84.3	158.5	400
16	Fluoride as F-	mg/l	0.6	0.9	1	1.2	0.3	1.6	1.5
17	Nitrates as NO3	mg/l	0.7	1.9	2.2	2.3	30.4	2.3	50
18	Sodium as Na+	mg/l	89.3	141.5	299.7	39.5	125.4	1924.8	--
19	Potassium as K+	mg/l	12.1	0.4	12.3	7.3	0.35	41.2	--
20	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.005
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05
22	Anionic Detergents	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1
23	Mineral Oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1
24	Cadmium as Cd	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
25	Total Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.2
26	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.5
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.1
28	Manganese as Mn	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--
29	Iron as Fe	mg/l	0.084	0.044	0.063	0.14	0.034	0.26	50
30	Total Chromium as Cr	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05
31	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05
32	Zinc as Zn	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	15
33	Aluminium as Al	mg/l	0.57	0.36	1.2	0.22	0.34	<0.01	--

Sl. No	Test Parameters	Unit of Measurement	SW1	SW2	SW3	SW4	SW5	SW6	IS2296-1982 Standard Class - C
34	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--
35	Pesticides	-----	Absent	Absent	Absent	Absent	Absent	Absent	
36	E. Coli	MPN/100 ml	291	196	255	333	437	365	
37	Total Coliforms	MPN/100 ml	390	270	340	460	590	490	5000
38	Fecal Coliforms	MPN/100 ml	99	74	85	127	153	125	--
39	Nickel as Ni	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--
40	Molybdenum as Mo	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
41	Salinity	ppt	0.23	0.36	0.92	0.1	0.21	5.55	
42	Barium as Ba	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
43	Ammonia (as Total Ammonia-N)	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
44	Temperature- ºC	ºC	25	25	25	25	25	25	--
45	Total Solids	mg/l	748	971	2103	428	840	8213	--
46	Silver as Ag	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
47	Sulphide as H2S	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
48	Total Nitrogen	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--
49	Total Phosphorous	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--
50	Biochemical Oxygen Demand	mg/l	<3	<3	<3	<3	<3	<3	3
51	Chemical Oxygen Demand	mg/l	<5	<5	<5	<5	<5	<5	--
52	Dissolved Oxygen	mg/l	5.4	5.6	5.1	5.8	5.9	4.8	4
53	Polynuclear aromatic hydrocarbons (as PAH)	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	
54	Alpha Emitters	µc/l	BDL	BDL	BDL	BDL	BDL	BDL	10(-9)
55	Beta Emitters	µc/l	BDL	BDL	BDL	BDL	BDL	BDL	10(-8)

Station Code	Name
SW 1	Water body Near Nattalkuppam
SW 2	Perumal Eri Near Palliodai
SW 3	Stream (Uppanar) Near Gopalapuram (Tidal Influenced)
SW 4	Kanyakvil Odai/ Neyveli River Near Andikuppam
SW 5	Perumal Eri Overflow Channel Near Anaiyampettai
SW 6	Buckingham Canal Near ITPCL Site (Tidal Influenced)

Appendix E: Ground Water Quality

Appendix E Ground Water Quality

Sl. No	Test Parameters	Unit	GW 1	GW 2	GW 3	GW 4	GW 5	GW 6	IS: 10500 (2012) Desirable Limits	IS: 10500 (2012) Permissible Limits
1	pH	-	7.12	7.91	7.86	8.27	8.21	8.43	6.5 – 8.5	NO Relaxation.
2	Colour	Hazen	1	2	1	2	2	1	5	15
3	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Conductivity	µs/cm	556	1097	938	1129	1264	986	--	--
6	Turbidity	NTU	2	3	2	3	3	2	1	5
7	Total Dissolved Solids	mg/l	352	695	587	710	795	635	500	2000
8	Total Hardness As CaCO3	mg/l	154.9	262.7	309.9	323.5	322.7	172.5	200	600
9	Total Alkalinity	mg/l	83.8	175.3	190	210	225	159	200	600
10	Calcium as Ca+2	mg/l	44.7	64.6	72.1	81.3	75.6	38.2	75	200
11	Magnesium as mg+2	mg/l	10.5	24.6	31.5	29.2	32.5	18.7	30	100
12	Residual Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2 min	1
13	Boron as B	mg/l	0.36	0.35	0.42	0.38	0.38	0.32	0.5	1
14	Chlorides as Cl-	mg/l	82.1	161.4	133.5	188.3	211.2	136.7	250	1000
15	Sulphate as SO4	mg/l	48.6	130.2	68.6	74.6	94.5	110.9	200	400
16	Fluoride as F-	mg/l	0.4	0.5	1.1	0.8	0.9	0.7	1	1.5
17	Nitrates as NO3	mg/l	31.1	11.2	20.5	9.6	11.1	28.3	45	NO Relaxation
18	Sodium as Na+	mg/l	54.8	125.8	71.6	107.5	136.4	144.5	--	--
19	Potassium as K+	mg/l	2.39	10.34	3.45	5.08	11.3	4.6	--	--
20	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	NO Relaxation
22	Anionic Detergents	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	1
23	Mineral Oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5	NO Relaxation
24	Cadmium as Cd	mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	NO Relaxation
25	Total Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.05
26	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	1.5
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	NO Relaxation

