DALMIA CEMENT (BHARAT) LIMITED

Executive Summary

Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for Cement Plant of capacity 3.0 mio tpa and Captive Power Plant of 27 MW Capacity at Govindapuram village, Ariyalur Taluk, Ariyalur District, Tamil Nadu

July 2007

HOLTEC CONSULTING PRIVATE LIMITED

EXECUTIVE SUMMARY

E.0 PROJECT DESCRIPTION

DCB proposes to setup a state-of-the-art dry process technology Greenfield cement plant at Govindapuram village in Ariyalur Taluk of district Ariyalur, Tamil Nadu with a total investment cost of approximately **Rs. 850 crores**. The proposed plant includes the following:

- Production of 2 million tonnes clinker per annum and accordingly cement grinding for production of 3 million tonnes (PPC & OPC) per annum
- Captive Power Plant (CPP) of 27 MW to cater to the need of power requirement.
- And an integrated township for its employees with ultra modern facilities and amenities.

The total Kiln Capacity of the proposed project will be of 6100 -tpd clinkers, (2.0 mio-tpa) which corresponds to plant's cement manufacturing capacity of 9100 tpd, (80% PPC & 20% OPC).

For the proposed project, an area of 560 acres has been earmarked in Village Govindapuram, of Ariyalur Taluk, Ariyalur District of T.N. The details of the land required for the different plant facilities are as follows:

Plant Area	-	218 acres
Railway Siding	-	80 acres
Workers Colony	-	54 acres
Officer's Colony	-	154 acres

The site is located at a distance of 3.5 km in the north from Ariyalur Town (Class III Town; with a population of 27822 persons in 6305 Households-2001 Census). The site is accessible from the nearby Ariyalur-Sendurai Road. Nallampattai (1.0 km in the north), Ottakkovil (1.5 km in the Northeast), Tamaraikkulam (0.8 km in the Southeast), Aminabad Bit-II hamlet (1.3 km in the southwest) and Govindapuram (1.9 km in the west) are the nearest settlements. The Southern Railway BG Line runs parallel to the site at a distance of 1.8 km in the west. The site is well connected with the Ariyalur, State Head Quarters Chennai and nearby Trichy, Kumbakonam and Jeyamkondacholapuram. The nearest Airport is Trichy at a distance of 55 km in the south. The nearest Ports are at Chennai (300 km) and Cuddalore (115 km). Location map of the proposed project is given in **Figure 1**.

E.1 DESCRIPTION OF THE ENVIRONMENT

E.1.1 BASELINE ENVIRONMENTAL STUDY

In order to assess the Environmental Impacts of the proposed plant a study area of 10 km from the center of the plant has been considered. Baseline study data were colleted during the month of **December 2006 to February 2007.** The area falls under semi-arid zone and is free from seismic effects. The Administrative unit within 10 km radius area comprises of parts of Ariyalur Taluk, Kunnam Taluk and Sendurai Taluk of Ariyalur District. The site is located at a distance of 3.5 km in the north from Ariyalur Town.

A seasonal Nallah River Marudaiyar drains the area and flows at 7.5 km distance from the site in the south. The site is located more than 25 kms away from the Notified Cauvery River which flows in the south. The drainage of the study area is mostly controlled by the structural features. Among the different drainage pattern the well-established drainage systems are parallel and sub-parallel. A water divide is noticed in the northern side of the

plant site. The surface water from the plant site flows towards south and confluences with river Maruthiyar. On the contrary, from the northern side of the plant site the surface water flows towards north and confluences with river Anaivari Odai that joins River Vellar.

E.1.1.1 Micrometeorology

During the monitoring period, the predominant winds were from NE/NNE/ENE quadrants; wind velocity readings were recorded in the range 0.2-22.6 kmph with a mean value of 4.5 kmph; temperature readings were ranging from 19.0 ^{o}C to 35.5 ^{o}C and the mean temperature value was 27.5 ^{o}C; the relative humidity values were ranging in between 38-95% and the mean value was 71.4%; the mean atmospheric pressure was recorded 760.2 mm (of mercury); partly cloudy sky prevailed most of the times and there was no rainy day during the monitoring period. The area gets major rainfall during October-November.

E.1.1.2 Ambient Air Quality Status

The study area represents the Residential, Rural and other Areas with respect to National Ambient Air Quality (NAAQ) Norms stipulated by CPCB/TNPCB. The following observations are made based on the collected data:

- RPM values were in the range 30-64 ug/m^3 with the mean value of 40.0 ug/m^3 against the NAAQ Norm value of 100 ug/m^3.
- SPM levels were ranging from 58 ug/m^3 to 137 ug/m^3 with the mean value of 83.5 ug/m^3 against the NAAQ Norm value of 200 ug/m^3.
- SO_2 levels were ranging from 6 ug/m^3 to 14 ug/m^3 with the mean value of 7.6 ug/m^3 against the NAAQ limit value of 80 ug/m^3.
- NO_x levels were ranging from 4 ug/m^3 to 17 ug/m^3 with a mean value of 8.9 ug/m^3 against the NAAQ limit value of 80 ug/m^3.
- CO and HC levels were below detectable limits viz.114.5 ug/m^3 and 65 ug/m^3.
- Particulate Lead was found to be below the respective detectable limit of 0.05 ug/m^3.

The ambient air quality in the study area was found to be in compliance with the ambient air quality norms stipulated by CPCB/TNPCB.

E.1.1.3 Noise Levels

The study area represents rural, residential and commercial areas in comparing with the MoEF Ambient Noise Norms. Ambient noise levels were ranging from 29.7 dB(A) to 100.4 dB(A) during day time and from 28.8 dB(A) to 102.1 dB(A) during night time on the monitoring day. Day Equivalent Noise (Leq-d) level was found to be 41.9 dB(A) and Night Equivalent Noise (Leq-n) level was 39.2 dB(A). While comparing with the MoEF Ambient Noise Norms of for respective categories, the day and night time Leq values were found to be well within the limits.

