RAPID ENVIRONMENTAL IMPACT ASSESSMENT

OF

DURGA CEMENT WORKS

ANDHRA CEMENTS LTD.

Durgapuram, Dachepalli mandal, Guntur District,
Andhra Pradesh

For

INCREASE OF PRODUCTION
CLINKER : 1.00 TO 2.00 MTPA
CEMENT : 0.80 TO 2.31 MTPA

WINTER SEASON '06-07

Prepared By

B.S. ENVI-TECH (P) LTD
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CHAPTER - 1

INTRODUCTION

1.0 INTRODUCTION

1.1 ANDHRA CEMENTS LTD

ANDHRA CEMENTS LTD (ACL), is operating the following units for cement production in the state of Andhra Pradesh with total installed capacity of 1.4 MTPA.

	Production MTPA
Durga Cement Works	0.8
VCW	0.62

ACL has commissioned Durga Cement Works in the year 1983 near Durgapuram Village, Dachepalli Mandal of Andhra Pradesh. The clinker production capacity of the cement plant is 1.0 MTPA. Of the total clinker production of 1.0 MTPA, **ACL** is dispatching about 0.30 MTPA of clinker to VCW for cement production. With the balance clinker of 0.70 MTPA, **ACL** is producing cement of 0.8 MTPA.

Various grades of cement produced by **ACL** are:

a. Ordinary Portland Cement
b. Portland Pozzolona Cement
c. Portland Slag Cement

Limestone requirement of Durga Cement Works is met from Captive Limestone Mine located in an area of 170.22 ha adjacent to the cement plant.

The current status of various units of **ACL** along with installed production capacities are given below :

OVERVIEW OF PRODUCTION CAPACITIES OF ACL

		INSTALLED CAPACITY MTPA
1	Clinker Production Capacity	1.00
2	Cement Production Capacity	0.80
3	Captive Limestone Mining	1.50

1.2 PRESENT PROPOSAL

Considering market demand, **ACL** has proposed to enhance the production capacity of the cement plant from 1.0 MTPA to 2.00 MTPA clinker by undertaking the following modification in the existing cement plant. As part of modification scheme, ACL proposes to upgrade the existing environmental management plan of the plant keeping in view of latest guidelines/norms of CREP/CPCB/MOEF. The salient features of the modification are given below :

a. Installation of Roller press for pre grinding of raw meal for the Raw mill -1 (ball Mill)
b. Installation of a new classifier, reject recirculation system for Raw Mill – 2 (VRM)
c. Conversion of pneumatic raw meal and Kiln feeding transport systems to mechanical systems.
d. Replacement of existing 4/5 stage preheater with 6 stage pre heater and Inline calcination with new PH fan
e. Installation of a Bag house for Kiln/raw mill in place of existing ESP.
f. Replacement of 12 m kiln shell with 40 m kiln, lining, girthgear, pinion, gear box, inlet and outlet seals, T.A. Duct, Kiln burner and P.A. fan
g. Installation of a new grate cooler of 113 m^2 in place of existing conventional cooler of 3 grates (71.20 m^2).
h. Installation of new ESP in place of existing two multiclones for cooler gas dedusting.
i. Contruction of new clinker silo of 40,000 tonnes
j. Moderinisation of coal mill with new classifier
k. Installation of a new cement mill of 150 tph capacity
l. Introduction of pneumatic flyash handling system and fly ash silo of 500 kg capacity
m. Installation of New rotary electronic packers
n. Installation of XRF for quality control

Of the total clinker production of 2.00 MTPA after modification, ACL proposes to dispatch about 0.35 MTPA to VCW and with the balance clinker of 1.65 MTPA, ACL proposes to produce cement of 2.31 MTPA

Details of production capacities of the cement plant before and after Modification are given below :

PRODUCTION DETAILS

	BEFORE MODIFICATION	AFTER MODIFICATION
Clinker, MTPA	1.00	2.00
Cement, MTPA	0.80	2.31

1.3 NEED FOR ADDITIONAL CEMENT MANUFACTURING CAPACITY

Cement industry is one of the main beneficiaries of the infrastructure boom. While on the one hand several big and small cement companies are actively considering expansion plans in anticipation of further growth in demand for cement, on the other, a phase of acquisitions and mergers among the existing players is also going on.

In India, the south consumes maximum of 30 % followed by East at 17 %, North at 19 %, Central at 16 %, and West 18 %. Also, there is an increase in the consumption of PPC cement from 48 % to 50 per cent.

The demand is expected to increase to 17.5 million by 2007-08 in view of irrigation and infrastructure projects. About 21.5 million tonnes capacity is expected to be added by the year 2008 by expansions. This year's domestic demand will be 160 million tonnes. Now that the GDP is expected to grow to 8 per cent, growth in the cement consumption is also expected to remain above 12 per cent per year.

Weaker sections' housing, construction of public toilets, schools in rural areas apart from several private and public infrastructure projects will also give tremendous boost to the cement consumption in the state. Most importantly, irrigation projects, worth nearly Rs 1 lakh crore, will trigger unprecedented demand for the next 5-7 years.

As per the Industry sources, demand has mainly come from the construction sector with the three main cities in the South — Bangalore, Chennai and Hyderabad — witnessing hectic construction

activity, be it for the information technology sector, shopping malls or integrated townships. The growth in demand has prompted many cement industries to consider expanding their capacities, both in present locations and in greenfield locations.

Continuous demand for exports to China and other South-East Asian countries along with the increased requirement of the domestic sector has lead all the cement manufacturers in the country to plan for increased capacities. The increase of production within the existing plant is based on the following considerations.

- Proximity of the site to limestone mines (captive) and abundant availability of reserves.
- Market demand
- Availability of land
- Availability of existing infrastructure.

1.4 PROJECT COST:

The project cost incurred on the existing plant till date is Rs 105.29 crores (Rs 3.44 crores for EMP).

ACL has estimated that the cost of implementation of the modification of cement plant will involve a total capital investment of Rs 312.70 Crores.

Of the proposed project cost of Rs 312.70crores, **ACL** has budgeted an amount of Rs 28 crores towards implementation of Environmental Management Plan.