Sl. No	Test Parameters	Unit	GW 1	GW 2	GW 3	GW 4	GW 5	GW 6	IS: 10500 (2012) Desirable Limits	IS: 10500 (2012) Permissible Limits
28	Manganese as Mn	mg/l	<0.01	0.29	<0.01	<0.01	1.35	<0.01	0.1	0.3
29	Iron as Fe	mg/l	0.056	0.043	0.052	0.07	0.14	0.063	0.3	NO Relaxation
30	Total Chromium as Cr	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NO Relaxation
31	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	NO Relaxation
32	Zinc as Zn	mg/l	<0.01	<0.01	<0.01	<0.01	6.9	0.013	5	15
33	Aluminium as Al	mg/l	0.46	0.54	0.86	0.82	0.77	0.18	0.03	0.2
34	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NO Relaxation
35	Pesticides	µg/l	Absent	Absent	Absent	Absent	Absent	Absent	Depend on Type of Persticide	NO Relaxation
36	E. Coli	MPN/100ml	Absent	Absent	Absent	Absent	Absent	Absent	Shall Not be Detected in any 100 ml	
37	Total Coliforms	MPN/100ml	<2	<2	<2	<2	<2	<2	--	--
38	Fecal Coliforms	MPN/100ml	Absent	Absent	Absent	Absent	Absent	Absent	--	--
39	Nickel as Ni	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	NO Relaxation
40	Molybdenum as Mo	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07	NO Relaxation
41	Salinity	ppt	0.15	0.29	0.24	0.34	0.38	0.25	--	--
42	Barium as Ba	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.7	NO Relaxation
43	Ammonia (as Total Ammonia-N)	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	NO Relaxation
44	Temperature- ºC		25	25	25	25	25	25	--	--
45	Total Solids	mg/l	436	895	712	829	887	746	--	--
46	Silver as Ag	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	NO Relaxation
47	Sulphide as H2S	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.05	NO Relaxation
48	Total Nitrogen	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	--
49	Total Phosphorous	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	--
50	Biochemical Oxygen Demand	mg/l	<3	<3	<3	<3	<3	<3	--	--
51	Chemical Oxygen Demand	mg/l	<5	<5	<5	<5	<5	<5	--	--
52	Dissolved Oxygen	mg/l	5	5	5	5	5	5	--	--
53	Polynuclear aromatic hydrocarbons (as PAH)	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	0.0001	NO Relaxation
54	Alpha Emitters	Bq/l	BDL	BDL	BDL	BDL	BDL	BDL	0.1	NO Relaxation
55	Beta Emitters	Bq/l	BDL	BDL	BDL	BDL	BDL	BDL	1	NO Relaxation

Station Code	Name
GWR 1	Vadalur
GWR 2	Villiyanallur
GWR 3	Kurinjipadi
GWR 4	Tambipettai
GWR 5	Alapakkam
GWR 6	Kullanchavadi

Appendix F: Soil Quality

Appendix F Soil Quality

S.No.	Parameters	Units	S1 - Vadalur	S2 - Villiyanallur	S3 - Kurinjippadi	S4 - Tambipettai	S5 - Alappakkam	S6 – Kullanchavadi
1	Texture	-	Sandy Clay Loam	Sandy Loam	Sandy Clay	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam
2	Particle size Distributions	Sand %	51	46	48	49	52	54
		Silt %	11	36	13	19	12	16
		Clay %	38	18	39	32	36	30
3	Color	-	Brownish	Brownish	Grey	Grey	Brownish	Brownish
4	Soil Type	--	SCL	SL	SC	SCL	SCL	SCL
5	pH (10% Slurry)	-	5.35	6.3	6.79	7.52	5.73	6.36
6	Conductivity	µs/cm	315	413	251	152	288	101
7	Cation exchange Capacity	meq/100gr	24.6	13.2	11.4	17.2	15	12.6
8	Bulk density	gram/cc	1.1	1	1.1	1	1.1	1
9	Porosity	% v/v	48	49.6	43.1	48.2	48.8	49
10	Permeability	Cm/sec	3.2	3.8	0.15	3.1	3.4	3.7
11	Water holding capacity	%	28	15	25	18	17	22
12	Sodium Absorption Ratio	SAR	0.69	0.75	0.46	0.18	0.27	0.44
13	Infiltration capacity	cm/hour	3.58	4.72	0.19	3.45	3.63	3.89
14	Nitrogen as N	Kg/hac	29	13.1	40.5	31.5	37.7	28.6
15	Phosphorus as P	Kg/hac	72.2	54.7	93.9	43.9	62	41.6
16	Potassium as K	Kg/hac	485.3	321	515.5	278.8	438.2	338.9
17	Zinc as Zn	mg/kg	83.9	21.5	21.3	28.2	60.3	29.6
	Alkali Metals							
18	Sodium as Na	mg/kg	804	325	244	162	283	262
19	Potassium as K	mg/kg	552	280	347	234	537	371
20	Calcium as Ca	mg/kg	4995	1632	1613	1588	2018	1802
21	Magnesium as Mg	mg/kg	764	471	384	375	615	363
22	Chromium as Cr	mg/kg	70.7	38.2	50.7	117	56.7	76.9
23	Copper as Cu	mg/kg	41	9.1	27.7	19.1	13	13.7
24	Iron as Fe	%	1.73	0.43	1.55	2.50	1.67	1.30
25	Manganese as Mn	mg/kg	257	56.6	242	41.9	85.3	174.6
26	Lead as Pb	mg/kg	29.9	8.6	8.5	11.12	5.52	10.79
27	Nickel as Ni	mg/kg	31.7	20.7	35.1	19.2	19.1	21.38
28	Barium as Ba	mg/kg	82.7	24	52.9	39.5	37.6	43.5
29	Bismuth as Bl	mg/kg	14.1	<0.1	7.8	<0.1	<0.1	<0.1
30	Cadmium as Cd	mg/kg	10.1	1.5	0.6	<0.1	<0.1	<0.1
31	Cobalt as Co	mg/kg	14.5	3.5	10.7	2.7	3.15	6.4

Other parameters like Mercury, Selenium, Silver, Arsenic are found to be <0.1 mg/kg and Chloroform, Nitrobenzene, Trichlorophenol, Vinyl chloride, Pentachlorophenol etc. are Below the Limit of Quantitation.

Appendix G: Air Quality Model Study

Appendix G Air Quality Modelling Study

As there is no additional impact envisaged due to the use of blended coal compared to Imported coal use, only the impact on air environment due transportation of indigenous coal from NLC India Limited mines located at Neyveli has been predicted based on air quality modelling studies.

The AAQ model studies carried out covering the following scenarios:

- Line sources i.e. increased vehicular activity due to normal and generated traffic from NLC India Limited mines located at Neyveli to the site on Option Route 1 which is the preferred route and increased vehicular activity due to the normal traffic on Option Route 2 which is an alternate route.