E.1.1.4 Water Quality

To assess the water quality, 6 surface water and 10 ground water locations were identified. **Surface Waters** were monitored with agreeable colour, taste and odour. pH value was monitored in the range 7.36-7.86. TDS value and Chloride values were found to be in the range of 360-480 mg/l and 104-136 mg/l respectively. DO content was found to ranging between 4.2-4.8 mg/l. Low BOD/COD levels were indicating the good quality surface water.

The water quality was found to be in compliance with the IS:10500 Norms for Drinking Water Quality except Total Coliforms.

Ground Waters were monitored with agreeable colour, taste and odour. pH value was monitored in the range 7.39-7.78. TDS values were ranging from 380 mg/l to 540 mg/l. Chloride values were ranging from 106 mg/l to 158 mg/l. Iron content was monitored in the range 0.08-0.14 mg/l. COD values were monitored in lower levels. There was no significant bacteriological contamination of these sources. In general, the ground water quality was found to be in compliance with IS: 10500 Standards for Drinking Waters (in the absence of an alternate source).

E.1.1.5 Land Environment

The study area can, physiographically, be classified as plain lands. The notable river of the study area is Marudaiyar river flows from west to east and discharges to Kollidam River. There are number of medium to minor irrigation tanks in the study area. The general elevation of the study area ranges from 35 m to 120 m above MSL. The elevation contour indicates the area is sloping towards north and south. The high relief area occurs in northeastern side of the study area. The plant site is located relatively elevated area (100-120 m).

Soil quality: The soils in the study area are classified into 5 types. They are Deep moderately drained calcareous cracking clay soil, Very deep imperfectly drained cracking clayey soil, Very deep moderately well drained calcareous cracking soil, Very deep well drained clayey soils, Very deep well drained loamy soils. To assess the soil quality 8 monitoring stations were identified. The pH of the samples collected in the study area, were found in neutral range. Electrical Conductivity of the samples were ranging from 1.49 to 2.82 mmhos/cm. NPK values were found to be present in significant concentrations. Organic content was monitored in the range 0.69-0.96%. The soil texture was silty loam in nature. The rate of infiltration was ranging from 3.4-3.8 cm/hr. There was no heavy metals intrusion/leaching into the ground strata. In general, the soil in the study area would support vegetation if modified suitably.

Land use pattern: IRS P6 LISS-III Satellite digital data for April-2006 was procured from NRSA, Hyderabad and used for the study. The dry cropland occupies the majority of the study area, which is about 58.61% of the study area. The wet crop occupies second to the dry cropland, which is about 22.70%. Most of the tanks and river in the study area contributes wet crop. The wet crop is noticed along the flood plains. Water body occupies about 5.34% of the study area, which indicates the economic development. About 1.691% of the study area is covered by built-up land. The barren land occupies about 5.08%, which can be used for economic development. Out of 41256 Ha area, Forest Land covers only 1066.04 Ha (2.58%), Total Irrigated Land covers about 4456.43 Ha (10.80%), Unirrigated area covers 22167.52 Ha (53.73%), Culturable waste area covers 4557.69 Ha (11.05%) and Area not available for cultivation covers 9008.32 Ha (21.84%).

E.1.1.6 Ecology

Flora : An ecological survey of the study area was conducted particularly with reference to recording the existing biological resources. Among the species identified, Tamarind (Tamrindus indicus), Neem (Azadirecta indica), Kalli (Euphorbia sps.), Echam (Phoenix syevestris), Mango (Mangifera indica), Palmyra (Borassus flabelifera), etc. were dominant with respect to other species. Presence of large number of Phanerophytes (shrubs and trees) and therophytes (annuals) indicates semiarid to trophical vegetation structure in the study area. Hemicryptophytes (predominantly grasses and sedges) were found to be

insignificant in the area. Hydrophytes, to some extent, were present in the seasonal water bodies. The study area did not record any critically threatened species.

Fauna: There is no Wild Life Sanctuary or National Park or Biosphere or Hotspots within the study area of 10 km. Also, there is no migratory path of avian fauna exist in the study area. Only, the common birds and fauna are observed during the survey**.** Other than the domesticated animals, jackal (Canis auries), field mouse (Rattus norvegicus), house rat (Rattus rattus), bat (Rhinolopus sp. & Hipposiderus sp.), etc. were reported to be common. Amphibians like frogs were mainly in fresh water places. Reptilian fauna is comparatively rich and is mainly restricted to the patches with dense vegetation.

E.1.1.7 Socio-Economic Environment

Population: During 2001 Census, Perambalur District was bifurcated into two districts viz. Perambalur and Ariyalur and later merged into one District i.e. Perambalur District. Recently, on 23rd Nov. 2007 again bifurcated in Ariyalur and Perambalur District. In the study area of 10 km radius, there are about 148177 Households (HHs) in the 51 villages and there are about 6305 HHs in Ariyalur Town. The total population was 610056 with a male population of 301535 and a female population of 308521. The total population of Ariyalur was 27822 with 50.55% males and 49.45% females. Perambalur District accounts for 1189170 persons in about 286745 HHs. In the total population of 610056, the Illiterate population was 54.77% whereas the illiterate population was 45.23%. As far as the population of Scheduled Castes and Scheduled Tribes are concerned, there were 173697 Scheduled Castes Population (with 85511 males and 88186 females) and 2548 Scheduled Tribes (with 1291 males and 1257 females) in the study area. The only Town of Ariyalur accounts for 2765 Scheduled Castes and 38 Scheduled Tribes whereas Perambalur District accounts for 3000365 Scheduled Castes and 11836 Scheduled Tribes.