1.5 LOCATION OF THE CEMENT PLANT

The plant is located near Durgapuram, Dachepalli Mandal, Guntur District of Andhra Pradesh. The site falls between 79°40' to 79°45' East longitude and 16°35' to 16°40' North latitude and is located at an average msl of 80 m above msl. The area is covered in Survey of India Topo sheet no. 56 P/10 [1:50000 scale].

Fig-1.1 shows the location map of the plant.

The plant is located at a distance of 0.8 km away from the State Highway connecting Miryalaguda-Guntur. Krishna River is flowing at a distance of 4.3 km in the northern direction. Musi River flows at a distance of about 5.1 km

Seasonal nallas like Naguleru vagu and Dandi vagu are tributaries of Krishna river located at a distance of about 1.2 km and 4.8 km of the plant in East and Western direction to the plant.

Bugga vagu source of Musi River is flowing at a distance of 7.7 km in NNW direction of mine. The confluence point of River Krishna & Musi is about 5.1 km from the plant in NW direction

The nearest village to the plant is Shrinagar located at a distance of 0.9 km form the plant.

Fig-1.2 shows the Key Map of the cement plant.

The area is well connected by roads from Miryalaguda, Gurajala & Guntur. Miryalaguda is the main city which is located at a distance of 28 km from the plant site.

The site is connected by Broad gauge railway line of South Central Railway on Guntur-Hyderabad-Macherla section. The railway head is passing at a distance of 6.7 km in the SSW direction and the nearest railway station is Vishnupuram and junction is Nadikudi at 6.6 km from the Plant.

The following are the various industrial activities within 10 km radius

The India Cement Ltd.,
[Penna Cement Industries Ltd.,
Deccan Cements
Deccan Chromates Ltd

FIG - 1.1
LOCATION MAP

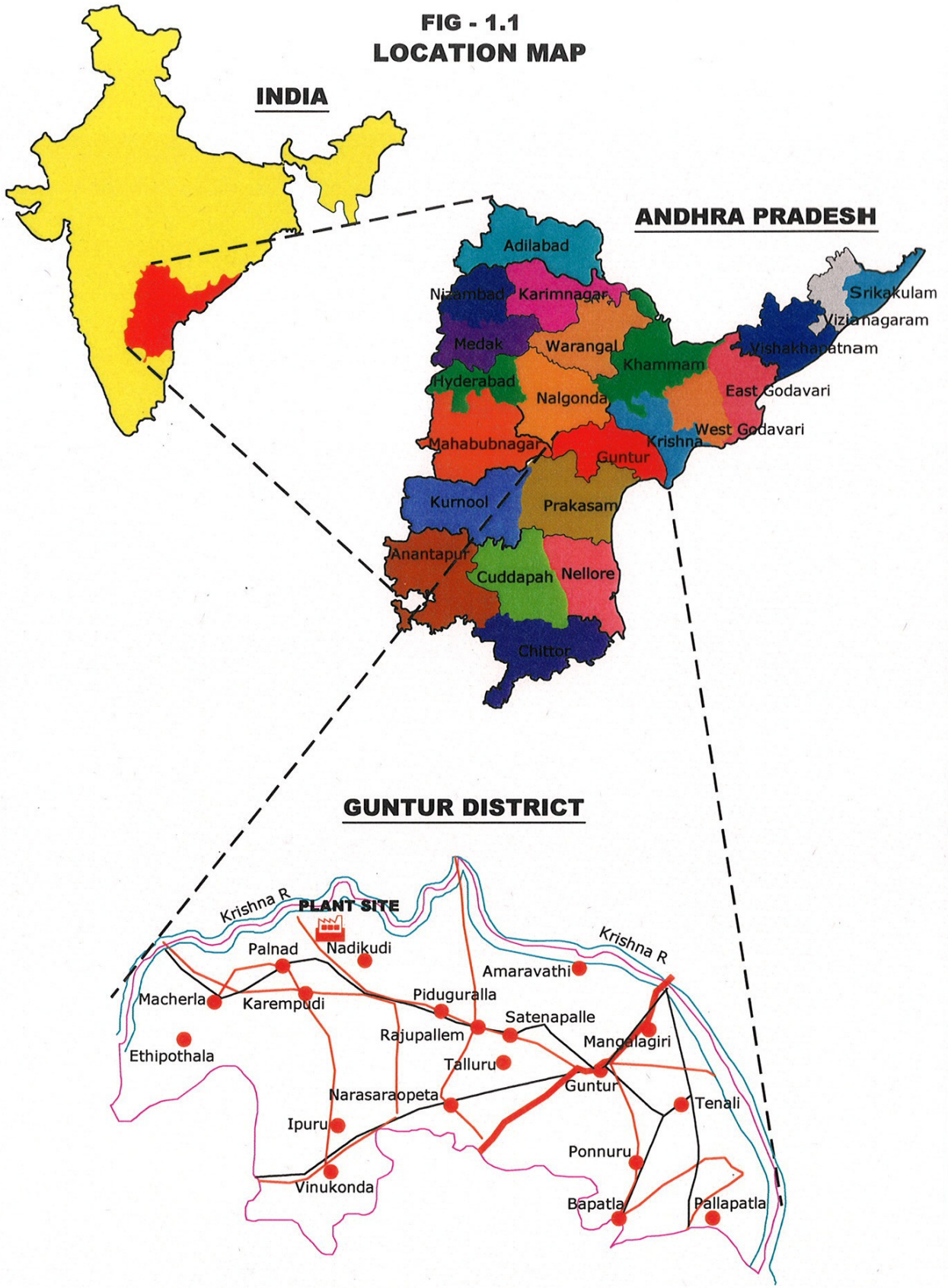
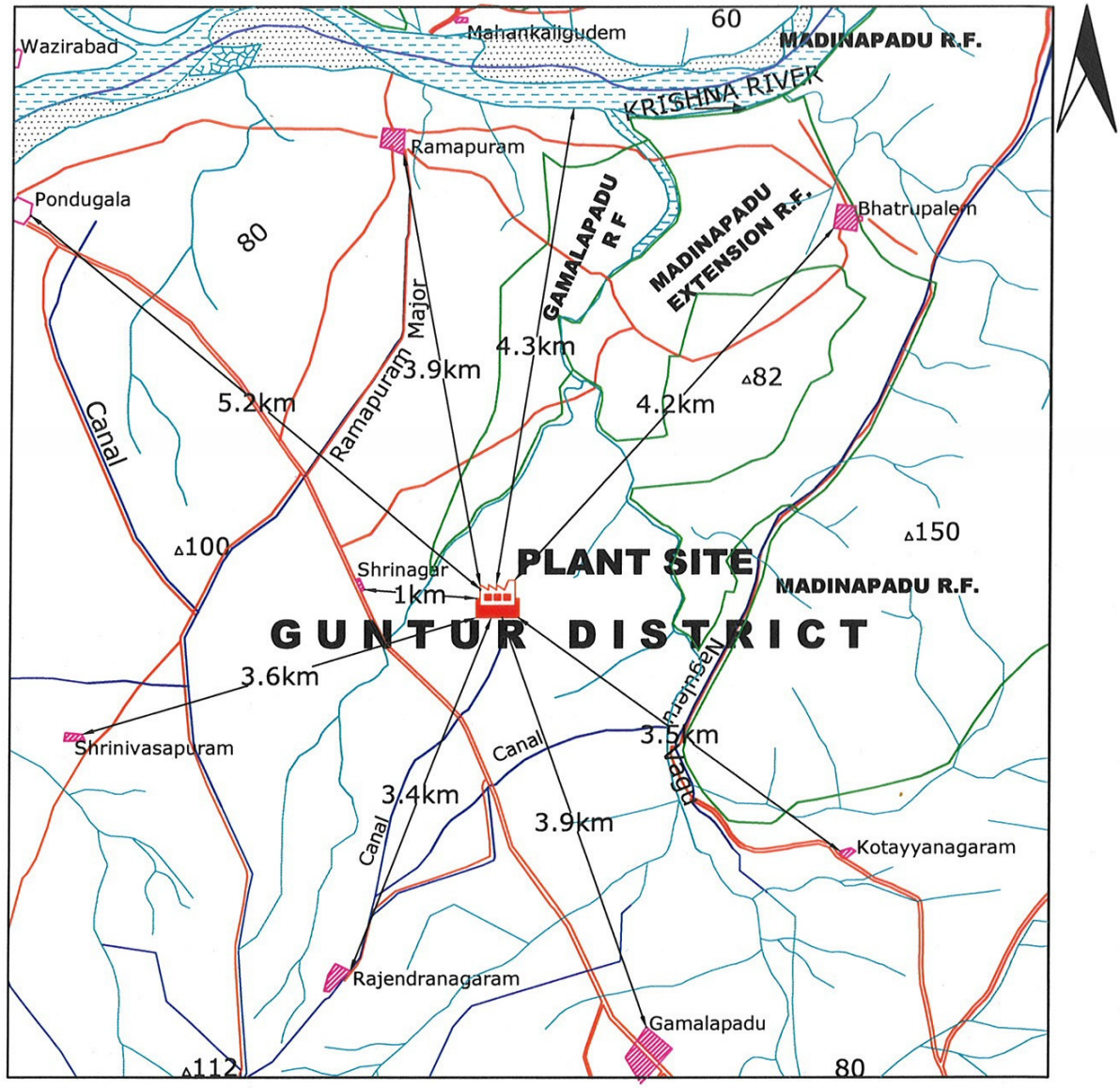