G.1 Line Sources of Emissions considered for Air Quality Modelling

Vehicular traffic on different road stretches such as NH-532/ Vadalur Junction, Vadalur to Kurunjipadi, Kurunjipadi to Kullanchavadi, Kullanchavadi to Alapakkam, Alapakkam to Viliyanallur & Viliyanallur to Site of the preferred option route 1 due to normal traffic and generated traffic and Vadalur to Maruvai, Maruvai to Pinnalur, Pinnalur to Seithiyathope, Seithiyathope to Bhuvanagiri & Bhuvanagiri to Villiyanallur of the alternate option route 2 due to the normal traffic has been considered for Air Quality Modelling. The number of vehicle trips per day due to Heavy Vehicles, Light Commercial vehicles and two/three wheelers on the above roads are estimated in the traffic & transportation study has been considered for air quality modelling.

The details of the emissions from the heavy, light vehicles and two/three wheelers estimated are given in **Table G-1** to **Table G-11.**

Table G-1: Emission Details of Vehicles on NH-532/ Vadalur Junction (Route 1)

Parameter	NH-532/ Vadalur Junction		
	Heavy Vehicle	Light Vehicle	Two/Three Wheeler
Vehicle Trips per Day	1118	1575	3753
Emission factor of SO_2 (g/km)	0.0043	0.0027	0.0006
Emission rate of SO_2 (g/s)	0.00051767	0.000452552	0.000242385
Emission factor of PM (g/km)	0.03	0.0008	0.0096
Emission rate of PM_{10} (g/s)	0.002166991	8.13577E-05	0.002326896
Emission rate of $PM_{2.5}$ (g/s)	0.000867	3.25E-05	0.000930759
Emission factor of NO_2 (g/km)	0.6887	0.0454	0.134
Emission rate of NO_2(g/s)	0.082911487	0.007695079	0.054132661

Table G-2: Emission Details of Vehicles on Vadalur to Kurunjipadi (Route 1)

Parameter	Vadalur to Kurunjipadi		
	Heavy Vehicle	Light Vehicle	Two/Three Wheeler
Vehicle Trips per Day	613	710	3911
Emission factor of SO_2 (g/km)	0.0043	0.0027	0.0006
Emission rate of SO_2 (g/s)	0.000164698	0.000118478	0.000146678
Emission factor of PM (g/km)	0.03	0.0008	0.0096
Emission rate of PM_{10} (g/s)	0.000689432	2.12995E-05	0.001408112
Emission rate of $PM_{2.5}$ (g/s)	0.000275773	8.5198E-06	0.000563245
Emission factor of NO_2 (g/km)	0.6887	0.0454	0.134
Emission rate of NO_2 (g/s)	0.026378428	0.002014577	0.03275815

Table G-3: Emission Details of Vehicles on Kurunjipadi to Kullanchavadi (Route 1)

Parameter	Kurunjipadi to Kullanchavadi		
	Heavy Vehicle	Light Vehicle	Two/Three Wheeler
Vehicle Trips per Day	757	849	3219
Emission factor of SO_2 (g/km)	0.0043	0.0027	0.0006
Emission rate of SO_2 (g/s)	0.000365614	0.000254557	0.000216832
Emission factor of PM (g/km)	0.03	0.0008	0.0096
Emission rate of PM_{10} (g/s)	0.001530476	4.57631E-05	0.002081583
Emission rate of $PM_{2.5}$ (g/s)	0.00061219	1.83052E-05	0.000832633
Emission factor of NO_2 (g/km)	0.6887	0.0454	0.134
Emission rate of NO_2 (g/s)	0.058557711	0.004328423	0.04842572

Table G-4: Emission Details of Vehicles on Kullanchavadi to Alapakkam (Route 1)

Parameter	Kullanchavadi to Alapakkam		
	Heavy Vehicle	Light Vehicle	Two/Three Wheeler
Vehicle Trips per Day	461	433	2133
Emission factor of SO_2 (g/km)	0.0043	0.0027	0.0006
Emission rate of SO_2 (g/s)	0.000144664	8.42506E-05	9.331E-05
Emission factor of PM (g/km)	0.03	0.0008	0.0096
Emission rate of PM_{10} (g/s)	0.00060557	1.51462E-05	0.000895776
Emission rate of $PM_{2.5}$ (g/s)	0.000242228	6.05847E-06	0.00035831
Emission factor of NO_2 (g/km)	0.6887	0.0454	0.134
Emission rate of NO_2 (g/s)	0.023169794	0.001432575	0.020839225

Table G-5: Emission Details of Vehicles on Alapakkam to Viliyanallur (Route 1)

Parameter	Alapakkam to Viliyanallur		
	Heavy Vehicle	Light Vehicle	Two/Three Wheeler
Vehicle Trips per Day	943	2574	2946
Emission factor of SO_2 (g/km)	0.0043	0.0027	0.0006
Emission rate of SO_2 (g/s)	0.000497469	0.000843195	0.000216872
Emission factor of PM (g/km)	0.03	0.0008	0.0096
Emission rate of PM_{10} (g/s)	0.002082429	0.000151586	0.002081971
Emission rate of $PM_{2.5}$ (g/s)	0.000832972	6.06343E-05	0.000832789
Emission factor of NO_2 (g/km)	0.6887	0.0454	0.134
Emission rate of NO_2 (g/s)	0.079676048	0.014337476	0.048434748

Table G-6: Emission Details of Vehicles on Viliyanallur to Site (Route 1)

Parameter	Viliyanallur to Site		
	Heavy Vehicle	Light Vehicle	Two/Three Wheeler
Vehicle Trips per Day	366	129	147
Emission factor of SO_2 (g/km)	0.0043	0.0027	0.0006
Emission rate of SO_2 (g/s)	5.28747E-05	1.15343E-05	2.96665E-06
Emission factor of PM (g/km)	0.03	0.0008	0.0096
Emission rate of PM_{10} (g/s)	0.000221336	2.07358E-06	2.84798E-05
Emission rate of $PM_{2.5}$ (g/s)	8.85344E-05	8.29431E-07	1.13919E-05
Emission factor of NO_2 (g/km)	0.6887	0.0454	0.134
Emission rate of NO_2 (g/s)	0.008468563	0.000196126	0.000662551