Occupational Structure: According to the 2001 census, the population of 610056 of which 333734 persons (54.70%) were Total Workers and 276322 persons (45.30%) were non-workers. About 8.14% of the people were engaged in tertiary activities, which included different services. The workers in the primary activities (Cultivators) and the secondary activities (Agricultural Labourers) were 27.27% and 19.30% respectively. The average annual income of the population was found to be in the range Rs.5,000-10,000. It is the nature of the occupational structure of the study area economy.

Places of Importance: There are no ecologically sensitive, historical or archeological monuments of importance in the study area. Although there is some Reserve Forests (RF) outside the study area, their names and distance from the center of the plant site are Vannankurichchi RF at 9.5 km E, Sedalavadi RF at 14 km NE, Manageri RF at 13 km ESE, Vilangudi RF at 14 km SE, Sunderesvarapuram RF at 16.5kmSE, Ulliyakkudi RF at 17km SE, Ambapur RF at 18 km SSE, Kulumur RF at 17 km N, Vanagram RF at 19 km NE of the project site.

Industries: TANCEM-Kallankurichi, Grasim-Reddippalaiyam and Dalmia Cement-Kallakkudi along with their Limestone Mines are major industries in and around the study area. Vijay Cement in Tittagudi Road was not in operation. Madras Cements Limited is coming up with 2 million tonnes clinker and 3 million tones cement per annum adjoining the proposed plant.

E.2 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

E.2.1 CONSTRUCTION PHASE

The construction phase of cement plant usually lasting for a year or two has the potential for a variety of positive and negative environmental and social impacts.

The most important of these impacts are described below.

E.2.1.1 ENVIRONMENTAL IMPACTS

- Emissions from vehicles using fossil fuels

  To minimize the impact construction materials as far as possible will be purchased from the local vendors and vehicles will be maintained and tuned to minimize such emissions.
- As there plant site has no major vegetation other than few shrubs so no cutting of trees and any major clearing of vegetation will take place hence, the impact will be insignificant.
- Noise and ground vibration, dust and dirt, visual effects;

  Noise generated from the construction activities; traffic movement etc. will be short term and will be confined to the plant site only. Water will be sprinkled at regular intervals on the haul roads and at construction site to minimize dust and dirt. Again it will be of short term and limited to construction site only.
- Potential soil contamination from fuels, oil, and other hazardous materials;

  Proper handling and storage will minimize soil contamination from fuels, oil and other hazardous materials. Any spillage will be cleaned immediately.
- Potential health and safety risk due to increase in traffic and access to the construction site;

  The present road conditions are reasonably good for proposed movement of traffic. Movement of heavy vehicles will be preferred mostly during nighttime.
- Potential health impacts and nuisance factors due to noise, dust, vibrations, etc.

  The proposed project is not likely to have any potential health impacts due to noise, dust, vibrations etc. as the nearest habitation is at Tamaraikkulam (0.8 km SE) and the noise dust vibrations etc. will be confined to plant site or will be within 200-500 m from the plant site. The habitations close to plant site are Nallampattai (1.0 km in the north), Ottakkovil (1.5 km in the Northeast), Tamaraikkulam (0.8 km in the Southeast), Aminabad Bit-II hamlet (1.3 km in the southwest) and Govindapuram (1.9 km in the west) are the nearest settlements.

Although utmost care will be taken to minimize these effects and confine it to the plant limits. The impacts shall be futher mitigated by providing warning signs, speed controls, covering loads to reduce spills, and cleaning vehicles and roads (internal roads and approach roads). The diesel storage for heavy equipment that may generate environmental impacts will be having special mitigation designs.

The potential positive impacts of the proposed construction of the project will be primarily socioeconomic in nature and may include:

- Job creation and skills development, with associated increase in living standards;
- Development and improvement of local physical and socio-economic infrastructure.

E.2.1.2 Waste Management

Waste produced during the construction phase of a cement plant is primarily solid waste resulting from mechanical and electrical installation operations, and liquid effluents (e.g. possibly causing emissions and erosion problems). During construction phase, solid waste such as excavated soil, debris, metal waste and oil & grease from construction machines will be generated. Excavated topsoil will be used for backfilling and as soon as construction

is over, all waste will be cleared.During construction phase, waste oil shall be generated as and when lubricating oil is changed. Waste oil shall be collected through the drain ports and stored in leak proof steel drums and sent to the “Spent Oil Storage Site”. The waste oil drums shall be properly identified with label of what is contained both in Tamil and English. This will be sold off as per the Hazardous Waste Management Rules and Handling Rules, (1989/2000 and 2003) to the licensed vendors.

The solid waste generated by workers as municipal waste will be minimal as most of them belong to local area. The solid waste so generated will be collected and segregated will be sent to municipal waste disposal site allocated by local administrative authorities.

Liquid effluents shall be managed by developing a site drainage plan to manage the flow of surface water and minimize the contamination of other water flows. Erosion can be minimised by, for example, replanting any exposed soils as quickly as possible.

Hence impacts shall be insignificant, reversible and for short duration only. The impacts shall be confined to the construction site only.

E.2.1.3 Social impacts

Transitory population increase

In addition to DCB staff, the labour strength engaged in the construction shall be about 600 to 800 persons depending upon construction activities. Most of the unskilled and semi-skilled labour will be by and large available from the nearby villages and towns. Thus, impact on the physical and aesthetic resources will be minimal.