FIG - 1.2
KEY MAP



LEGEND

- ROAD
- STREAM/ TANK
- CONTOUR
- FOREST
- CANAL
- RIVER
- SETTLEMENT
- ▲82 SPOT HEIGHT
- DISTRICT BOUNDARY
- PLANT SITE

SCALE
0 1 2km

FIG - 1.2

PROJECT :
ANDHRA CEMENTS LIMITED.,
DURGAPURAM VILLAGE, DACHEPALLI MANDAL,
GUNTUR DT, A.P.

TITLE :
KEY MAP

PREPARED BY:
B.S.ENVI-TECH (P) LTD.,
HYDERABAD

The following are the Reserved Forests present in 10 km radius of plant:

Gamalapadu RF-0.4 km
Madinapadu RF-1.8 km
Daida RF-4.7km
Saidaulnam RF-5.0 km
Ravipahad RF-6.6 km
Wazirabad RF-6.8 km

The nearest airport is at Vijayawada at a distance of 150 km from the Cement plant.

Fig-1.3 shows the 10 km radius of the study area around the plant. **Table-1.2** gives the salient features of the plant.

1.6 RESOURCES AVAILABILITY

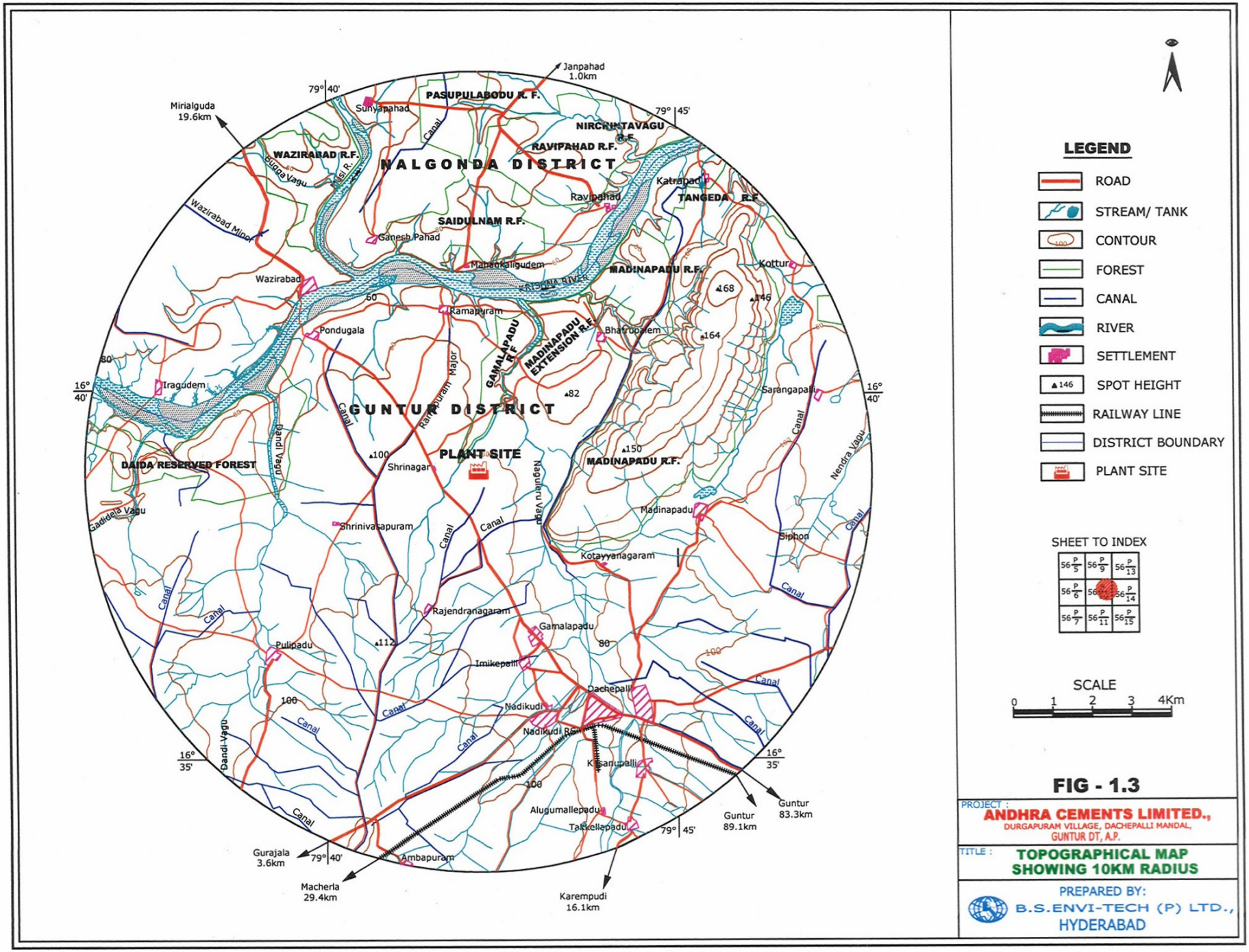
1.6.1 RAW MATERIAL

The major raw material used in the manufacture of cement is Limestone.

Present limestone requirement of 1.00 MTPA clinker production is about 1.5 MTPA. The total limestone requirement for producing 2.00 MTPA clinker is estimated to be about 3.0 MTPA.

The limestone requirement will be met from the existing captive limestone mine located in an area of 170.22 ha adjacent to the cement plant. This mine has reserves totaling to about 62 million tones. At the proposed limestone production rate of 3.0 MTPA, this mine can supply limestone for a period of 21 years.

The total requirement of raw material before and after modification of the cement plant are given below:



LEGEND

- ROAD
- STREAM/ TANK
- CONTOUR
- FOREST
- CANAL
- RIVER
- SETTLEMENT
- SPOT HEIGHT
- RAILWAY LINE
- DISTRICT BOUNDARY
- PLANT SITE

SHEET TO INDEX

SCALE

0 1 2 3 4Km

FIG - 1.3

PROJECT :
ANDHRA CEMENTS LIMITED.,
DURGAPURAM VILLAGE, DACHEPALLI MANDAL,
GUNTUR DT, A.P.

TITLE :
TOPOGRAPHICAL MAP SHOWING 10KM RADIUS

PREPARED BY:
B.S.ENVI-TECH (P) LTD.,
HYDERABAD

TABLE - 1.1

SALIENT FEATURES OF THE PLANT

FEATURE	DETAILS
Altitude	80 m above msl
Longitude	79°40' to 79°45' E
Latitude	16°35' to 16°40' N
Village, Tehsil, District, State	Durgapuram, Dachepalli Mandal, Guntur District of Andhra Pradesh
Max. Temp.	46 °C
Min. Temp.	12 °C
Relative Humidity	40-80 %
Annual rainfall	627 mm
Land availability	141.574 ha
Topography	Plain
Soil Type	Sandy Loam
Nearest River	Krishna River – 4.3 km and Musi River - 5.1 km
Nearest Highway	State Highway connecting Miryalaguda-Guntur is passing at a distance of 0.8 km from the plant.
Nearest Railway station	Nadikudi – 6.6 km
Nearest Railway Junction	Nadikudi-6.6 km
Nearest Industries	The India Cement Ltd., Penna Cement Industries Ltd, Deccan Cements (All the Cement industries/mines are located within 10 km of the plant)
Nearest Village	Shrinagar Village- 0.9 km
Nearest City	Miryalaguda– 28 km
Nearest Air port	Vijayawada – 150 km
Nearest Forest	Gamalapadu RF-0.4 km, Madinapadu RF-1.8, Daida RF-4.7, Saidaulnam RF-5.0, Ravipahad RF- 6.6 & Wazirabad RF-6.8
Historical places	None within 10 km

** all distances mentioned in the above table are aerial distances.*

REQUIREMENT OF RAW MATERIAL, MTPA

		BEFORE MODIFICATION	AFTER MODIFICATION	Source
Installed capacities	**CLINKER**	**1.00**	**2.00**	
	CEMENT	**0.80**	**2.31**	
RAW MATERIAL				
Limestone		1.5	3.0	Captive Limestone Mine
Laterite /Bauxite		0.025	0.0437	LMW, SLINE and VK - Mallempally
Fly ash		0.15	0.465	VTPS, KTPS, NTPC and ITC.
Gypsum		0.06	0.09	EID, Parry
Coal		0.18	0.36	Singareni Colleries

1.6.2 LAND

ACL has acquired an area of 141.574 Ha for the cement plant and colony of which the present units along with greenbelt occupy an area of 44.36 ha. Vacant land available within the acquired area is adequate for accommodating the new units of the cement plant. Hence no additional land will be acquired.

FIG – 1.4 shows the layout of the cement plant.

