Executive Summary

1.0 Introduction

Considering the present shortage in electricity supply, especially peaking shortages in the southern region and particularly in Tamil Nadu state as well as projections that the power shortages are going to increase as the demand for power increases in this region, M/s PEL Power Limited (PPL), a subsidiary of Patel Engineering group, envisages grass root development of a coal based thermal power plant in coastal belt of Nagapattinam district in Tamil Nadu state. It is proposed to use imported coal as fuel during normal operation of proposed thermal power plant (TPP).

M/s Fichtner Consulting Engineers (India) Private Limited, Bangalore, carried out the techno-economic feasibility study including evaluation of alternative sites for the proposed coastal thermal power plant M/s Fichtner consulting engineers prepared a detailed project report (DPR) based on the feasibility study for proposed TPP. As per this DPR the configuration of proposed TPP comprises 2 units of 500 MW capacity each, with matching coal import, storage and handling facilities; sea water intake, desalination unit, effluent outfall into sea and ash management system apart from the required infrastructure, onsite & offsite utilities. The township for the proposed TPP employees will be planned separately out side the proposed project site.

The site for proposed coastal thermal power plant was selected by the project proponent M/s PPL after evaluation of three potential alternative sites by their project consulting engineers. The identified site of about 1013 Acre land consisting undeveloped barren land and agriculture land in three villages in Nagapattinam district. Geographical coordinates of the project site centre location could be represented by 79°50'E, 11°07'N. The project site is in coastal belt with flat terrain and the ground elevation vary from –0.9m to +3.0m w.r.t. mean sea level (m.s.l.) with an average elevation of about 2.0 m above m.s.l. Bay of Bengal sea shore is at about 1.0 km distance from eastern boundary of project site (nearest point). The sea backwater (during high tide) reach to project site through Sevanar river, due to which CRZ/CMZ/HFL would be applicable to project site. The sea shore is covered with sand and there are no mangroves in this area. The National Highway-45A (Chidambaram–Karaikal–Nagapattinam section), also locally called as East Coast Road (ECR), is at 2.5 km distance (nearest point) in west direction from SW corner of project site. At present the nearest railway station, Myladuthurai / Mayuram (Broad gauge railway line), is at about 22 km distance from project site in west

direction. Karaikal sea port (medium scale) is nearest to project site which is at about 28 km away in south direction. The nearest Airport, Tiruchhirapalli, is at about 110 km distance from project site. There is no metropolitan city or highly populated town (>3,00,000 population) / urbanized area within 25 km radial distance around project site. The inter state boundary, Karaikal of Pondicheri state, is at about 12 km distance in south direction. There are no ecologically significant areas like National park, Sanctuary, Elephant / Tiger Reserve, important lakes or migratory routes, coastal areas rich in coral formations / mangroves etc. within 25 km radial distance. The project site is located in the coastal belt affected by Tsunami (2002) and Tropical depressions / cyclones (4-5 per year) formed in Bay of Bengal. The site falls in Seismic Zone-II [Low Damage Risk Zone (MSK VI or less)].

2.0 Project Description

The configuration of proposed 1000MW coal based TPP is planned through two units of 500MW capacity each. Each 500 MW unit will be an independent system consists matching capacity boiler for steam generation, DM water system, steam turbine generator (STG), condenser cooling system, hydrogen supply system, flue gas exhaust etc. as per the requirement. However, a common stack will be provided with twin flue paths for both units. The other required facilities like coal import & storage / handling, sea water system (for cooling & desalination), ash management system, power evacuation facilities, onsite / offsite utilities etc. are part of proposed project.

As per the selected technology, the steam generator / boiler of each unit will be centrifugal outdoor type with single furnace, single reheat, balanced draft and once through system. The gross station heat rate of 2450 kCal/kWh will be maintained as per CERC guidelines. The PCC sub-critical technology provides overall 33-36% heat efficiency. Necessary precautions shall be taken at each stage of project development, viz. design, equipment selection, construction / implementation as well as operation and maintenance of proposed TPP with the objective of resource conservation, minimization of loss / waste resulting to maximization of efficiency in this category of units resulting to minimization of environmental impacts.

The process involved in coal based power generation could be broadly categorized into steam generation, power conversion, post-combustion (flue gas) clean-up, coal handling and water management systems.

The steam generator will be designed according to the latest IBR and ASME Sec 1 to generate about 1624 ton/hr of super heated steam at 174.8 bar and 541^0C at the

super heater outlet considering the feed water inlet temperature of 253^{0}C at economiser inlet. Steam generator will be provided with a high efficiency Electrostatic precipitator to control the dust / Fly ash emission through flue gas. HP exhaust steam is reheated from 345^{0}C to 568^{0}C in the reheater at the turbine MCR condition and 1336 ton/hr is fed to IP turbine.

The maximum continuous rating (MCR) of coal firing to generate sufficient steam to produce 500 MW electric power would be 250 TPH considering an average gross calorific value of 4900 kCal/kg with 100% plant load factor and gross plant heat rate of 2450 kCal/kWh. The proposed 1000 MW TPP would require 500 TPH coal and daily requirement is estimated as 12000 metric tonne. The annual requirement of imported coal is estimated as about 4.38 million tonne.

The Indonesian coal shall be transported by sea route upto the proposed captive coal berth / Jetty near the project site. The imported coal from the ships will be unloaded into the hoppers, which would be positioned over the belt conveyers to convey the coal to project site.

The coal handling system at proposed TPP site covers facilities for receipt of coal by closed conveyor belt system, crushing, stacking coal reclaiming from stockpile and conveying upto coal mill and the steam generator bunkers. The coal handling system will have design capacity of 1200 TPH with two conveyors (one operating and one stand-by).

The steam generator will be designed for 100% coal firing in normal operation. The secondary fuel system will also be provided for boilers (steam generator) cold start-up and initial warm-up. For cold start-up and warm-up purposes Light Distillate Oil (LDO) will be used during commissioning as well as in periodical maintenance (shut down / startup) activities. Heavy Furnace Oil (HFO) will be used for warm start-up and for flame stabilisation at low load conditions. The estimated HFO and LDO requirement would be 1900 kL/month and 1175 kL/month respectively considering a firmed-up value of specific oil consumption. HFO and LDO will be received at project site through road tankers.

The water necessary at project site for heat cycle make-up, chilling plant make-up, sweet service water requirement, drinking water etc. would be drawn from sea water intake system and treated through desalination as well as demineralization.

Power Evacuation

Power generated at proposed TPP will be evacuated through 400 KV power transmission lines by TNEB/PGCIL. The location of line termination and number of evacuation lines will be finalised in consultation with TNEB/PGCIL.

Ash Handling System

The Ash Handling shall be done in automatic manner and / or remote manual mode programmable logic control system (PLC). The microprocessor based PLC would be configured with hot backup redundancy. The fly ash storage syllos will be designed to have a storage capacity of twenty four hours, and would be loaded in trucks to facilitate dispatch of ash to ash utilizing industries.