The potential for employment and access to new services may draw people to the area around the cement plant. On the positive side, there will be a temporary increase in economic activity and employment for the local community, local skills development, and the possibility of increased funding for public infrastructure due to population increase. Potential negative social and socio-economic effects may include the an influx of strangers into local communities, disrupting social systems and community structures and affecting community values, family values and religion; increased demand on local services and infrastructure (e.g. by bringing in illness and disease); negative effects on community members if the increase in living standards due to job creation is not sustainable (e.g. where job opportunities cease after completion of the construction phase); and an increase in crime and deviant behavior (e.g. drug abuse, prostitution). Further local skilled, semi skilled and unskilled labourers will get direct and indirect employment during the construction phase. This might also result in a steep rise in agricultural wages in the surrounding villages, especially at the time of harvesting for short duration. Hence, short-term positive impacts on socio-economic conditions of the area are anticipated during the construction phase

E.2.1.4 Health and safety

The construction phase may generate safety hazards in relation to increases in traffic and access to the construction site, and potential health impacts and nuisance factors due to noise, dust, vibrations, etc. On the positive side, the implementation of general hygiene measures and general measures of safety can constitute a sustainable policy for the future, especially during the operations phase.

E.2.2 IMPACTS DURING OPERATION PHASE

The operations phase of a cement plant can be very long and often lasts up to 50 years (sometimes more). There is potential for both positive and negative impacts on environmental, as well as local and regional socio-economic, systems, including some cumulative effects

E.2.2.1 Social impacts

There are likely to be both positive and negative social impacts on local communities from the proposed cement operations. The likely potential negative social impacts from operation of a cement plant and DCB's approach to deal are as follows:

- Additional pressure on the existing physical infrastructure (sewerage, water supply, etc.) and social infrastructure (health services, educational facilities, etc);

  The operation of the proposed plant doesn't pose any additional pressure on the existing physical infrastructure (sewerage, water supply etc.) as the proposed plant will have its integrated township with all the modern facilities and independent infrastructural set up, DCB has planned to have a Sewage Treatment Plant to treat sewage from plant and township. Water supply to the plant and township will be met by company owned borewells. DCB has planned to have a full-fledged Health Centre, Schools up to Secondary level within its premises.
- Impacts on the health of local populations;

  The operation of the plant will not pose any health hazard to the local populations as the plant is having state-of-art technology and fitted with high efficiency pollution control equipments wherever necessary. The cement dust kiln dust will be recycled back to the process. The stacks will be designed for the particulate emission standard of 50 ug/m^3.
- Increase in crime and deviant behavior (e.g. drug abuse and prostitution);

  With the growing opportunities of employment and development in the area, there will be remarkable growth in socio-economic status of the people in general but there may be rise in inequality. This may lead to a sense of insecurity, increase in crime and deviant behavior.

  DCB will adopt the following mechanism to control the effects of industrialization in the area.
  - Promote formal education, vocational education and training opportunities for youth and facilitate access to information, guidance and employment.
  - Create an enabling environment for sustainable, rightful and gainful livelihood, employment, financial credit and other services.
  - Preserve and promote traditional art, culture and heritage and promote healthy lifestyle through engagement in sports and physical activities, including traditional sports.
  - A self-sustained township is planned so that the employees can live with their families.
- Changed cultural values

  With the influx of people from different parts of the country for employment, there may be a slight shift in cultural values, a mixed culture can be seen as India has a very diverse culture. But, this change will be noticeable only within the colony campus where most of the employees will live. This will be localized. The majority of the population of the area will not be affected with this.

E.2.2.2 Occupational health and safety

The health and safety risks in a cement plant during operations include potential for respiratory diseases, burns, allergies and industrial accidents. Additional hazards can arise

from the use of chemicals in the process and explosive materials used in quarrying activities. All such hazards can be successfully controlled by the adoption of safe plant methods, training programs and occupational health and safety management systems.

E.2.2.3 Environmental impacts

E.2.2.3.1 Air emissions

Particulate Matter

A. Cement Plant: Major pollutant emitted from the cement plant is Particulate matter. Sources of PM at cement plants include (1) quarrying and crushing, (2) raw material storage, (3) grinding and blending (4) clinker production, (5) finish grinding, and (6) packaging and loading. The largest emission source of PM within cement plants is the pyroprocessing system that includes the kiln and clinker cooler exhaust stacks. Often, dust from the kiln is collected and recycled into the kiln thereby producing clinker from the dust. Bypass systems sometimes have a separate exhaust stack. Additional sources of PM are raw material storage piles, storage silos, and loading & unloading facilities.

All the pollution control equipment in the proposed cement plant are designed for an outlet emission of less than 50 mg/Nm^3. It is proposed to install a bag house for raw mill/Kiln, bag filter for coal mill and cement mill and ESP for cooler. At all other sources, DCB proposes to install suitable bag filter systems. The dust collected from the various pollution control equipment will be recycled in the cement manufacturing process.

B. Captive Power Plant: It is proposed to use coal as fuel in the 27 MW captive power plant. An ESP is proposed and is designed for an outlet emission of less than 50 mg/Nm^3 to control the particulate emission from the CPP. Boiler based on Circulating Fluidised Bed Technology is proposed to be used, which considerable help in reducing SO_2 emission. Further a stack of height 80m is proposed for proper dispersion of the pollutants.

C. Railway siding

A railway siding spread over an area of 80 acres is proposed for coal unloading at the wagon tippler area and cemnt loading at the wagon loading area. Major source of emission from the handling facilities is in the form of dust. Points of dust generation are wagon tippler stations, wagon loading stations, conveyor discharge points, junction towers. Containment of dust emission will be done by catching the dust at the generation points itself and dust control measures will be provided at various points. Sources of coal dust pollution are at the Wagon Tippler area, primary and secondary crusher house, stacker/reclaimer and coal mill areas of the plant.