Table G-7: Emission Details of Vehicles on Vadalur to Maruvai (Route 2)

Parameter	Vadalur to Maruvai		
	Heavy Vehicle	Light Vehicle	Two/Three Wheeler
Vehicle Trips per Day	883	1801	2482
Emission factor of SO_2 (g/km)	0.0043	0.0027	0.0006
Emission rate of SO_2 (g/s)	0.000105518	0.000133545	4.13614E-05
Emission factor of PM (g/km)	0.03	0.0008	0.0096
Emission rate of PM_{10} (g/s)	0.000441704	2.40081E-05	0.000397069
Emission rate of $PM_{2.5}$ (g/s)	0.000177	9.60E-06	0.000158828
Emission factor of NO_2 (g/km)	0.6887	0.0454	0.134
Emission rate of NO_2 (g/s)	0.016900084	0.002270763	0.00923738

Table G-8: Emission Details of Vehicles on Maruvai to Pinnalur (Route 2)

Parameter	Maruvai to Pinnalur		
	Heavy Vehicle	Light Vehicle	Two/Three Wheeler
Vehicle Trips per Day	627	1961	2277
Emission factor of SO_2 (g/km)	0.0043	0.0027	0.0006
Emission rate of SO_2 (g/s)	0.000227772	0.000442291	0.000115406
Emission factor of PM (g/km)	0.03	0.0008	0.0096
Emission rate of PM_{10} (g/s)	0.000953463	7.9513E-05	0.001107899
Emission rate of $PM_{2.5}$ (g/s)	0.000381385	3.18052E-05	0.00044316
Emission factor of NO_2 (g/km)	0.6887	0.0454	0.134
Emission rate of NO_2 (g/s)	0.036480558	0.007520609	0.025774048

Table G-9: Emission Details of Vehicles on Pinnalur to Seithiyathope (Route 2)

Parameter	Pinnalur to Seithiyathope		
	Heavy Vehicle	Light Vehicle	Two/Three Wheeler
Vehicle Trips per Day	638	2011	2084
Emission factor of SO_2 (g/km)	0.0043	0.0027	0.0006
Emission rate of SO_2 (g/s)	7.94223E-05	0.000155401	3.61726E-05
Emission factor of PM (g/km)	0.03	0.0008	0.0096
Emission rate of PM_{10} (g/s)	0.000332465	2.79373E-05	0.000347257
Emission rate of $PM_{2.5}$ (g/s)	0.000132986	1.11749E-05	0.000138903
Emission factor of NO_2 (g/km)	0.6887	0.0454	0.134
Emission rate of NO_2 (g/s)	0.012720494	0.0026424	0.00807854

Table G-10: Emission Details of Vehicles on Seithiyathope to Bhuvanagiri (Route 2)

Parameter	Seithiyathope to Bhuvanagiri		
	Heavy Vehicle	Light Vehicle	Two/Three Wheeler
Vehicle Trips per Day	558	1851	2319
Emission factor of SO_2 (g/km)	0.0043	0.0027	0.0006
Emission rate of SO_2 (g/s)	0.000263887	0.000543316	0.000153006
Emission factor of PM (g/km)	0.03	0.0008	0.0096
Emission rate of PM_{10} (g/s)	0.001104642	9.76747E-05	0.001468859
Emission rate of $PM_{2.5}$ (g/s)	0.000441857	3.90699E-05	0.000587544
Emission factor of NO_2 (g/km)	0.6887	0.0454	0.134
Emission rate of NO_2(g/s)	0.042264813	0.009238399	0.034171373

Table G-11: Emission Details of Vehicles on Bhuvanagiri to Villiyanallur (Route 2)

Parameter	Bhuvanagiri to Villiyanallur		
	Heavy Vehicle	Light Vehicle	Two/Three Wheeler
Vehicle Trips per Day	697	2370	2935
Emission factor of SO_2 (g/km)	0.0043	0.0027	0.0006
Emission rate of SO_2 (g/s)	0.000596259	0.001259795	0.000350593
Emission factor of PM (g/km)	0.03	0.0008	0.0096
Emission rate of PM_{10} (g/s)	0.002495967	0.00022648	0.003365689
Emission rate of $PM_{2.5}$ (g/s)	0.000998387	9.0592E-05	0.001346276
Emission factor of NO_2 (g/km)	0.6887	0.0454	0.134
Emission rate of NO_2 (g/s)	0.095498456	0.021421225	0.078299019

As these emissions are assumed as continuous in nature and this line source is considered as a string of volume source for Air Quality modelling for prediction of impacts.

G.2 AERMOD Model

AERMOD is a 'near-field, steady-state' Gaussian model. It uses boundary-layer similarity theory to define turbulence and dispersion coefficients as a continuum, rather than as a discrete set of stability classes. Variation of turbulence with height allows a better treatment of dispersion from different release heights. AERMOD requires Surface as well as Upper Air data as meteorological input.

G.2.1 Model Assumptions

The following are the assumptions for the air quality modelling;

- Uses rural dispersion
- Stack-tip downwash
- Model assumes receptor on flat terrain
- Used calms processing routine
- Used missing data processing routine
- No exponential decay
- No Dry and Wet Depletion

Input Data: The technical details considered for Air Quality Modelling studies are provided from **Table G-1** to **Table G-11**.

G.2.2 Meteorological Data Considered

For the purpose of carrying out the air quality modelling study, site specific meteorological data (pre-processed from MM5) for the complete year of 2017 (January to December) obtained from Lakes Environment was used. The raw met data have been processed in AERMET view to create surface and upper air data which can be used as inputs to AERMOD.

G.2.3 Wind Speed and Wind Direction

The wind roses were drawn for the met files obtained on a sixteen-point compass (N, NNE, NE, ENE; E, ESE, SE, SSE; S, SSW, SW, WSW; W, WNW, NW, and NNW). Wind pattern representing 24 hours for the entire year of 2017 is discussed. The frequency occurrence of wind at various speeds was calculated on the basis of total number of observations recorded in the respective wind speed category. The overall wind pattern recorded for 24 hours during the year 2017 is given in **Figure G-1**. The predominant wind directions observed were from South West followed by North East; calm conditions prevailed for 4.16% of the total time. The average wind speed was observed to be 3.19 m/s.