Pollution Control Measures in Project Conceptual Phase

The steam generators (Boilers) will be provided with high efficiency electrostatic precipitators with Microprocessor based controllers. The ESP will be designed to control particulate matters in flue gas to a maximum exit concentration of 50 mg/Nm^3. Sulphur dioxide emission level would be low, because of the low sulphur content in proposed coal.

Coal yard would be provided with water spray (dust suppression) system which would spray water on the coal piles. The Coal yard would have a drainage system to drain out rainwater & collect in a runoff pond.

The oil from unloading and pumping areas and drainage would be recovered by recovery pump and sent back to the oil tanks to minimise pollution.

Rain water harvesting will be provided in the plant for groundwater recharge, through percolation pit. Roof water will also be diverted into these pits after filling the pit with pebbles and river sand.

3.0 Description of Environment

The site for proposed grass root development of 1000 MW imported coal based power plant is located at Marudampallam village, Tarangambadi taluka of Nagapatttinam district (Tamil Nadu). The identified land of about 1013 Acre (410 Ha) for the proposed TPP project (79°50'E, 11°07'N) is on a flat terrain situated in coastal belt (an undeveloped rural area). The major part of identified project site consists abandoned aquaculture ponds, non productive barren (waste) land and balance part covered with irrigation land (one season crop / low productive). The Chidambarampakkam village dwellings are existing as per SoI toposheet, but the Chidambarampakkam village is not listed in 2001 census record (Govt. of India) for Nagapattinam district. The elevation of project site (1013 Acre) vary from -0.9 m to +3.0 m m.s.l. with an average of 2.0 m above m.s.l. It is bounded by Rajendran canal (dry during study period) on the north side and Kidangal – Chimankudi village road on the south. The project site is about 1.0 km distance from sea coast, i.e. away from local CRZ.

Air Environment

The baseline (pre-project) air quality status within the study area has been assessed during post-monsoon season through 10 Ambient Air Quality Monitoring (AAQM) stations. Based on the type of coal storage, handling and combustion activities at proposed project, the conventional air pollutants such as Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM), Sulphur dioxide (SO_2), Oxides of nitrogen (NOx) and Carbon monoxide (CO); and the project specific pollutants such as Ozone (O_3) and total Aldehydes (HCHO) in the form of formaldehyde as well as Mercury (Hg) and Arsenic (As) contents in particulate matter were identified for ambient air quality assessment. The standard methods prescribe for individual pollutant were followed to determine the concentration during study period.

The 8 hourly windroses during study period (September-November, 2008, Post-monsoon season) shows predominantly calm condition especially during night time. During day time the winds from NW-N sector as well as from ESE direction were observed with dominant wind speed class of 1-10 kmph during 08-16 hrs. During 16-24 hrs the winds from west were dominant along with NW and SSE winds. During the study period the maximum mixing height was observed as 1275 m in the afternoon hours, which includes local influences which is determined through in situ vertical temperature measurements by minisonde.

The average concentrations of Suspended Particulate Matter (SPM) and Respirable Particular Matter (RPM) at different locations varied from 49 $\mu g/m^3$ to 81$\mu g/m^3$ and 16 $\mu g/m^3$ to 20 $\mu g/m^3$ (24 hrly) respectively during study period while the entire range of SPM levels are 30-154 $\mu g/m^3$ (24 hrly) and RPM levels are 10- 52 $\mu g/m^3$ in the study area. The maximum RPM concentration was observed at Manikkappangu as 52 $\mu g/m^3$, it may be due to localized activities. The lowest observed values are 10 $\mu g/m^3$ at almost all the sites. The SO_2 and NOx concentrations in study area represent rural undeveloped region with mostly below detectable limits at all locations with highest concentrations of SO_2 : 15 $\mu g/m^3$ and NOx : 18 $\mu g/m^3$ during study period. The highest SPM concentration of 154$\mu g/m^3$ in the study area was observed at Tarangambadi, which is taluka headquarter and considered as a small town. The relatively higher value may be attributable to local road traffic, road conditions and commercial activities. During the study period, the 98^{th} percentiles of 24 hourly SPM concentrations are found in the range: 107-147 $\mu g/m^3$ in entire study area. The 98^{th} percentiles of RPM concentrations are found in the range: 28-49 $\mu g/m^3$.The average concentrations of 24 hrly SO_2 at individual locations varied between 2 and 4 which are equivalent to natural background levels and

the 98th percentile values of SO_2 during the study period were recorded in the range: 3-15µg/m^3. The mean concentrations of NOx at all locations varied from 4-7µg/m^3 during study period whereas the 98th percentiles of 24 hourly NOx were found in the range: 5-18µg/m^3. The NOx concentrations at project site (Marudampallam) were very low and found to be maximum 5 µg/m^3 .The 98th percentile concentrations of SPM, RPM, SO_2 and NOx (baseline status) are well within the stipulated National Ambient Air Quality Standards for residential, rural and other areas at all stations during study period (post-monsoon season). There are no notified sensitive areas within the project region (<25km radial distance). The 8 hourly concentrations of ozone (O_3) and Aldehydes (HCOH) were observed in the ranges of 2 to 10 µg/m^3 & 3 to 14 µg/m^3 respectively at all sampling locations during the study period. The Carbon monoxide (CO) concentrations at different locations were monitored within the study area and found very low range. In all the sites the levels of VOC are not detectable. The Mercury (Hg) and Arsenic (As) contents in SPM samples were found in the range : BDL-0.019 µg/m^3 and 0.001 µg/m^3-0.008 µg/m^3 respectively in the study area as background levels. The baseline air quality status in the study area represents predominant rural undeveloped region.

Noise Environment

The prevailing ambient noise levels were monitored at 15 villages, 1 existing industry and at 6 locations on National Highway (NH-45A) using precision noise level meters. The sound pressure level in villages were observed in the range of 36.8-72.5 dB(A) during day time and 34.0-65.4 dB(A) during night time. However the 1 hourly equivalent noise levels (Leq) in villages were observed in the range of 49.5-54.9 dB(A) during day time and 44.5-47.2 dB(A) during night time. The instantaneous sound pressure levels in villages were found to be high during day time as well as night time due to relatively high vehicular traffic with air horns on NH-45A as well as school, commercial activities in market places of individual villages and man made sources like public speakers in temples. However, the equivalent noise level found to be within the ambient noise standards prescribed by CPCB during day time, where as in night time at few places the equivalent noise levels were within the prescribed standards.