1.6.3 WATER

The present water requirement of the Cement Plant including Colony is about750 m^3/day. Gas conditioning tower of Kiln ESP is the major source of water consumption . With the modification of cement plant, the water consumption of the plant is will reduce by 250 m^3/day. The reduction in water consumption is mainly due to replacement of ESP with Bag house for Kiln and Installation of sewage treatment plant for treating and recycling of treated wastewater for use in process. The

10. FIRST AID CENTRE
11. RESERVE STATION
12. HSD REFUELING STATION
13. PRIMARY CRUSHER
14. SURFACE WATER TANK
15. MINES IFFICE ADN WORK SHOP
16. SECONDARY CRUSHER
17. LIME STONE STOCK PILE
18. RAW MATERIAL HOPPERS
19. RAW MILL DEPT
20. RAW MEAL SILO
21. CLINKER STOCK PILE
22. KILN FEED DEPT
23. PREHEATER
24. ROTARY KILN
25. CENTRAL CONTROL ROOM
26. COAL AND GYPSUM YARD
27. RAW COAL BELT CONV
28. CLINKER WAGON LOADING CONV
29. GYPSUM BELT
30. FOLAX COOLER
31. COAL MILL DEPT
32. LAB AND ENGG OFFICE
33. ADMINISTRATIVE OFFICE
34. CANTEEN
35. WORK SHOP
36. GEN STORES
37. 132 KV RECEIVING STATION
38. D G SET
39. CEMENT MILL DEPT
40. PACKING PLANT
41. CEMENT STORAGE SILO
42. WEIGH BRIDGE
43. CENTRALISED BATH AND W.C.
44. TIME OFFICE
45. SECURITY OFFICE
46. OTH
47. PRO.TEMPLE COMPLEX
48. COLONY SUB STATION
49. DORMITRY
50. CLUB DRIVERS REST ROOM
51. DIRECTORS REST HOUSE (Manchala)
52. DIRECTORS (BANGLOW)
53. TRANSPORT CONTRACTORS OFFECES
54. QTRS FOR COOKS /DRIVERS
55. SHOPPING COMPLEX
16A. SECONDARY CRUSHER
18A. RAW MAIL HOPPERS
18B. BLUE DUST HOPPER
19A. ATOX RAW MILL 37.5
20A. RAW MEAL SILO
19B. COMPRESSOR HOUSE
23A. PREC ALCINER
31A. ATOX COAL MIL20
37A. 132KV RECEVING STATION
39A. CEMENT MILL
41A. CEMENT SILO
40A. PACKING PLANT
25A. CENTRAL CONTROL ROOM
24A. CEM SCANNER
56A. DIESEL STORAGE TANKS
58A. HT DG SET HOUSE (2*5.8MW)
59. DUTY PAID GODOWN
60. DIRMITOTY BLOCK
61. I D FAN - 1 (NEW)

PROPOSED
62. CRUSHER
63. STACKER/RECLAIMER -2Nos
64. RAW MATL DEPT
65.RAW MILL DEPT
66. RAW MEAL SILO
67. KILN FEED
68. PREHEATER
69. KILN
70. COOLER
71. COAL MILL
72. DEEP BUCKET CONV.
73. CLINKER SILO
74. ROLLER PRESS
75. CEMENT SILOS
76. PACKING PLANT

PROPOSED
MODIFICATION

FIG - 1.4

PROJECT :
ANDHRA CEMENTS LIMITED.,
DURGAPURAM VILLAGE, DACHEPALLI MANDAL,
GUNTUR DT, A.P.

TITLE :
PLANT LAYOUT

PREPARED BY:
B.S.ENVI-TECH (P) LTD.,
HYDERABAD

1/12

total water consumption after modification of the plant will be 420 m^3/day.

The above requirement is met from the Naguleru stream located at a distance of about 1.2 km from the cement plant.

1.6.4 POWER

The average specific power consumption in the cement plant was found to be about 90 kWhr/T of cement. The peak power consumption in the total plant including colony and Mines at present is 15 MW and is met from grid.

The total power requirement of the cement plant after modification at enhanced production is estimated to be about 28 MW. This requirement will be met from grid.

1.6.5 MANPOWER

The existing manpower working in plant is 542 There will be additional manpower requirement to an extent of 20 people for operating the cement plant at enhanced production.

1.6.6 TOWNSHIP

ACL has constructed a full-fledged colony consisting of 182 houses for the benefit of employees.

Colony of **ACL** is located at 1.0 km from the plant in the western direction. All the necessary infrastructure facilities such as School, dispensary, Park and Playground, Temple, Commercial Complex, etc., are provided in the colony. As part of expansion programme, **ACL** proposes to setup a sewage treatment for treating the wastewater generated from the colony.

1.7 ENVIRONMENTAL IMPACT ASSESSMENT STUDY

As per the guidelines of MoEF, **ACL** has conducted environmental impact assessment study to identify the possible environmental impacts and correspondingly to design proper Environmental

Management Plan to the standards prescribed by State Pollution Control Board and MoEF.

This report highlights the Environmental Impact assessment study carried out in Winter season of 2006-07 on various environmental components such as air, noise, water, soil and socio economy within an impact zone of 10 km radius around the plant site and the proposed mitigation measures.

CHAPTER - 2

SCOPE OF METHODOLOGY OF REIA

2.0 SCOPE AND METHODOLOGY OF THE REIA STUDY

2.1 SCOPE

The scope of the study includes preparation of Environmental Impact Assessment study with detailed characterisation of various environmental components such as air, noise, water, land and socio economic within an area of 10 km radius around the ACL cement plant located near Durgapuram village, Dachepalli Mandal, Guntur District of Andhra Pradesh as per the guidelines of CPCB/MOEF.

The main objectives of characterisation are

- To assess the existing baseline status of air, water, noise, land and socio-economic environments within the plant (core zone) and around 10 km radius of the study area (buffer zone).
- To identify and quantify significant impacts due to various operations of the proposed increase in production on various environmental components through prediction of impacts.
- To evaluate the beneficial and adverse impacts of the proposed increase in cement production.
- To prepare an Environmental Management Plan (EMP) detailing control technologies and measures to be adopted for mitigation of adverse impacts if any, as a consequence of the proposed increase of production.
- To prepare a Post Project Monitoring Programme for checking and regulating the environmental quality in the post expansion phase of the plant and help in sustainable development of the area.

2.2 METHODOLOGY OF REIA

Any developmental activity is expected to cause impacts on surrounding environment during the construction and operation phases. The impacts may be adverse or beneficial. In order to assess

the impacts due to increase in clinker production from 1.0 to 2.00 MTPA, an Environmental Impact Assessment study has been conducted within an area of 10 km radius around the plant.