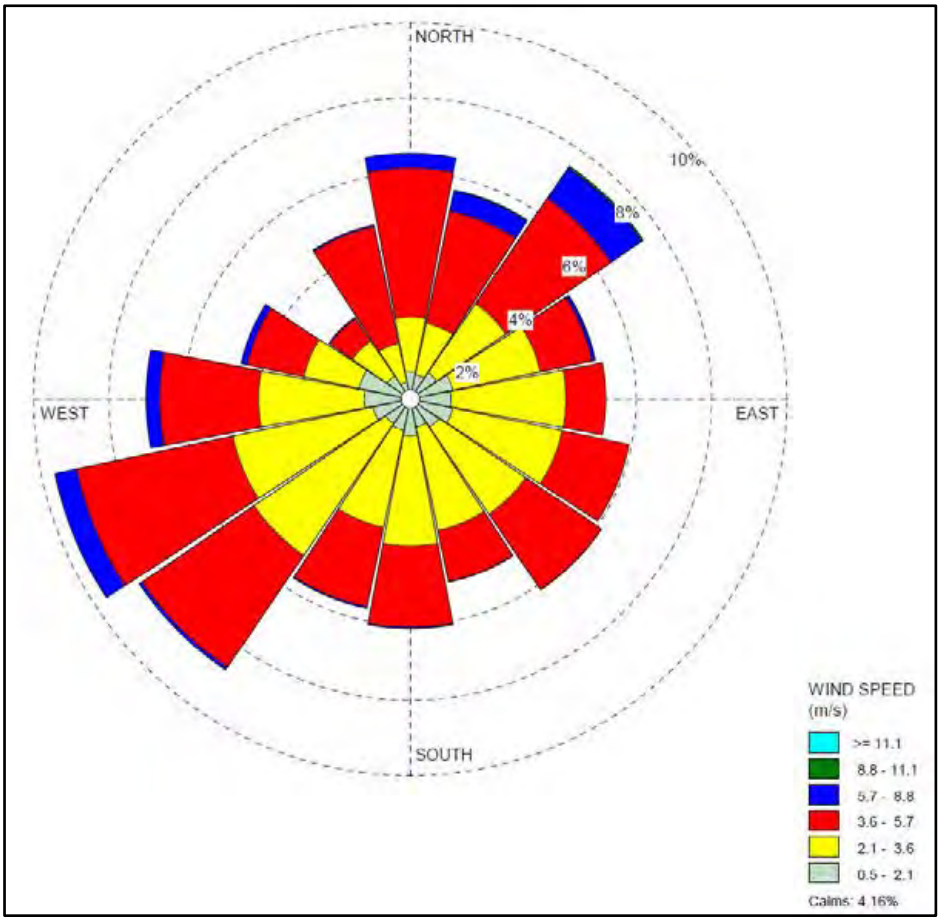


Figure G-1: Annual Wind Rose Diagram (January – December 2017)

G.2.4 Receptor Locations

The details of the receptors which are monitored for the baseline data on preferred coal transportation route & alternative route and monitored as a part of the compliance report are provided in **Table G-12**.

Table G-12: Receptor Details

Station Code	Name	Distance from Road (km)	Environmental Setting
AAQ Monitoring Locations along Preferred Coal Transportation Route			
AR 1	Neyveli		
AR 2	Vadalur		
AR 3	Kurinjipadi		
AR 4	Tambipettai		
AR 5	Kullanchavadi		
AR 6	Alapakkam	> 0.1	Industrial, Residential, Rural and Other areas
AR 7	Villiyanallur		
AAQ Monitoring Locations along Alternate Coal Transportation Route			Industrial, Residential, Rural and Other areas
AR 8	Maruvai		
AR 9	Pinnalur		
AR 10	Odaiyur		
AR 11	Seithyathope Near X Road		
AR 12	Bhuvanagiri		

G.2.5 Model Results

The 1st highest 24 hour average incremental for PM_{10}, $PM_{2.5}$, SO_2 and NO_2 for AAQ monitoring locations are given in **Table G-13** to **Table G-16** .

Table G-13: 1st 24-hour Average Average Incremental Concentration of PM_{10}

Location No.	Receptors	1st 24 Hour Average Incremental Concentration (µg/m³)	Baseline Concentration (µg/m³)	Resultant Concentration (µg/m³)	NAAQ Standards (µg/m³)
				1st 24 Hour	24 Hour
		PM_{10}			
AR1	Neyveli	0.022	70.6	70.62	100
AR2	Vadalur	0.406	64.8	65.21	
AR3	Kurinjipadi	0.145	66.8	66.94	
AR4	Tambipettai	0.224	61.0	61.22	
AR5	Kullanchavadi	0.217	57.4	57.62	
AR6	Alapakkam	0.100	60.4	60.50	
AR7	Villiyanallur	0.088	62.4	62.49	
AR8	Maruvai	0.113	58.6	58.71	
AR9	Pinnalur	0.159	55.7	55.86	
AR10	Odaiyur	0.113	56.4	56.51	
AR11	Seithyathope Near X Road	0.076	55.2	55.28	
AR12	Bhuvanagiri	0.246	63.7	63.95	

Table G-14: 1st 24-hour Average Average Incremental Concentration of $PM_{2.5}$

Location No.	Receptors	1st 24 Hour Average Incremental Concentration (µg/m³)	Baseline Concentration (µg/m³)	Resultant Concentration (µg/m³)	NAAQ Standards (µg/m³)
				1st 24 Hour	24 Hour
		$PM_{2.5}$			
AR1	Neyveli	0.009	26.2	26.21	60
AR2	Vadalur	0.163	22.5	22.66	
AR3	Kurinjipadi	0.058	24.0	24.06	
AR4	Tambipettai	0.089	20.8	20.89	
AR5	Kullanchavadi	0.087	18.0	18.09	
AR6	Alapakkam	0.040	20.8	20.84	
AR7	Villiyanallur	0.035	21.3	21.34	
AR8	Maruvai	0.045	19.7	19.75	
AR9	Pinnalur	0.064	18.0	18.06	
AR10	Odaiyur	0.045	19.9	19.95	
AR11	Seithyathope Near X Road	0.031	18.3	18.33	
AR12	Bhuvanagiri	0.098	21.5	21.60	