Water Environment

The baseline water quality status has been established by analyzing the surface water samples and ground water samples collected from various locations in the study area during post-monsoon season (September – November, 2008). Water samples from Cauvery River, were collected at two (2) locations, ground water samples from fifteen (15) locations in the study area . Coastal sea water samples were collected at six (6) locations

covering tidal cycle in about 19 km stretch falling in study area. The ground water samples were collected from hand pumps and bore wells. There was no dug well in this area. The physico-chemical characteristics of surface water samples shows that the pH values varied from 7.5-7.8 indicating surface water is neutral in nature. Turbidity varied between 2.44-2.85 NTU. The levels of TDS are very low in Cauvery river stretch ranging from 300-304 mg/l. Nutrient values in the form of Nitrate : 1.7-2.1 mg/l and Phosphate : 0.02 mg/l were observed in river water samples. The DO was observed in the range 6.0-6.3mg/l, while the BOD as well as COD were non-detectable. As per the physico-chemical characteristics observed during study period in water samples, the Cauvery river water in study area (near project site) match with 'A' class criteria according to CPCB classification of inland surface water. However, the flow available in this river stretch was very low during study period. The total coliform count in river water samples were found in the range of 20- 24 CFU/100 ml whereas faecal coliforms were found to be in the range of 6-10 CFU/100 ml.

The ground water quality of the study area showed a medium mineral content. The levels of total dissolved solids varied from 508-25184 mg/l, chlorides 85-6849 mg/l, sulphate 4.0-250 mg/l and total hardness 340-1200 mg/l . Marudampallam showing the lowest TDS value and Peruntottam showing the highest (i.e. 6400). Sea water must have intruded in some places. Turbidity of the ground water samples showed 0.3 to 52.8 NTU. Four ground water samples from Killiyur, Melperumpallam, Semangalam, & Manigramam were highly turbid showing 70.8, 52.8, 30.9 and 20.2 NTU respectively.

The coastal sea water quality of the study area showed a medium mineral content. The levels of total dissolved solids varied from 30140-39552 mg/l, sulphate 1625-2075 mg/l and total hardness 12500-15000 mg/l. Turbidity of the coastal sea water samples varied from 0.7 to 4 NTU during low tide and 1.97 to 7.4 NTU during the high tide. The coastal sea water quality in study area match with 'B' class criteria according to CPCB classification of inland surface water. . The density of total coliform was found in the range of 0-100 CFU/100 ml. In ground water sources the faecal coilform concentration was not detected.

Land Environment

The proposed site is situated on flat terrain with the elevation varying from -0.9m to +3.0m mean sea level (m.s.l) with an average elevation of about 2.0 m above m.s.l. The area surrounding project site upto 10 km radius also consists flat terrain consisting Cauvery river delta / estuary with multiple distributaries, rainfed agriculture fields and residential / dwellings in coastal villages and Bay of Bengal sea in eastern part of study

area. Major part of the study area is dominated by irrigated land i.e. 54% followed by 36% of area not available for cultivation. Unirrigated area is confined to 8% where as 2% of land comes under culturable waste area. The land use pattern shows the absence of forest land in the study area.Major crop grown in the study area is samba, (Type of Paddy), Which is a Rabi crop followed by blackgram which is a kharif crop. The other crops grown in study area are Thaladi, greengram, ground nut, cotton and kuruvai. Baseline data was collected to assess landuse / landcover of different villages within 10 km radial distance around project site.Total thirteen soil samples were collected from the study area within 10 km radial distance from project site.

The soil characteristics show that sandy clay loam is the prominent textural class in the impact zone followed by clay as second dominance and sandy loam as third dominance .Clay content in the soil of the study area varies from 3.2 to 43.2%. The soil from Neduvasal, Mudikondanallur and Manikkappangu have low clay content. The soil being of friable consistency, the bulk density of the soil is in the range of 1.28 to 1.44 g/cm^3 whereas the porosity and water holding capacity are in the range of 36.18-50.82% and 26.43-40.24 % respectively. Low bulk density values (1-1.5 g/cm^3) generally indicate a favorable condition of soil for plant growth. The soil has a good structure and many pore spaces for an optimum balance of air and water content.

The pH of the soil extract in the study area is neutral to slightly alkaline having pH in the range of 6.25 to 8.62. The EC for the soil samples are in the range of 0.11 to 12.4 dS/m.

It was observed that calcium and magnesium are in the range of 0.95 to 7.3 meq/l and 0.42 to 11.40 meq/l respectively. Sodium and potassium levels varied from 0.81 to 11.56 meq/l and 0.12 to 10.77 meq/l respectively. Organic carbon content in the soil is in the range of 0.19-0.41 percent which is poor and available nitrogen, phosphorous and potassium are found to be in the range of 114.85 to 252.20 kg/ha and 10.97 to 20.69 and 111.47 to 212.69 kg/ha respectively. Data indicates that soil in the study area is poor with respect to available nitrogen phosphorus and available potassium present in the soil.

Biological Environment

The proposed TPP site (1013+9 Acre land) is in coastal belt of Bay of Bengal sea (approximately 1.0–1.5 km distance from sea shore). The major part of project site is endowed with barren (abandoned ponds) and natural scrub vegetation (waste land) and balance with agriculture fields, some residences and man-made vegetation. The Sevanar river / Savugan creek (seasonal) is adjacent to project site on the east side. There are no

mangroves or back water swamps either within the identified project site or in the vicinity except Savugan creek. The study area (10 km radial distance around project site) in all consists of 49 villages out of which 20 villages were selected for sampling. The terrestrial flora in study area is predominantly covered by agriculture fields with paddy as a dominant/ main crop. The uncultivated land is covered mostly by herbs/shrubs like *Tephrosia perpurea*, *Prosopis juliflora* or by temporary water ponds. The natural vegetation around the project site and on the unutilized waste land is mainly comprise of the naturally growing plant species and as per the filed The percentage of medicinal plants found in the study area is about 12%. Most important medicinal plants from the study area are *Achyranthes aspera, Calotropis procera, Datura sp., Vitex negundo, Aegle marmelos, Azadirachta indica, Phyllanthus emblica, Syzygium cumini* etc.observations, *Prosopis juliflora* seems to be a dominant plant species.

In the present survey 15 species of avifauna were observed in the study area. Cattle egrets were found in symbiotic association with grazing animals. Common Crow, Brahminy Kite and Eagle were most conspicuously observed hovering over the inundated paddy fields and barren lands. No rare or threatened faunal species are present at proposed site and surrounding study area. The aquaculture activity in the study area has been reduced to a small scale due to tsunami. No single sea turtle was observed by filed team during survey period in the coastal beach within study area.