The various steps involved in Environmental Impact Assessment study of the project site are divided into the following phases:

- Identification of significant environmental parameters and assessing the existing status within the impact zone with respect of air, water, noise, soil and socioeconomic components of environment.
- Prediction of impact on air quality taking into consideration the proposed emissions to project the overall scenario
- Prediction of impact on Water, Land and Socio Economic Environment
- Evaluation of total impacts after superimposing the predicted scenario over the baseline scenario to prepare an Environmental Management Plan

The methodology adopted for studying the various individual components of environment are described below.

2.2.1 Micro Meteorology

An auto weather monitoring station to record meteorological parameters was installed to record the various parameters like Wind speed, Wind direction, maximum and minimum temperatures, relative humidity, cloud cover was recorded on hourly basis continuously for the Winter season 2006 -07 covering the months of December '06, January '07 and February '07.

Wind speed & wind direction data recorded during the study period were used for computation of relative percentage frequencies of different wind directions. The meteorological data thus collected has been used for interpretation of the existing Ambient Air Quality status, and the same data has been used for prediction of impacts of future scenario due to the activities of the expansion scheme.

2.2.2 Ambient Air Quality

Core Zone

Ambient air quality of the plant is assessed by two AAQ monitoring station located at different locations of plant area.

Buffer Zone

The scenario of the existing ambient air quality in the study region has been assessed through a network of six ambient air quality stations during the study period within an area of 10 km radius around the mine area. The monitoring network was so designed such that representative samples are obtained from the upwind direction, down wind and cross wind directions of the plant site. These monitoring sites have been established keeping in view the available climatological norms of predominant wind direction and wind speed of this particular region. The following points were also taken into consideration in designing the network of sampling stations:

a) Topography / Terrain of the study area
b) Populated areas within the study area
c) Residential and sensitive areas within the study area.
d) Magnitude of the surrounding industries
e) Representation of regional background levels
f) Representation of cross sectional distribution in downward direction.

The existing Ambient Air Quality status (AAQ) has been monitored for SPM, RPM, SO_2, NO_X, and CO. SPM & RPM at each station has been monitored on 24 hourly basis and all the gaseous sampling has been done on 8 hourly basis except CO which was monitored on 4 hourly basis.

Precalibrated Respirable dust samplers have been used for monitoring of the existing AAQ status. Methodologies adopted for sampling and analysis were, as per the approved methods of Central Pollution Control Board (CPCB). Maximum, minimum, average and percentile values have been computed from the raw data collected at all

individual sampling stations to represent the ambient air quality status of the study area.

2.2.3 Noise Environment

Core zone

Spot Noise levels were measured at six locations within plant complex at various noise generating sources.

Buffer zone

Noise monitoring has been carried out at six locations to identify the impact due to the existing sources on the surroundings in the study area. Noise levels were recorded at an interval of 30 minutes during the day and night times to compute the day equivalent, night equivalent and day-night equivalent level.

2.2.4 Water Environment

Eight water samples from various locations around the plant site within 10 km radius were collected for assessment of the existing physico-chemical and bacteriological quality. Out of 8 samples, 7 samples from ground water & one sample from surface water body [Krishna River] were collected. Methodologies adopted for sampling and analysis were according to the IS methods. Field parameters such as pH, Temperature were monitored on site. The parameters thus analysed were compared with IS 10500. The activities surrounding the source during sampling were taken into consideration in interpretation of the water quality of that particular source.

2.2.5 Land Environment

Field surveys were conducted to identify the land use in and around 10 km radius of the mine area. Representative soil samples were collected from -six sampling locations within an area of 10 km radius around the plant for analysis of the physico chemical characteristics to assess the cropping pattern, microbial growth etc. Standard procedures were followed for sampling and analysis. The samples

collected were also analysed to check the suitability for growth of native plant species in and around the plant. Information on flora and fauna has been collected in the study area during the study period within 10 km radius.

2.2.6 Socio – Economic Environment

Details on economic status of various villages within an area of 10 km around the plant have collected.

Information on existing amenities has been collected to determine the developmental activities to be undertaken by the ACL authorities. Such developmental activities would result in upliftment of the economic status in the area.

All the above environmental parameters have been used for identification, evaluation and prediction of significant impacts.

2.3 Prediction of Impacts, Environmental Management Plan & Disaster Management Plan

Various technical aspects of the expansion of the plant have been studied to identify the significant impacts which would arise for the clinker production from 1.0 to 2.00 MTPA. The identified impacts have been quantified through prediction of impacts to estimate the post project scenario.

Identified impacts due to expansion of the plant have been studied in detail to predict the impacts on various environmental components. Standard techniques and methodologies have been adopted to predict impacts on various environmental components. Predicted scenario has been superimposed over the baseline (pre-project) status of environmental quality to derive the ultimate (post-project) scenario of environmental conditions.

Environmental Management Plan (EMP) of the plant details the control measures which are being undertaken and which are proposed to be undertaken by ACL for the increased production to maintain environmental quality within the stipulated limits specified by State Pollution Control Board /MOEF/IBM.

CHAPTER - 3

CEMENT PLANT COMPLEX AND ENVIRONMENTAL SCENARIO

3.0 CEMENT PLANT COMPLEX AND ENVIRONMENTAL SCENARIO

3.1 PRESENT PRODUCTION CAPACITIES OF ACL

ACL currently is manufacturing 0.80 MTPA cement. The total limestone production from the captive limestone mine at present is about 1.5 MTPA.

3.2 LAYOUT OF CEMENT PLANT COMPLEX

Cement plant and colony are located in an area of 141.574 ha including greenbelt. The captive limestone mine area located in an area of 170.22 Ha. Layout of the existing cement plant along colony are shown in **Fig-3.1**. The land use break up of the total land has been discussed hereunder.

PRESENT LAND BREAKUP (Ha)

		Area
1	Plant	61.034
2	Colony	39.18
3	Greenbelt	24.00
4	Open Area	17.36
Total		141.574

3.3 PRODUCTION DETAILS

ACL is manufacturing OPC and PPC. The composition of OPC and PPC: The compositions of above two types of cement are given below.

COMPOSITION OF DIFFERENT TYPES OF CEMENT

	ORDINARY PORTLAND CEMENT	PORTLAND POZZOLANA CEMENT
Clinker	95 %	60 %
Gypsum	5 %	5 %
Flyash	---	35 %

FIG - 3.1

PROJECT :

ANDHRA CEMENTS LIMITED.,

DURGAPURAM VILLAGE, DACHEPALLI MANDAL,
GUNTUR DT, A.P.