Table G-15: 1st 24-hour Average Average Incremental Concentration of SO_2

Location No.	Receptors	1st 24 Hour Average Incremental Concentration (µg/m³)	Baseline Concentration (µg/m³)	Resultant Concentration (µg/m³)	NAAQ Standards (µg/m³)
				1st 24 Hour	24 Hour
		SO_2			
AR1	Neyveli	0.006	15.5	15.51	80
AR2	Vadalur	0.082	11.2	11.28	
AR3	Kurinjipadi	0.029	12.6	12.63	
AR4	Tambipettai	0.047	10.5	10.55	
AR5	Kullanchavadi	0.041	9.2	9.24	
AR6	Alapakkam	0.031	10.1	10.13	
AR7	Villiyanallur	0.030	11.6	11.63	

Location No.	Receptors	1st 24 Hour Average Incremental Concentration (µg/m³)	Baseline Concentration (µg/m³)	Resultant Concentration (µg/m³)	NAAQ Standards (µg/m³)
				1st 24 Hour	24 Hour
		SO_2			
AR8	Maruvai	0.035	9.9	9.93	
AR9	Pinnalur	0.051	8.8	8.85	
AR10	Odaiyur	0.038	8.5	8.54	
AR11	Seithyathope Near X Road	0.026	8.0	8.03	
AR12	Bhuvanagiri	0.083	10.8	10.88	

Table G-16: 1st 24-hour Average Average Incremental Concentration of NO_2

Location No.	Receptors	1st 24 Hour Average Incremental Concentration (µg/m³)	Baseline Concentration (µg/m³)	Resultant Concentration (µg/m³)	NAAQ Standards (µg/m³)
				1st 24 Hour	24 Hour
		NO_2			
AR1	Neyveli	0.682	17.0	17.68	
AR2	Vadalur	10.951	13.0	23.95	
AR3	Kurinjipadi	4.035	14.1	18.14	
AR4	Tambipettai	6.306	14.1	20.41	
AR5	Kullanchavadi	5.932	11.3	17.23	
AR6	Alapakkam	2.957	13.7	16.66	
AR7	Villiyanallur	2.716	15.2	17.92	80
AR8	Maruvai	3.358	12.8	16.16	
AR9	Pinnalur	4.653	10.9	15.55	
AR10	Odaiyur	3.391	10.2	13.59	
AR11	Seithyathope Near X Road	2.334	10.4	12.73	
AR12	Bhuvanagiri	7.309	12.9	20.21	

G.2.6 Isopleths

The Isopleths for 1st incremental 24-hour Average Concentration of all the parameters are given in **Figure G-2** to **Figure G-5**.