Socio-economic Environment

The primary socio-economic data was collected through field survey in sample villages within study area as well as through the observations made by survey team. The details regarding the demographic structure of the study were collected from Census records of Nagapattinam district. Study area covers 2 talukas, i.e. Tarangambadi and Sirkali of Nagapattinam district. There are total 49 villages in the study area as per census record of Nagapattinam district. The total population of the study area as per 2001 census is 151800. The literacy rate of the population in the study area is about 62.03%. There is no industrial development in the study region except the PPN power plant at Thirukkadaiyur. Fishing and agriculture are the primary occupation of the people in the study area. The unemployment level is high in the region as non-worker population share more than half of the total population in the region 91159 (60.05%). The water supply in the study region is through tap water, tube well, hand pumps, and other allied sources. Almost all villages are electrified in the region. Transportation is good in the region. Medical facilities in terms of community health workers are available in some of the villages, primary health center and primary health sub centers are also available. A

temple at Anantha mangalam village near Thirukkadaiyur is noted for the presiding deity of Daspuja Veera Anjaneyar. Total population of project affected people as per 2001 census is 11562. The existing average Quality of life (QoL) index value for the study area is leaning satisfactory level.

4.0 Impact Assessment

Identification of significant impacts from the proposed grass root development of 1000 MW coal based power project is an imminent step to identify the likely critical impacts on various components of environment due to proposed coal based power plant in coastal belt at Marudampallam (Tamil Nadu state). The "Network Method" has been adopted for identification of impacts, which involves understanding of cause-condition-effect relationships between an activity and the consequences / impacts on environmental and socioeconomic parameters. The detailed list of activities corresponding to proposed thermal power plant at the site identified in coastal belt, as described in previous chapters of this report, have been taken into consideration for generation of cause-condition-effect networks (i.e. chains of events and consequences).The impact networks have been delineated for construction and operation phases of proposed 1000 MW coal based power plant in coastal belt using sea water.

Prediction of Impacts

The mathematical models used for prediction of impacts in the present study include, steady state Gaussian Plume Dispersion model suitable for multiple point sources of atmospheric emissions located in flat and or complex/hilly terrain; and hemispherical wave propagation model for noise impact prediction. In case of water, land, biological and socio-economic components, the predictions have been made based on the available data, scientific expertise and judgments.

Air Environment

The proposed 1000 MW TPP will have only one stack with two flues corresponding to two units. The details of imported (proposed) coal characteristics indicate maximum sulfur content of 0.6%, ash content of 15% max. Based on average gross calorific value of 4900 kcal/kg of coal, the consumption rate has been estimated as 250 TPH for each unit, i.e. total 500 TPH coal for generation of 1000 MW power. Each of the proposed 500 MW unit will be equipped with high efficiency (about 99.8%) Electrostatic Precipitators (ESPs) which would control SPM levels in flue gas to less than 100 mg/Nm^3 as per the details provided in DPR. In view of proposed category of unit capacity (500 MW each) TPP, a stack of 275m height will be implemented at proposed

1000 MW TPP. The emissions of SPM, SO_2, NO_X are estimated as 7.2TPD, 144.0 TPD and 112.8 TPD respectively.

The micrometeorological data recorded near project site during study period (post-monsoon season) has been used for air quality prediction model. The ISCST3 air quality model has been applied with flat terrain option to predict the air pollution impacts from proposed project w.r.t. SO_2, NOx and SPM as per the methodology stipulated by CPCB.

The ground level impacts from the proposed coal based power project (one stack with twin-flue) are predicted w.r.t SO_2, NOx and SPM in terms of 24 hrly ground level concentrations (GLCs) keeping in view the prescribed National Ambient Air Quality Standards (NAAQS). GLCs of individual pollutant are predicted at 250mx 250m cartesian square grid receptors in the impact zone covering 10 km radial distance (20 km x 20 km) as well as 25 km radial distance (50 km x 50 km) with project site at the centre.

During operation phase of proposed power project at design capacity, the maximum 24 hrly GLC of SPM has been predicted as 1.2 $\mu g/m^3$ at about 1.5 km downwind distance in SSE direction. Accordingly the impact of SPM from proposed 1000 MW TPP would be negligible as per the details given about the SPM control measures at project site. The maximum 24 hourly concentration of SO_2 is predicted as 23.1 $\mu g/m^3$. The significant impact zones are in SSE and NW directions in accordance with predominant winds at a distance of about 1.5 km in SSE direction. The SO_2 impact from proposed project would diminish to less than 7 $\mu g/m^3$ in SE direction and < 10 $\mu g/m^3$ in NW direction between 10 and 15 km radial distances and would be insignificant beyond 15 km distance from stack location. The maximum impact of NOx from proposed TPP is predicted as 11.5 $\mu g/m^3$ at about 1.5 km downwind distance in SSE direction. Accordingly, the ground level impact of SPM, SO_2 and NO_x from proposed power project would be well within the prescribed NAAQS for residential, rural and other areas during normal operation phase.

Noise Environment

The noise sources would be considerable during such type of large scale construction activities. The total construction activities at proposed project are scheduled to complete in about 36 months. In this period, the approach road between NH-45A (ECR) at Mukkuttu village and project site (about 3 km) will be used for transportation of heavy construction material and plant machinery. The impacts during construction phase are temporary and would be margina especially in the nearby human habitat/villages like Marudampallam, Kilperumpallam and Kidangal. The noise impact would be relatively

higher on construction workers during their duty hours, which shall be mitigated to comply occupational exposure standards and use of personal protective devices like ear muffs/plugs etc. shall help to minimize the occupational noise impacts

During operation phase, the major stationary noise sources are Boilers, Steam Turbine generators, Compressors, Pumps, Coal crushers etc. and mobile sources corresponding to mainly vehicular traffic for staff mobilization; materials/lime stone, imported coal transportation, liquid fuel transport to project site, fly ash transport out of project site etc. As per the details provided by project proponent, the noise generation from major equipment will be restricted to 85 dB(A) through manufacture specifications for BFPs, compressors, STGs, Coal crushers etc.

The cumulative noise impact from different stationary sources at proposed project site has been predicted and the impact of noise out side the proposed project premises would be less than 30 dB(A) result in net increase of 1.1 to 1.5 dB (A) over existing baseline status which would remain within the preserved ambient noise standard for residential area.

The impact of noise from mobile sources (Vehicular traffic) at residential areas near approach roads is predicted as 54 dB (A), which will result in net increase of about 2 dB (A) only over existing baseline status.

The occupational noise exposure to the workers in the form of 8 hourly time weighted average will be maintained well within the prescribed OSHA standard limits hence the impact on health of the workers would be insignificant.

Water Environment

The Bay of Bengal sea coast is at about 1 km distance from project site and sea water will be used at proposed TPP. The sea water quality in project area reflects conventional saline water characteristics with TDS range: 30140-39552 mg/l and fall in non-polluted of category during study period. The saline (sea) water will be used for condensers & Auxiliaries cooling system where as the soft (fresh) water requirement will be met through desalination of sea water. The estimated total sea water requirement for proposed 1000 MW TPP is 8363 m^3/hr (200712 m^3/d). The major part (approx. 75%) of the total sea water will be utilized for cooling water makeup in (NDCTs). M/s PPL propose to install desalination plant based on reverse osmosis (RO) system to produce 471m^3/hr (11304 m^3/d) desalinated water for feed to DM plant, service water, air conditioning purposes, fire water make-up, coal & ash handling system potable use and for greenbelt development.