TITLE :

PLANT LAYOUT

PREPARED BY:

B.S.ENVI-TECH (P) LTD.,
HYDERABAD

3.4 RAW MATERIAL CONSUMPTION

The major raw material used in the manufacture of cement is Limestone. This limestone is met from the captive limestone mines.

ACL present limestone requirement is 1.5 MTPA of limestone for its present clinker production of 3.0 MTPA. The consumption of limestone and other raw material in the cement plant is given below:

REQUIREMENT OF RAW MATERIAL

		MTPA	
Installed capacities	**CLINKER**	**1.00**	
	CEMENT	**0.90**	***Source***
RAW MATERIAL			
Limestone		1.5	Captive Limestone Mine
Laterite /Bauxite		0.025	LMW, SLINE and VK - Mallempally
Fly ash		0.15	VTPS, KTPS, NTPC and ITC.
Gypsum		0.06	EID, Parry
Coal		0.18	Singareni Colleries

The calcination process of clinkerisation is accomplished with supply of heat. Coal required for the plant is procured from SCCL.

The average calorific value of the coal and ash content are about 4500 kcal/kg and 30 % respectively

3.5 PROCESS DESCRIPTION

The plant is designed to manufacture clinker by adopting the dry process technology. The process largely comprises of

A. Crushing the limestone
B. Raw Mix preparation

C. Raw mix homogenization
D. Coal preparation
E. Calcination and Clinkerisation
F. Cement Grinding
G. Packing

Fig – 3.2 shows the process flow diagram of the cement manufacturing process.

Description of each of the above operation is detailed below:

Limestone, the principal raw materials is mined from the captive mines using sequential Blasting Technique, which generate minimal vibrations. The blasted material is then loaded by the Hydraulic Excavators into Dumper's and transported to crusher for crushing the larger size pieces to smaller size, acceptable for milling operations.

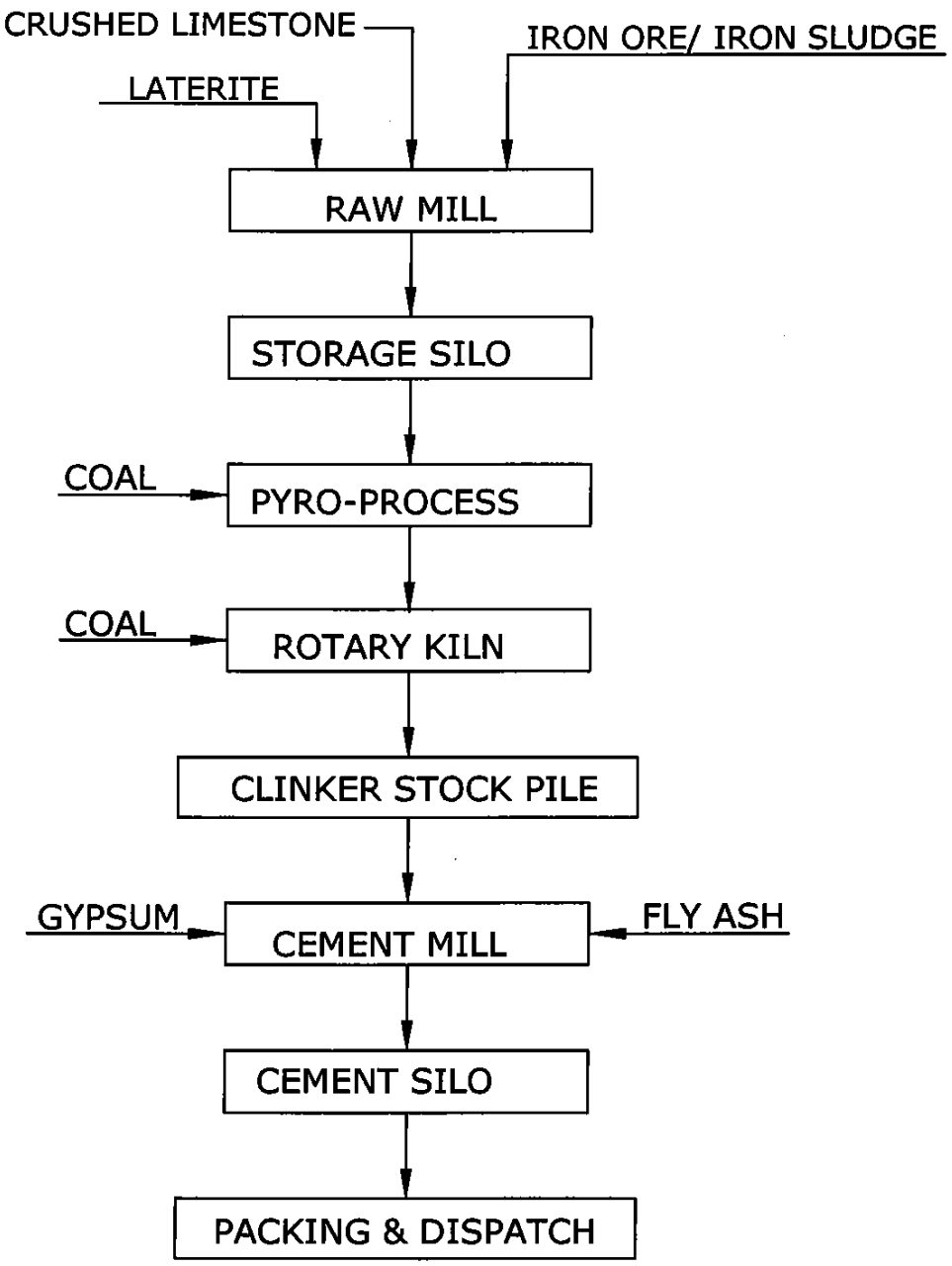
The stored limestone is extracted by the reclaimer equipment and conveyed to the vertical roller mills storage hoppers by belt conveyors.

Along with the crushed limestone a small proportion of additives such as bauxite, laterite, Iron ore and *Iron Sludge* are added as required and inter ground to a fine powder known as raw meal using vertical roller mill/raw mill and conveyed to the blending silos for final blending.