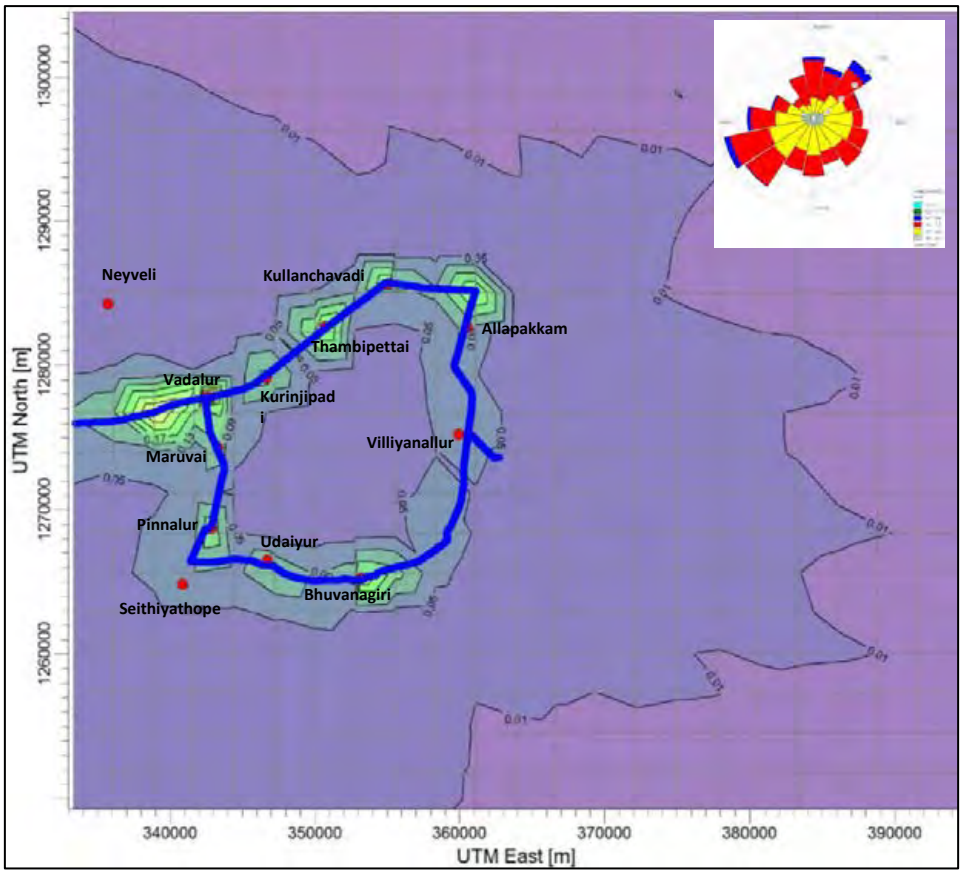


Figure G-2: Isopleth for 1st 24-Hr Average Incremental Concentration of PM_{10}

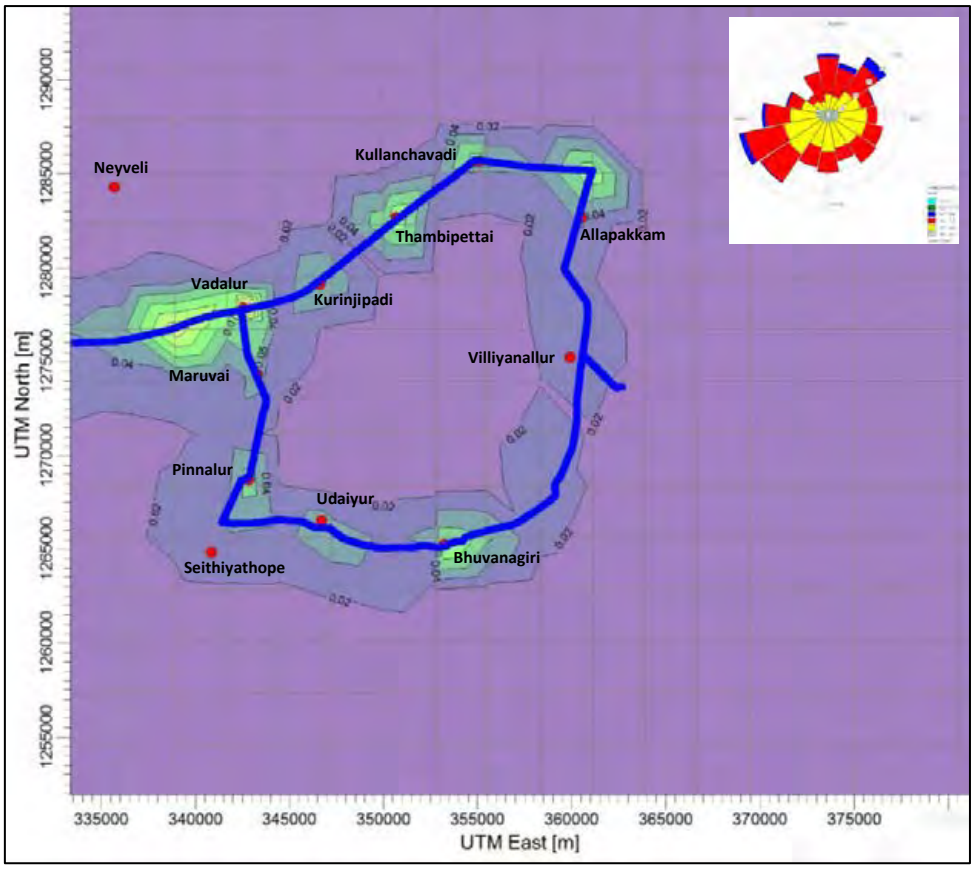


Figure G-3: Isopleth for 1st 24-Hr Average Incremental Concentration of $PM_{2.5}$