The oily waste stream (OWS) as well as sewage from plant site will be treated at proposed WWTP / STP within project premises. From total 8363 m^3/hr (200712 m^3/d) sea water drawl, about 2769 m^3/hr (66456 m^3/d) will be either utilized or evaporation losses at project site and the balance 5594 m^3/hr (134256 m^3/d) containing mostly sea water rejects will be discharged back into sea through marine outfall.

According to the information made available in this study, there is no proposal for extraction and use of groundwater for the proposed project. Hence the stress on ground water in project area would be negligible due to proposed (new) TPP. The proposed rain water harvesting / surface runoff / flood water storage would contribute to groundwater recharge through seepage in the adjacent areas.

Land Environment

The site identified for proposed project covering 1013+9 Acre (410+4 Ha) land is on coastal flat terrain. The proposed site is away from CRZ as per NIO study report except the Savugan creek (Sevanar river) on the eastern side of project site to which the tidal backwater reaches during high tide period and fall in CRZ-III category in view of coastal zone in undeveloped rural area. Most of the land identified is under the private ownership and there is no forest or ecological sensitive land within proposed site. The project proponent proposes to procure the land through direct negotiations & purchase from the individual owners by paying negotiated cost for the land. The environmental pollution impacts during construction phase would be temporary and are expected to gradually stabilize by the time of commissioning of proposed project.

During operation phase, total ash generation has been estimated as 75 TPH (1800 TPD), out of which fly ash (80%) would be 60 TPH (1440 TPD) and bottom ash (20%) would be 15 TPH (360 TPD). It is proposed to collect dry fly ash from ESP hoppers in dry form and provide / supply to ash users. The balance unutilized ash (mostly bottom ash and some fly ash), if any will be disposed off into ash dyke by conventional slurry method. The impact of ash pond supernatant / run off on surrounding water body (Bay of Bengal) would be insignificant provided the ash pond/bund is constructed with proper compact/impervious clay layer as well as the recovered ash water is disposed through marine outfall as envisaged in DPR.

The hazardous waste generated at proposed TPP are spent oils, lubricants and oily sludges etc which will be preferably sold to the potential users with necessary authorization for reprocess/reuse. In case some of them require disposal, they shall be

disposed in a secured landfill after necessary approval by the State Pollution Control Board. The biomedical waste will be treated and disposed as per Biomedical waste rules.

The total non-hazardous solid waste in the form of sludge generation from project related units, viz. sea water, OWS and sewage treatment plants is estimated insignificant, i.e., <10m^3/hr (240 m^3/day). The non-hazardous solid waste, i.e. after sludge thicker/centrifuge and sludge drying beds, could be used as landfill material/manure in greenbelt area or even for reclamation of low lying areas, however they will be ultimately disposed as per MoEF guidelines in consultation with TNPCB.

The estimated domestic solid waste from proposed power project premises would be less than 1 TPD (insignificant). The domestic solid waste normally constitutes about 50% organic matter. This material can be composted to yield the compost manure which can be used in the green belt area within project premises.

The proposed greenbelt in and around the proposed project site would contribute further towards attenuation of air & noise impacts and the proposed permanent vegetative cover in the form of green belt will improve the aesthetics in project area.

Biological Environment

The proposed project does not envisage disturbance or displacement of any native faunal species. The impacts from proposed project is envisaged to be insignificant due to proposed cleaner coal usage and proposed pollution control measures. The proposed project may cause insignificant impact on the sparsely distributed vegetation in the impact zone due to emission of relatively large quantities of CO_2, heat, aerosols etc. during normal operation and may cause marginal impact on coastal ecology due to large scale coal handling and ash disposal in ash dyke. Necessary precautionary measures are essential at the design stage itself to mitigate the air pollution impacts to the lowest possible level during normal operation of the proposed project.

With the proposed development of 50-100 m wide green belt around proposed coal storage yard and ash dyke as well as about 50 m wide green belt all along the periphery / boundary of proposed project site covering approx. 280 Acre land area, there is possibility of improvement in permanent vegetative cover, local ecology in the form of attracting avifauna leading to improved biodiversity and richness in microflora and fauna (micro-ecosystem) as it has been observed at the other existing modern industrial complexes.

The impacts on marine aquatic ecology due to proposed project would be negligible, as the treated effluents from the proposed power plant will meet the prescribed

standards prior to final discharge into sea and the marine outfall location is selected through mathematical simulation studies to minimize the adverse impacts, if any, on coastal marine ecology.

Socio-economic Environment

The prediction of such impacts on socio-economic component of environment is carried out through different methods, viz. (i) qualitative description, (ii) quantitative description, (iii) application of statistical techniques and (iv) relative comparisons of the effects of alternatives.

The identified project site falls in the revenue jurisdiction of three villages. The project proponent has stated that it is their policy not to put any local people to hardship due to establishment of the industry. Consistent with this policy, M/s PPL has stated that they selected land at Marudampallam and Kilperumpallam villages in Tarangambadi taluka and Vanagiri village in Sirkali taluka, which are listed in revenue as well as census records. In addition, land is also acquired at another village called Chemperambakkam which is not listed in census records. Actually land of this village (Chemperambakkam) is in the revenue records of Marudampallam and Kilperumpallam villages.

The land has been selected in such a way that the existing residential areas are not disturbed to the extent possible. As per the project proponent, the major residential areas at Marudampallam have been excluded from the site even though all of them are illegal settlements as per revenue records and ownership of the particular land. As a result the project site boundary has become irregular shape. Even after excluding all major residential areas there are some sparsely distributed tenements consisting mostly hutments about 150 in number existing within the site which are also illegal settlers. These tenements are called as extension of Chemperambakkam 1 and 2 as well as Marudampallam, which are proposed to be shifted to alternate location.