Oxides of Sulphur (SO_2) Emissions

A. Cement Plant Kiln: Sulfur dioxide may be generated both from the sulfur compounds in the raw materials and from sulfur in the fuel. Since cement is alkaline in nature, 50-90% SO_2 is removed from the combustion gases in the cement kiln and becomes part of the clinker, thereby mitigating the quantity of SO_2 emissions in the exhaust stream. Due to firing of coal in the proposed plant, about 18.5 gm/sec of SO_2 is estimated to be emitted from the kiln stack.

B. Captive Power Plant: Emission from coal-fired boiler is estimated to be about 23.15 g/s.

Oxides of Nitrogen

A Cement Plant Kiln: In the cement manufacturing process, NOx is generated in the burning zone of the kiln and the burning zone of a precalcining vessel. The present fuel used is coal, which have higher fuel nitrogen but burn with lower flame temperatures will generate lesser less NOx than does oil or gas. Using proper kiln design, low-NOx burners, and an optimum level of excess air should control NOx emissions. For dispersion calculation, the NOx emission rate calculated based on the value of 0.5kg/t of clinker will be about 34.72 g/sec.

B. Captive Power Plant: Emission rate of Oxides of Nitrogen has been computed with a value of about 150 ppm in the flue gas. The NOx emission rate calculated from the stack is about 11.52 g/s. The sources of emissions from the proposed cement plant and CPP are given in **Table E.1.**

E.2.2.3.2 Dispersion Modeling

Prediction of Ground Level Concentration (GLCs) of SPM, SO_2, & NOx has been made by using Industrial Source Complex Short Term model Version-3 (USEPA-ISCST 3). , As **Madras Cement Limited (MCL)** plant is coming up in the adjoining area and its emissions is not represented in the baseline of the study area**,** hence an effort has been made to predict the environmental conditions and cumulative Ground Level concentrations of the different pollutants through dispersion modeling. MCL plant is of similar capacity and setup same emissions are expected to be released from the stacks.

Sn.	Description	Stack Details											
		Control Equip.	Ht. (m)	Dia. (m)	Vel. (m/s)	Temp (0C)	Emission rate (g/s)			Flow Rate (Nm^3/hr)	Coordinates, m		Design Cap. (mg/Nm^3)
							SPM	SO_2	NOx		X	Y	
Proposed DCB Unit													
1	CPP Boiler	ESP	80	3	8	150	1.87	23.15*	11.52	191,446.80	205.19	-55.67	<50
2	Crusher	BF	15	0.86	10	40	0.28	--	--	20,998.42	-35.19	-266.93	<50
3	Kiln / Vertical Roller Mill	BH	90	4.48	12	110	7.35	18.5#	34.72	680,019.84	0	0	<50
4	Cooler	ESP	35	3.22	12	250	2.78	--	--	351,613.18	-22.97	61.84	<50
5	Cement Vertical Roller Mill Hopper	BF	45	3.99	10	90	5.13	--	--	449,902.13	-137.05	124.15	<50
6	Packing Plant	BF	35	0.79	12	60	0.26	--	--	21,164.48	70.72	283.18	<50
7	Coal Mill	BF	40	1.62	12	90	1.11	--	--	88,998.65	-27.7011	-61.12	<50
MCL Unit (Assumed)													
1	CPP Boiler	ESP	80	3	8	150	1.87	23.15*	11.52	191,446.80	-1091.3	-205.9	<50
2	Crusher	BF	15	0.86	10	40	0.28	--	--	20,998.42	-917.7	-436.4	<50
3	Kiln / Vertical Roller Mill	BH	90	4.48	12	110	7.35	18.5#	34.72	680,019.84	-1200	-400	<50
4	Cooler	ESP	35	3.22	12	250	2.78	--	--	351,613.18	-1286.4	-428.6	<50
5	Cement Vertical Roller Mill Hopper	BF	45	3.99	10	90	5.13	--	--	449,902.13	-1359	-559.4	<50
6	Packing Plant	BF	35	0.79	12	60	0.26	--	--	21,164.48	-1501.8	-341.6	<50
7	Coal Mill	BF	40	1.62	12	90	1.11	--	--	88,998.65	-1119.8	-463	<50

*Max. sulphur content of 2.5% considered (Local Coal/Lignite)
#Max. sulphur content of 1.0% considered (Imported Coal)

Table E.1: Source Characteristics/ Release Characteristics

GLCs are calculated by using meteorological data collected from the meteorological station at site during the monitoring period i.e. from **December 2006 to February 2007**. 24-hourly average ground level concentrations of SPM, SO_2 and NO_X computed showed the following maximum values as depicted below:

Sources	SPM	SO_2	NOx
Predicted Ground level Concentration (Max), $\mu g/m^3$	10.94	21.35	25.27
Distance of occurrence, km	1.0	1.8	1.8

Baseline Scenario (98th percentile) max	110	14	17
Overall Scenario	120.94{200}	35.35{80}	42.27{80}

NOTE: The values in parentheses are the CPCB limit for rural and residential areas.

E.2.2.4 Dust emissions/Fugitive Emissions

Well-planned management of activities (e.g. in the methods of loading/unloading and material transfer) can reduce the generation of dust significantly, and with relatively little additional cost. Options for controlling dust from other operations include the use of covered or enclosed conveyers, crushers, material transfer points and storage areas; installation of dust collectors and/or bag filters where needed; paved plant roads; vacuum sweepers for plant roads; sprinklers for plant roads and storage piles and wagon tippler area; latex stabilizing sprays for storage piles; and site landscaping and vegetation. The proposed green belt and regular water sprinkling will further reduce the fugitive emissions. Estimated fugitive dust emissions as calculated from USEPA AP-42 emission factors for uncontrolled sources are as follows:

SPM		
Activity	**Emission g/s**	**Emission g/s/m^2**
Hauling	29.9947205	7.50E-04
Limestone Handling & Loading	0.056087567	9.35E-05
PM2.5		
Hauling	1.683325311	4.21E-05
Limestone Handling & Loading	0.008357048	1.39E-05

With the adoption of various control, techniques its is assumed to be much below this level.