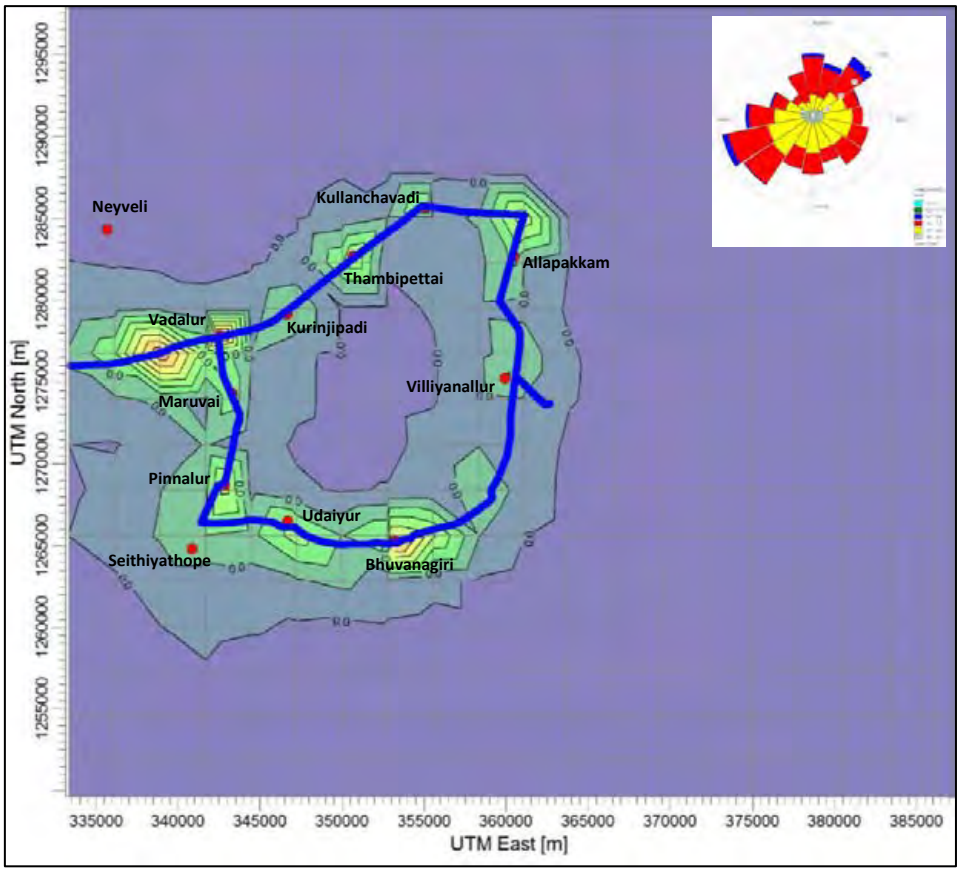


Figure G-4: Isopleth for 1st 24-Hr Average Incremental Concentration of SO_2

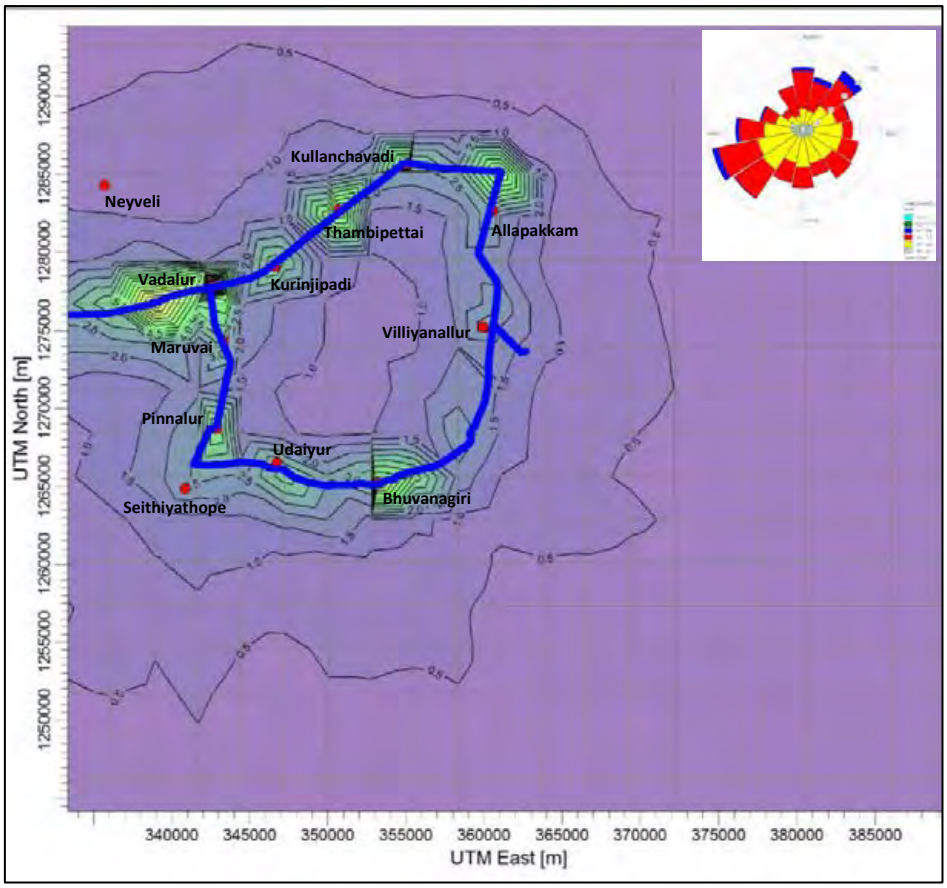


Figure G-5: Isopleth for 1st 24-Hr Average Incremental Concentration of NO_2

G.2.7 Observations at Receptors

It is pertinent to mention that the existing ambient air quality status presented in the baseline chapter is inclusive of emissions from existing 1200 MW Imported coal based units as well as present traffic emissions in the Route 1 and 2.

The predicted 1st highest 24 hour average average incremental concentrations of PM_{10}, $PM_{2.5}$, SO_2 and NO_2 for AAQ monitoring receptors locations as well as resultant concentrations are found to be well within the National Ambient Air Quality Standards (NAAQS), 2009 due to the transportation of indigenous coal.

Appendix H: CSR Activities

CSR Initiatives

As a responsible Corporate Citizen the Company has been participating in all-round development of the Community around the project area by contributing to the improvement of infrastructure facilities, education, livelihood, health care and sanitation facilities apart from providing employment and business opportunities to the local villagers.

As a part of IL&FS Group, our imbibed culture is to bring in the best possible, sustainable, scalable and replicable solutions for the projects and the community around our project area. Inclusion of community has been an integral part of our project design.

The Company has designed a well thought out strategy for fulfilling the socio-economic needs of the community and at times also consulted with the District administration while implementing various CSR initiatives in villages around the plant.

Healthcare Initiatives

The Company along with Deepam Education Society for Health (DESH) launched "Arogyam" a healthcare program in 2013 focusing on both curative and preventive healthcare. A total of 180 villages having a population of nearly 1,00,000 have been covered by two Mobile Medical Units (MMUs) and one static clinic which provides diagnostic facilities, medicines, expert doctors, special camps on secondary health issues.

Also, the patients are screened/tested for non-communicable diseases and those needing further attention are referred to government hospitals or nearby specialty hospitals.

Further, DESH also conducts a customized program named HAPPY designed with an objective to promote health and reduce the vulnerability to substance use/abuse among youth. HAPPY has been implemented in 11 schools with students from class 6 to 12 benefitting 2300 students, 105 Peer educators and 11 teachers from the programme.

Education

The Company has provided physical infrastructure and basic amenities to schools around project area. Apart from this, the Company has donated computers and K-Yans projectors for computer based visual learning in surrounding schools. A Vocational Education programme by the name 'Introduction to Basic Technology' has been introduced in 3 schools benefitting 540 children of class 8th, 9th & 10th. The program focus is mainly on 'Learning while doing' principle.

Livelihood

The Company has constructed a safe landing facility for boats of fishermen in the nearby villages. For this purpose, the Company has dredged the creek and constructed a trainer wall and floating berth besides improvement of infrastructure of the fishing boat landing jetty. Further, the Company has been undertaking regular maintenance of the facility including dredging of the creek.

An in depth water resource assessment study was commissioned with the help of National Agro Foundation covering an area of 5600 Ha spread across 4 micro watersheds of Villiyanallur, Kothatai, Ariyakoshti and Agaram covering about 10,000 families. The study highlighted that a) the population is majorly dependent on rain-fed agriculture for livelihood; b) there is an increased risk of salinity ingress in the ground water which is a major source of drinking and irrigation purpose.

In order to address the same, a long-term action plan has been launched to improve the water quality and quantity, catchment with a ridge to valley approach in line with the Watershed Development guidelines and activities have already been commenced in Villiyanallur watershed. The Company has also approached NABARD to garner the fund support for this large program. The intervention will lead to improved quality and quantity of water and improved agriculture productivity through diverse cropping and increased crop cycles.

Infrastructure

ITPCL has extensively catered to the infrastructure needs of the local community and supported for Construction and Refurbishment of Schools, community halls, library, De-siltation of ponds and drains, Roads and construction of toilets for 2000+ households.

L&T INFRASTRUCTURE ENGINEERING LIMITED

6-3-1192/1/1, 5th Floor, Block No.3,
White House, Kundan Bagh, Begumpet, Hyderabad – 500 016
Ph: 91 -040 – 40354444 ; Fax: 91-040-40354430