Critically analyzing the baseline status of the socio-economic profile and visualizing the scenario with the proposed project, the impact on socio-economic component would be of varied nature as summarized below :

Positive Impacts

- Scope for increase in job opportunities during the construction as well as operation phases for the qualified and skilled as well as unskilled people in project region (direct employment)

- The civil amenities like medical facilities, market, education, sports and cultural activities are likely to improve in the neighboring villages through the community welfare measures
- The additional electricity generation will help in electrification of the villages, development of irrigation facilities and drinking water supply etc. apart from industrial and economic development (towards energy security)
- Proposed project would promote the economic development in the region
- Proposed activity is expected to generate significant indirect employment opportunities, as daily wage workers will be employed in construction and transportation activities, supply of materials and auxiliary and ancillary works

Negative Impacts

- The socioeconomic survey conducted in project affected three villages indicates that their main occupation, i.e. agriculture and fishing related activities will get affected due to the acquisition of land
- Coal dust, air pollution through flue gas would be generated which may result to severe health problems, viz. Respiratory problem, Lung diseases etc., if proper control measures are not planned and implemented
- Quality of land and water may deteriorate due to proposed project if not properly managed. Noise pollution will also increase in the region nearer to the plant
- There may be change in the occupational pattern within the project region
- Quality of land may deteriorate which will affect the agricultural activity, reducing the production and quality of crops and ultimately affecting the economy and quality of life of the farmer in the region
- The project proponent is committed to implement adequate precautionary measures from design stage onwards to mitigate/control the environmental pollution from proposed project

It is anticipated that the adverse impacts on parameters of human interest could be mitigated by proper implementation of the control measures indicated in the Environmental Management Plan for the proposed project. According to the result there will be very marginal improvement (from 0.44 to 0.47) in average cumulative quality due to proposed project with social welfare measures.

5.0 Environmental Management Plan

Construction Phase

Environmental impacts during construction phase would be considerable in view of proposed grass root development. The construction phase impacts are temporary and localized phenomena except the permanent change in local landscape and landuse pattern at the project site. However, they shall be taken into consideration with due importance and also wherever applicable detailed protocol/procedures shall be implemented to prevent/mitigate adverse environmental impacts as well as occupational hazards for construction work force.

- The site grading, partial level raising as required at project site shall be planned keeping in view the existing natural surface drainage in the vicinity of project site.
- The existing man-made irrigation canals 3 Nos. within project site, which are also acting as surface drainages in rainy season shall be appropriately diverted and join to existing natural drains (with widening, if necessary) to prevent flood situation.
- Proper storm water management system shall be integrated in design phase and civil works shall be carried out accordingly at project site.
- Project proponent should transport / resettle the displaced families (irrespective of their legal entity) as indicated prior to start of civil construction activities.
- The existing Sevanar river / Savugan creek within / adjacent to project site shall be protected / maintained undisturbed including CRZ area as per local coastal zone management plan (CZMP).
- The surface (rain water) drainage within the project premises (open channel or closed conduit) shall be lined with fly ash bricks to facilitate rain water harvest.
- Necessary conditions/ instructions shall be included in all civil construction tenders/contracts to use fly ash based construction material.
- Instructions/conditions related to compliance of all prescribed regulatory limits related to exhaust as well as noise generation for all construction machinery and vehicles used by contractors shall be included in all bid documents.
- The proposed green belt area shall be earmarked in the beginning before startup of earth work and tree planting (large size species) should be undertaken in this area as per CPCB guidelines.

- High efficiency ESP shall be planned as integral part of each unit without any bypass provision
- Suitable sewage treatment plant (STP) shall be planned for combined domestic/sanitary wastes from plant area.
- The cooling water system (condenser cooling, Cooling tower, associated pipelines etc.) shall be constructed with appropriate material suitable to operate with high TDS (saline) cooling water.
- Sites for construction and workers camp should be clearly demarcated to prevent occupational hazards. Ensure provision for necessary basic needs and infrastructure facilities such as temporary housing water supply, fuel supply, sanitary & health care facilities.
- Hazardous materials such as lubricating oil, compressed gases, paints and varnishes as also rock blasting explosives required during construction phase should be stored properly as per the safety regulations at isolated places.

Operation Phase

The proposed 1000 MW TPP increase availability of electricity. In order to mitigate the adverse environmental impacts during operation of proposed TPP, following measures have been delineated.

- M/s PPL shall duly consider on priority basis, the guidelines/ actions specified by CPCB under Corporate Responsibility for Environmental Protection (CREP) for Thermal power plants
- A road map/action plan for 100% ash utilization / disposal shall be developed keeping in view the latest MoEF Notifications.

Air Environment

- Furnaces and boilers should be operated with proper air fuel ratio so that fuel consumption is optimized and NOx emissions are minimized. Low NOx burners to be installed for further reduction in NOx emissions.
- Instruments for Continuous monitoring of flue gases for measuring the levels of SPM, RPM, SO_2, NOx, CO/CO_2 should be installed in the stack alongwith Hg monitor. Port holes and sampling facilities should also be provided at suitable locations as per TNPCB/CPCB guidelines to enable stack monitoring

by statutory authorities/environmental audit team as and when required through portable instruments.

- Ambient air quality w.r.t. SPM, RPM, SO_2, NOx and CO should be regularly monitored at minimum 4 sampling locations around the project site with at least one location in upwind direction and more locations in predominant downwind directions. The identification of monitoring locations shall be done in consultation with the Tamil Nadu State Pollution Control Board.
- An electronic weather station should be installed and operated within the proposed project premises
- The fugitive emissions of coal dust from coal storage facilities, from crushers and at coal transfer points should be reduced by adopting suitable measures like cyclones/bag filters/water sprinklers/fog system
- Personal protective devices such as dust filters, ear muffs, industrial shoes/gumboots, HT resistive hand gloves etc. should be provided to the workers to combat occupational hazards

Noise Environment

- The operators working in the high-noise areas, i.e. compressor, boiler houses, blowers, generators, feed pumps, steam generation plant, turbo-generator etc. should be strictly instructed to use ear-muffs/ear-plugs
- The control room should be properly designed to minimize noise impact (low noise levels) from neighbouring equipment / machinery with a provision for deep windows and fire resistant doors
- Low vibration generating machines/equipment are to be selected to meet international standards and foundations are to be so designed to minimise vibrations
- Personnel working near the vibrating machinery in different units should be provided with well designed vibration resistant handgloves / footwares and suitable PPEs
- Training of personnel is recommended to create awareness about the damaging effects of vibrations; if PPEs are not used as regular practice while on duty

Water Environment

- Necessary measures for water conservation shall be implemented from design stage onwards till commissioning and also during operation phase, apart from reuse and recycle of treated effluent at project site.
- Boiler Blowdown is recommended to reuse as plant service water or cooling tower makeup after adequate treatment.
- The effluent from Oil Handling Areas carrying spillages, oily floor wash etc. should be taken to oil/water separation. The decanted oil (containing small amount of water) should be taken to a slop oil tank for further separation. The decanted oil may be stored in a tank for reuse.
- The power house and boiler area effluents will be taken to the oil/water separators, slop oil tank and treated in the same way as the oil handling area effluent.
- The entire coal storage yard should be provided with separate drains, which will be led to a common sump of adequate capacity. The heavier particles will settle in the sump and the clear water can be used as wash water.
- Sanitary waste from the plant premises should be treated at sewage treatment plant and reuse for greenbelt at project site.
- As per the details available in DPR, sea water is proposed to be used for condenser cooling through recirculating (NDCTs) cooling system and the CTBD of saline water will be discharged into sea through marine outfall as per the recommendations made in marine EIA study
- The possibility of using treated effluent/CTBD for coal and ash handling systems shall be explored and implemented
- Project proponent shall explore options for implementation of long term measures to enhance reuse & recycle of treated effluents in steam generation, dust suppression in coal yard etc. in order to conserve water
- The measures recommended for ETP should be planned, completed and commissioned alongwith the commissioning of the first unit among proposed 2x500 units
- Performance evaluation of the effluent treatment plant should be undertaken at regular intervals to keep a check on the treated effluent quality

- The oily sludges from oil separator should be disposed off at identified location as per TNPCB / CPCB requirements or project proponent could explore the possibility of mixing it with crushed coal for combustion
- Rain water harvesting should be planned, implemented and maintained as integral part of proposed project for surface storage and reuse based on the hydrological studies at project site.