E.2.2.5 CO_2 and climate change

The Emission Factor, was worked out to be 0.488 tons of CO_2/tons of clinker using the estimated Emission factor of CO_2, the net emission of CO_2 from the proposed operation will be 34.445 kg/sec.

E.2.2.6 Noise and vibration

The heavy machinery (crushers, grinding mills, blowers, compressors and large fans) used in cement manufacture can give rise to emissions of noise and/or vibration. Based on the model, calculations the elevated noise levels will be limited to a short distance from source. Further the resultant noise level will mingle with the background noise levels (assumed to be 75 dB (A) at 30 m during day time and 70 dB (A) at 100 m during night time). The above noise levels worked out are without mitigative measures. With the mitigative measures, the noise levels will be further restricted within very short distance from the source.

E.2.2.7 Traffic impacts

These arise from the transport of raw materials to the plant, and delivery of cement to customers. Similar impacts and inconveniences are faced as in the construction phase. The measures suggested for the construction phase should be carried forward to the operational stages. Traffic to and from the plant during operation will be more intensive and much heavier than at present in normal operating conditions. In turn, it will contribute to noise as well as ambient air quality in terms of dust and other gaseous pollutants. The

regular maintenance of vehicles shall limit the pollution within limit. The present road conditions are reasonably good for proposed movement of traffic.

E.2.2.8 Solid waste

All the solid waste will be fully re-used either in the process or in ancillary activities. The municipal solid waste will be sorted and the Biodegradable waste will be composted and used as manure. Non-degradable waste will be land filled at identified areas. Solid Waste generated from-Regular Road Sweeping collection comprises of a mixture of limestone dust, clay and soil. Civil and construction debris / rubbish (Occasionally) will be Dumped in the low-lying areas, which are devoid of mineable reserves. The area thus filled up/ reclaimed shall be used for tree plantation. Flyash from CPP shall be transported pneumatically to the cement plant flyash silo and shall be used in manufacturing of PPC. Bed ash shall be collected from overflow spouts into ash cooler hoppers. Ash from hoppers, after sufficient cooling will be conveyed pneumatically to a bed ash storage silo for further use as boiler bed material. Waste produced during clinker production consists basically of unwanted rock and soil waste materials, which are removed from the raw materials during the preparation of the raw meal, and kiln dust removed from the by-pass flow and the stack. Measures to avoid, minimize and mitigate the solid waste impact of a cement plant may include:

- ❑ Recycling dust to reduce the volume of solid waste;
- ❑ Incineration of waste materials in the burning process, where practicable;
- ❑ Use of rock and soil waste material to backfill and rehabilitate quarries (where of a suitable quality); and
- ❑ Disposal of material that is not suitable for burning or backfilling of quarries in an acceptable manner.

E.2.2.9 Water Resources

During the operation of the plant including CPP, the total water requirement shall be 2500 m^3/day. This requirement of water will be drawn through borewells. Hydrological investigations indicate that sufficient ground water resources are available in the area. The additional exploitation of water resources during the operation will not affect the water availability in the area.

Wastewater

The process wastewater will be treated in ETP & Domestic wastewater of plant and colony will be treated together in Sewage Treatment Plant. The treated water system shall be used for green belt development & dust suppression. There will be no discharge of wastewater from the proposed plant. Based on the discussion it may be concluded that impact shall be insignificant.

E.3 ENVIRONMENTAL MONITORING PROGRAMME

DCB will have a environmental monitoring division/ Environmental Cell which will be responsible for management and implementation of the environmental control measures of the proposed plant operation. They will conduct the scheduled monitoring as specified in the environmental monitoring plan. In addition to the regular schedules of monitoring of Environmental parameters, DCB shall engage an External Agency to conduct the monitoring of all the parameters once a year. The external agency should carry out monitoring exercise within the plant as well in the neighborhood villages.

E.4 ADDITIONAL STUDIES

Risk assessment Study has been carried out for the proposed 27 MW coal based captive power plant and subsequently, Disaster Management Plan (DMP) is prepared keeping in view and conforming to the requirements of the provisions of The Factories Act, 1948 under section 41 B (4) and Guidelines issued by the Ministry of Environment and Forests, Govt. of India and Manufacture, Import and Storage of Hazardous Chemicals Rules, 2000-Schedule 11 under Environmental Protection Act, 1986. The individual risk from proposed coal based captive power plant is tolerable as it lies within ALARP (As Low As is Reasonably Practicable) region as it is below the criterion of individual risk not to exceed 10^{-6} per year in populated areas. The off site societal risk level (out side the plant boundary) lies in the broadly acceptable region and can be considered as negligible.

E.5 PROJECT BENEFITS

People will be benefited directly and indirectly, by creation of employment avenues, school/colleges hospital facilities etc. will be made available. DCB has a very good track record in past & understands its social responsibility. The positive effects of the proposed operation are summarized in the following points:

Afforestation: 33% of the project area will be developed as green belt, which will increase the diversity and density of trees in the area.

Employment: The project will generate direct employment for about 400 persons for the cement plant and about 100 persons for the mines. The indirect employment generated by way of transportation, workshops, petty contractors, shopkeepers and other casual employment is expected to be about 800-1000. Thus the project will have positive impact on the employment pattern of the region. In addition to direct job opportunities, there will be a number of indirect job opportunities in the form of tea stalls, saloons, hotels, puncture repair shops, opportunities to transporters, diesel and petrol suppliers etc.