Land Environment

Proposed grass root development will lead to change in the landuse/land cover at the project site only on permanent basis. Although the proposed project correspond to industrial development, the concurrent development of green belt in an area of about 280 Acre shall improve the aesthetics at local level in view of mostly barren land at present.

Project proponent shall delineate suitable, site specific action plan for 100% utilization of fly ash in accordance with the provisions given in MoEF notification on ash utilization. The project proponent is exploring all possibilities and perusing with fly ash uptakers .

Ash Pond Management

Ash pond is an essential requirement at project coal based thermal power station. The pond size will depend upon quantum of ash generation the level of utilization. The total area identified for ash pond can be divided into at least four parts/compartments. At any given time one part shall be used for ash dumping while other two parts of ash pond could be utilized for planting Bio-fuel trees & medicinal plants, plantation corresponding to high rate transpiration system (HRTS) etc. which could also be useful for stabilization/reclamation of ash pond area on later date. One of the these compartments could also be used for disposal of dry ash following ash mound (dry compaction) technology. Fly ash disposed in dry form can later be utilized for any of the above indicated purposes.

Solid/Hazardous Waste Management

- A record w.r.t quantity, quality and treatment/ management of solid/hazardous waste shall be maintained by the environmental management cell at the proposed project
- The spent transformer oils, spent lubricants generated at proposed project shall be handled/managed as per the norms prescribed in Hazardous waste (Management & Handling) Rules 1989 as Ammended in 2003, i.e. after obtaining necessary approval from CPCB/TNPCB

- All oily sludge generated from ETP must be disposed off through environmentally compatible manner as per the prescribed Hazardous waste management rules

Domestic Solid Waste

- The domestic solid waste generated at proposed project including Township and plant areas shall be managed as per the MoEF Notification S.O. 908 (E) dated 25th September 2000.
- The domestic solid waste normally constitutes about 50% organic matter. This material can be composted to yield the compost which can be used along with the chemical fertilizer in the surrounding farms.
- The non-compostable solid waste material should be separated at the sources. These materials can be disposed off by using sanitary landfilling.

Green Belt Development

With a view to attenuate air pollutants, to resist noise propagation from power generation units and uptake of treated effluent to some extent, it is recommended to develop a 100m wide green belt all along the periphery of project site From total 1013 Acre land for project site, about 260 Acre land (25.7%) has been delineated in layout plan for green belt development. In addition to this, afforestion and bio-diversity improvement programmes shall be undertaken in the surrounding villages.

Biological Environment

- The combination of proposed green belt and large scale river water as well as rain water storage reservoirs will provide new habitat for birds, aquatic fauna etc. and improves microclimate of the region as per the past experience at similar project sites
- Periodical assessment of status of terrestrial ecology in the project area including species richness, dominance and diversity of flora and avifauna by an independent agency would be useful in the long run
- The proposed large scale open surface water reservoir shall be properly fenced with controlled entry points (for purely maintenance / recreation purposes) to prevent accidental hazards
- The possibility of fish culture may be explored in the proposed water storage reservoirs

Socio-economic Environment

- M/s PPL should take adequate steps to get local people into confidence so as to avoid any misconceptions amongst the local people about the project in long run.
- Interaction with the local community should be institutionalized and done on regular basis by the project authorities to provide an opportunity for mutual discussion
- Project authorities should organize awareness programmes on regular basis to bring forth beneficial aspects of the project and social welfare measures being undertaken for improving their Quality of Life
- Preference shall be given for employment of the local people during construction phase as well as maintenance activities
- Providing basic amenities like drinking water, health, sanitation facilities in adjacent villages
- Awareness programmes must be taken to make people aware about the environmental protection, need for water conservation, rainwater harvesting and methods of preserving water quality
- Conduct awareness campaigns in the community specially related to basic health, hygiene and sanitation
- Periodical health checkup camps should be organized by project authority for workers as well as local people
- Mobile dispensaries may be provided for medical check-up and also for providing basic / essential medicines to the villagers
- Short term Training courses on Job oriented skills may be organized through Industrial/Technical Training Institutions for Educated Youth (both for male and female), like O&M of electrical, Home appliances, tailoring, plumbing, secretarial/computer literacy, etc. trades
- Enterpreneurship Development Programme (EDP) may be undertaken for both male and female, irrespective of their educational qualification in the areas like poultry farm, dairy farm, fisheries (inland and coastal marine) etc. based on the local facilities

- As regards aesthetic environment, development of social forestry and road side plantations shall be encouraged through tree plantation drives in the project region

Occupational Health

- In view of the possible exposure of the operators to hydrocarbons and heat radiation as well as high voltage electrical hazards at different work places, a properly scheduled periodical diagnostic and health checkups shall be undertaken for the employees,
- Potential hazards, safety procedures, emergency measures etc. shall be displayed at suitable locations at all workplaces to mitigate occupational hazards
- Workers at different units may be trained properly to follow safety norms strictly to prevent incidences/accidents, about the procedures to be followed under emergency situations to minimize the intensity of impacts
- Awareness programmes shall be conducted periodically for the workers regarding occupational hazards, safety aspects, emergency preparedness and environmental protection
- Strict enforcement for use of personal safety and protective devices provided to them, while they are on duty

Environmental Management System

- Establishment and maintenance of documented environmental objectives and targets at all relevant levels starting from quality assurance of feed/fuels, at each relevant operation/function at individual utilities, offsites, power modules etc. including environmental policy matters of the organization
- Allocating responsibilities at different levels for achieving the set objectives and targets
- In order to assess the performance of environmental management system, periodical assessment studies by an independent agency would be highly useful
- A full fledged environmental management cell with necessary infrastructure shall be developed at proposed project

Post-project Environmental Monitoring

Air Environment

- Schemes for monitoring stack and ambient air quality shall be adopted. The ambient air quality monitoring the ground level concentrations and fugitive emissions as per CPCB/TNPCB guidelines/ norms.
- Continuous SPM, SO_2, NOx, CO/CO_2 and Hg analysers should be installed for all flues of stack with data recorders/loggers in the central control room.
- Regular monitoring of ground level concentrations of SPM, RPM, SO_2, NOx, be carried out.