Occupational Avenues & Pattern: A shift in household industry is likely towards carpentry, blacksmiths and cobblers (the essential services required for any plant and /or its township) other than traditional village handicrafts, pottery etc. The livestock-rearing pattern is likely to change in the vicinity of the plant for holding of goats and sheep to an increase in cows and buffalo rearing. A moderate increase in poultry farming is also likely, to meet the increased demand for eggs and poultry items.

As there will be influx of people in the area there will be a demand of additional supply of food, meat, milk, eggs etc. by the inhabitants leading to shift in household industry such as poultry, dairy, grocery shops etc in the area. This will in turn generate additional employment and income to the people in the region.

Ancillary Industries: Development of cement based industries such as hume pipes, cement concrete poles, cement concrete prefab structures etc. because of regular availability of cement will be ensured from the plant within the State.

Revenues: The project will increase the Govt. Revenues, which will enable the Govt. to spend on the development of the villages and would put more funds for the socio-economic development of the area. In addition to payment of additional royalty to the State Government, DCB shall make all efforts to improve the socio-economic status of the local habitants. DCB shall review various welfare schemes going on in the area from time to time and take appropriate decisions of modifications/ additions of welfare schemes as per requirement of local habitants.

Infrastructure: Development of real estate markets. As there will be creation of huge reservoir from the mined out area, which will be devoted to the public/self help group of the area for activities like pisciculture and recreation facilities. Large amount of afforestation is planned which will also be help in meeting the needs of fuel and fodder for the locals and will help in modifying the scenic beauty of the place. Development of Roads, schools, increased medical facilities, education opportunities etc.

These benefits and opportunities will, however, need to be developed to reach their fullest potential (e.g. by helping local entrepreneurs to establish and run these services for local benefit).

E.6 ENVIRONMENT MANAGEMENT PLAN

Environmental Management Plan (EMP) has been designed within the framework of various Central/State legislative and regulatory requirements on environmental and socio-economic aspects and has been designed to Minimize disturbance to native flora and fauna; Prevent air, water, soil and noise pollution; Avoid sites of historical, cultural and archaeological significance; and Encourage the socio-economic development. DCB's management is conscious of the continuous threat posed by pollution to society. DCB is committed to apply standard operative practices for construction & operation and to use best acceptable technology for the operation of plant and control of pollution so as to minimize the adverse impacts. Additionally, following are the salient features of EMP.

E.6.1 AIR POLLUTION CONTROL MEASURES

The details of the various pollution control equipment proposed are:

- Installation of bag house/bag filter systems and one ESP for cooler and one for CPP for control of dust generated from various processes. All the flue gas outlets will be provided with state of art air pollution control equipment to maintain the particulate emission level below 50 mg/Nm^3.
- Interlocking mechanism will be incorporated for all the pollution control equipment and process units.
- Handling of fine coal in closed circuit. Adequate water spray shall be provided.
- As low sulphur coal is proposed to be used, SO_2 emission shall be negligible and SO_2, if any, will get fixed with raw meal in the cement kiln and converted as $CaSO_4$. SO_2 emission from stack will be well within the limits.
- In Kiln, a well-designed burner system is adopted to limit the temperature to a reasonably low value of NOx.
- All vehicles and their exhausts would be well maintained and regularly tested for emission concentration
- The roads in the cement plant will be paved to prevent dust emissions.
- Bag filters will be provided at various locations of the transfer points.
- All the raw material stockpiles will be covered with aprons for fugitive dust control.

The above said measures shall be adopted to curb air pollution from the proposed plant and the outlet concentration of SPM from each stack shall be below the prescribed limit of 50 mg/Nm^3.

E.6.2 NOISE POLLUTION CONTROL MEASURES

Plant machinery like cement mill, raw mill, ID fans, compressors, turbo generators, Crusher etc. are the major sources of noise pollution. The following are the noise control measures proposed to be undertaken to ensure low noise levels.

- ❑ All rotating items shall be well lubricated and provided with enclosures as far as possible to reduce noise transmission. Vibration isolators will be provided to reduce vibration and noise wherever possible
- ❑ In general, noise-generating items such as fans, blowers, compressors, pumps, motors etc. will be so specified as to limit their speeds to less than 1500 rpm and reduce noise levels. Static and dynamic balancing of equipment will be insisted upon and will be verified during inspection and installation
- ❑ Provision of silencers shall be made wherever possible.
- ❑ Provision of acoustic dampeners in foundations and insulators in the interiors.
- ❑ Layouts of equipment foundations and structures will be designed keeping in view the requirement of noise abatement
- ❑ Central control room(s) provided for operation and supervision of plant and equipment will be air-conditioned, insulated and free from plant noise. Necessary enclosures will also be provided on the working platforms/areas to provide local protection in high noise level areas
- ❑ The operators in close proximity of noise generating equipment will be provided with necessary safety and protection equipment such as ear plugs, ear muffs etc
- ❑ Automatic door enclosures for control room and laboratory etc
- ❑ By provision of green belt in and around the plant premises. A thick greenbelt will be developed all around the plant boundary to act as noise attenuator.
- ❑ Occupational Health and Safety Administration System (OHSAS) for evaluation of exposure of noise pollution on the associated staff and comparing it with permissible exposure and subsequently taking corrective actions will be developed.

By these measures, it is anticipated that noise levels in the plant will be maintained below 75 dB(A). Earth mounds and plantations in the zone between plant and township would further attenuate noise in the residential area.

E.6.3 WATER POLLUTION CONTROL MEASURES

No wastewater is generated from cement plant process and cooling as the total water undergoes evaporation during the exchange of heat. Wastewater generation from CPP cooling tower blow down/ is mainly rejected due to increase in TDS concentration after few cycles. This wastewater will be used for green belt development in the plant and colony after treatment in ETP. The domestic wastewater of plant and colony will be treated in Sewage Treatment Plant (STP) and then reused for green belt development.