Noise Environment

- Monitoring of the noise levels and exposure is essential to assess the effectiveness of Environmental Management Plan implemented to reduce noise levels. A precision digital sound level meter with octave bands and statistical analysis modules and noise exposure meter may be procured for the same. Audiometric tests should be conducted periodically for the employees working close to the high noise sources.

Vibration Monitoring

- Monitoring of the vibration levels is essential to assess the efficiency of maintenance schedules and vibration prevention measures undertaken at major installations

Water Environment

- Daily analysis of influent and effluent of wastewater treatment plant is recommended. Sampling and analysis of wastewater from individual treatment unit for relevant parameters depending on type of treatment facility provided be carried out once a week. The coastal sea water quality monitoring shall be carried out at least at 5 locations.
- Methods of sample collection and preservation should be as per prescribed methods of TNPCB, CPCB and MoEF.

- An independent laboratory with facilities for chemical analysis should be set up within the premises for each stage of proposed project. The laboratory should have a provision for fume-hood and a cold room.

Budgetary Provision for EMP

- Adequate budgetary provisions have to be made by of M/S PPL for executing the environmental management plan as delineated above.

6.0 Risk Assessment

MCA analysis for a proposed project does not include quantification of the probability of occurrence of an accident. In practice the selection of accident scenarios for MCA analysis corresponding to a proposed project is carried out on the basis of past accident analysis at similar projects, engineering judgement and expertise in the field of risk analysis especially in accident analysis.

Hazard Criteria

The degree/level of hazards is identified by computing Fire and Explosion Index (FEI). FEI for each unit/activity is computed by material factor (MF), general process hazard (GPH) and special process hazard (SPH).

The Fire and Explosion Indices computed for different fuel storage and handling facilities at proposed project. As per the criteria, the LDO and HFO storage and handling facilities at proposed project fall in **light category** of degree of hazards.

Consequence Analysis

Release of flammable material (LDO/HFO) can cause hazard to the environment. The extent of the risk is dependent upon the nature of the release and the physical state of the material. It is necessary to visualize the worst possible consequences based on the potential damages for delineation and implementation of necessary risk preventive / mitigation measures to be adopted in detailed engineering and implementation stages, so as to minimize risk potential from proposed project.

Accidental release of the hazardous chemicals from the storage facilities have been studied by building various probable scenarios on the basis of their properties and the effects. The worst possible scenarios are then calculated in terms of damage distances. The results (damage contours) are plotted on proposed plot plan in order to visualize magnitude and extent of consequence. The accident scenarios corresponding

to 25 mm, 50 mm leaks and catastrophic rupture are visualized for release of HFO, LDO separately from storage tanks.

Pool Fire

Release of LDO/HFO due to leak in storage tanks may lead to formation of a pool and depending on availability of ignition source may cause pool fire. This scenario was visualized by considering different leak sizes of 25 mm and 50 mm and catastrophic rupture of storage tank for various heat loads 37.5 kW/m², 12.5 kW/m² and 4.0 kW/m² under the weather stability conditions of 2F, 3D and 5D. The damage distances due to catastrophic rupture of LDO storage tank for the heat load of 4.0 kW/m² are predicted as 42.31 m, 44.13 m and 47.86 m corresponding to different weather conditions; 2F, 3D and 5D respectively.

Flash Fire

The flash fire scenarios for LDO/HFO storage tanks are visualized by considering different leak sizes of 25 mm and 50 mm and catastrophic rupture for LFL concentration under different weather conditions like 2F, 3D and 5D. The predicted flash fire damage distances for leak sizes of 25 mm and 50 mm in LDO and HFO storage tanks. Catastrophic rupture of LDO storage tank were found to be 22.07 m, 20.70 m and 22.65 m for weather conditions of 2F, 3D and 5D respectively.

With the worst possible flash fire in catastrophic rupture scenario including cascading effect at LDO/HFO tanks, the damage contour maximum distance (36.93 m) would remain / fall within the proposed TPP premises as per the current layout plan. Hence there would be no possibility of risk to general public in surrounding area from accidental flash fire at HFO/LDO storage tanks.

Risk Mitigation Measures

- Fire prevention and relevant code enforcement is one of the major responsibilities of project proponent.
- Periodic maintenance of all protective and safety equipment
- Periodical training/awareness programmes should be undertaken for the benefit of work force at the project as refresh courses to handle any emergency situation
- Periodic mock drills should be conducted so as to check the alertness and efficiency of the DMP and corresponding records should be maintained

- Sign boards including emergency phone numbers and no smoking signs should be installed at all appropriate locations
- Plant shall have suitable fire proof communication system
- All major units/equipment shall be provided with smoke/fire detection and alarm system

Project Specific Measures

Fuel Oil System

- Separate dyke area must be provided for the different products. Do not store the different products in the same dyke
- The fire proofing material/coating should be resistant to weather effects such as chalking, corrosion and erosion. Top coat, wherever provided, must be resistant to solar ultra violet radiation
- The fire proofing materials should have adequate adhesion, strength and durability
- In case of accidental release, shut-off leaks without risk. Prevent spillage from entering drains or water sources
- After spills wash area with soap and water preventing runoff from entering drains.
- For small spills, take up with sand or other non combustible material and placed into closed containers for later disposal
- Provide proper ventilation, respiratory protection shall be provided if ventilation is inadequate
- Use face shield, PVC gloves, safety boots while handling. Contaminated clothing to be immediately removed

Control Rooms

- The control room shall be located in predominant upwind direction w.r.t. LDO & HFO storage and handling facilities
- Smoke detection system shall be provided for control rooms at appropriate locations
- To resist fire spread through ducts, dampers shall be installed in ducts.

Coal Dust-Occupational Health Hazard

Fugitive dust emission from different coal transfer points, ash dyke, transportation etc. poses the major health hazard mainly for the workers and may also to the neighborhood dwellers. The workers engaged in these activities will be affected by the "Dust hazard". Smoke and fire are common phenomena at large scale coal stock piles / storage yard, similar to the proposed one. However, it is not a spontaneous activity and could be controlled or even prevented very well by proper water sprinkling.

Dust Mitigation Measures

- Coal dust fugitive emissions from transfer points shall be controlled by pneumatic suction into cyclone or bag filters as per design feasibility.
- Dust containment should be accomplished by enclosing the coal conveying equipments and related installations.
- Water spraying should be done to suppress the dust in outdoor areas. Permanently mounded water sprinklers should be located in the dust generating area.

An approach to Disaster Management Plan has been recommended covering on-site Emergency Preparedness Plan and Off-site Emergency Preparedness Program. Necessary measures for safe guarding public as well as necessary actions by general public are also included in DMP.