E.6.4 GREEN BELT DEVELOPMENT

Around 800-1000 trees per hectare are proposed to be planted annually and the plantation would eventually cover almost 33% of the project area.

E.6.5 WATER HARVESTING

DCB shall contribute in maintaining the ground water table by adopting water harvesting schemes as per details given below:

- ❑ Roof top harvesting and collection of water in well will be carried out at:

a) Limestone Stacker Shed (80 m dia) having a total roof collection area of 7500 m^2. The maximum collection potential of the same will be about 720 m^3;
b) Fly ash Shed (125 m x 75 m size) with a total roof collection area of 14000 m^2. The maximum collection potential of the same will be about 1350 m^3.
c) CPP Shed (25mx25m size) having a total roof collection area of 900 m^2. The maximum collection potential of the same is about 90 m^3.

- DCB shall also store storm water in special collection pits made for the purpose. The water thus collected shall be used for irrigation of green belt in the plant.

E.6.6 SOCIO – ECONOMIC MEASURES

In addition to payment of royalty to the state Government and increase in revenue because of the cement plant, DCB shall also put its efforts to improve the socio-economic status of the local habitants.

E.6.7 ENVIRONMENT MANAGEMENT CELL

DCB will have a department consisting of officers from various disciplines to co-ordinate the activities concerned with the management and implementation of the environmental control measures of the proposed plant operation. Basically, this department will undertake monitoring of the environmental pollution levels by measuring stack emissions, ambient air quality, water and effluent quality, noise level etc., either departmentally or by appointing external agencies wherever necessary.

E.6.8 FISCAL ESTIMATES FOR EMP

The Capital investment proposed on environmental management is Rs. 1745 Lacs and the annual coast of monitoring and implementation of control measures for proposed plant operation are estimated to be about Rs. 485 Lacs.

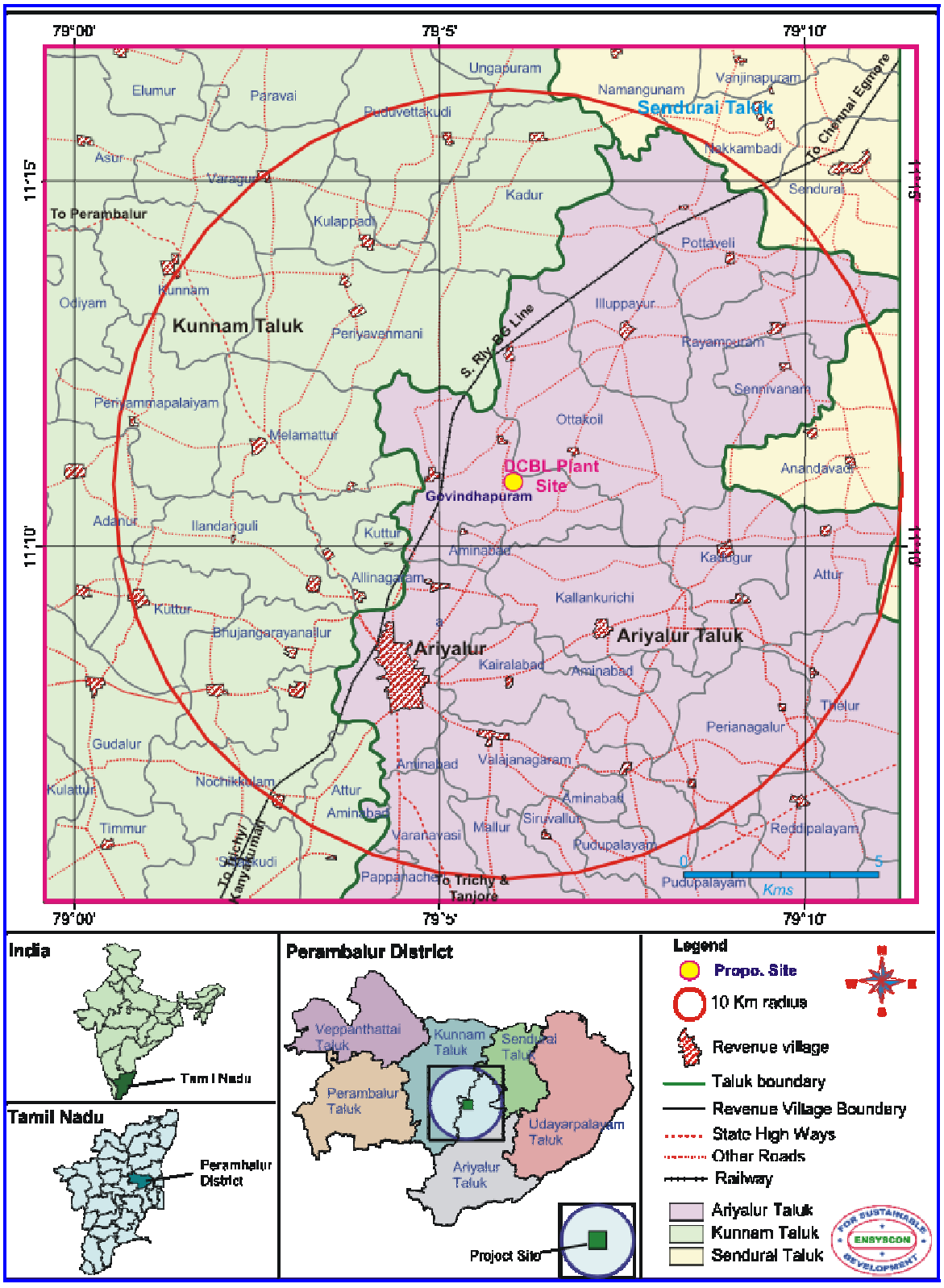

Figure E.1: Location Map of the Proposed Project

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