The fine powder, thus conveyed to blending silos, gets thoroughly blended by pneumatic aeration system and forms into a homogeneous mixture. The homogeneous mixture is then stored in storage silos for further processing in the pyro - process system.

The well homogenized raw meal or otherwise called kiln feed is pumped pneumatically using vertical pneumatic pump to pre-heater cyclone section of the pyro - process system.

FIG - 3.2
PROCESS FLOW DIAGRAM OF
CEMENT MANUFACTURING PROCESS



Coal is used as main fuels in the pyro-process. The fuel is pulverized to a fine powder in vertical coal mill/ball mill and fired into the system at two points. One is in the kiln and the other is in the pre- calciner in counter current to the raw meal feed.

The raw meal or kiln feed under goes chemical reactions as it travels from the preheater to kiln and then passing through various process zones and finally to the burning zone transforming to nodules called clinker. The hot clinker falling from the kiln outlet is cooled in a grate cooler and finally transferred to the Clinker Stockpile by Deep Bucket Conveyer/Drag chain and Deep pan conveyer / Belt Conveyor.

The clinker from the Clinker Stockpile conveyed to Cement Mill clinker hoppers and gypsum is conveyed to gypsum hopper. In cement mill the clinker is ground to fine powder along with 2-5% of gypsum, termed as cement and pumped in to cement storage silos by vertical pneumatic pumps.

The stored Cement is drawn from the silos as and when required to packing machines and packed in 50 Kg HDPE/Paper Bags. The packed Cement sent to various destinations by Road/Rail

3.6 UNIT WISE OPERATIONS

Crushed Lime Stone:

Desired quality of limestone is crushed at cement plant.

Raw Mix Preparation:

There are two component of raw mixes in use with composition of 95$\pm$ 0.3% of limestone and 5 $\pm$0.3% of additives. The blended crushed limestone and additives is fed into VRM in desired and controlled proportion through weighfeeders to grind these two components, so as

to produce powdery raw mix of required quality and fineness suitable for producing good quality clinker.

Raw Mix Homogenization:

The raw mix thus produced is homogenized in blending silo having required blending ratio and is called kiln feed.

Coal blend Preparation:

The Indian coal and imported coal of known quality as received is stacked separately and ground in a coal mill to the required fineness to arrive at an average calorific value of 4400 kcal/kg.

Clinkerisation

The desired and consistent quality of kiln feed is pyroprocessed in the rotary kiln at 1400^{0}C using blend of fine coal & imported coal as a fuel. Clinker of consistently high and desired quality is produced. The hot clinker nodules rolling out of kiln are cooled by air in grate cooler and the clinker is stored in clinker closed storage yard further processing.

Cement Grinding:

The clinker is ground in cement mill with gypsum (3-5%) or with gypsum (3-5%) and fly ash (20-25%). The OPC and PPC is ground directly in the ball mills.

Finished Product:

Different types of cement is stored separately in silos and packed in 50 kg HDPE bags through packers of 50$\pm$0.25 kg accuracy. These bags are loaded into trucks by mechanized loaders.

3.7 PROCESS CONTROL SYSTEM

ACL has provided interlocking system in the mills of the cement plant. Kiln is monitored and controlled as per desired parameters through Distributed Control System (DCS) installed in Central Control Room (CCR). The operator has facilities with colour graphic quick alarms and sophisticated fine tuned auto control loops to get optimum production maintaining the desired quality.

The following control systems in the process line are provided to produce the quality cement.

- Online Quality Control and Monitoring system
- Plant optimization system.
- Raw Material Proportioning system
- Micro processor based bag filter timers
- High efficient auto tuning ESP
- PLC based blaster control panels
- PLC based compressor control system
- All sub control systems in DCS
- Mechanical material conveying system.
- Damperless and variable speed fans
- Ball mills for raw material
- High efficiency motors, fans, blowers, pumps and compressors
- Low pressure high efficiency cyclone and calciner.

3.8 ENVIRONMENTAL SCENARIO OF EXISTING CEMENT PLANT COMPLEX

Cement manufacturing process involves handling and processing of raw material and finished product in fine form. ACL has invested about Rs 24 Crores for the installation of pollution control systems. The major pollution sources from the cement plant are kiln flue gas, cooler gas, cement mills and coal mills.

Unlike other process industries, in cement plants pollution control systems will be considered as process Units. Any loss of raw material or finished product is a direct loss of revenue. Hence proper care has been taken at ACL to maintain the process emissions far less than 100 mg/Nm^3 to minimize the material loss into the atmosphere.

- All the pollution control systems (PC) have been designed for a maximum outlet dust concentration of 100 mg/Nm^3 against the consent value of 115 mg/Nm^3.

- It has been found during the field studies (emissions conducted during the study period) that the outlet dust concentration at each pollution control system in the plant was found to vary between and 100 mg/Nm^3 at full load conditions against the APPCB consent value of 115 mg/Nm^3.

POLLUTION CONTROL SYSTEMS IN THE PROCESS

S.NO	LOCATION	POLLUTION CONTROL EQUIPMENT
1	Limestone crusher	Bag filter
2	Raw mill silo top – Blending silo	Bag filter
3	Kiln feed weight feeder	Bag filter
4	Kiln and Raw mill	ESP
5	Grate cooler exhaust	Multiclone
6	Clinker conveyor – Transfer point	Bag filter
7	Cement mills	ESP
8	Cement Silo	Bag filter
9	Packing plant	Bag filter
10	Coal Mill – 1	Bag filter
11	Coal Mill – 2	ESP

ESP: Electrostatic Precipitator

ACL has made all efforts to control the emissions from the plant and also have provided clean working environment inside the plant. The over all environmental quality in the cement plant has been discussed hereunder.

- The ambient air quality in the plant has been found to be well within the NAAQ standards prescribed for Industrial and mixed zones.

- Baseline air quality measured within 10 km radius was found to be less than 161 $\mu g/m^3$ and which is well within the norms of NAAQ standards prescribed for rural and residential zones.

- Stack gas emissions from the plant have been maintained in between 70 mg/Nm^3 and 100 mg/Nm^3 which meets the APPCB standards of 115 mg/Nm^3 for particulate Matter (PM) emissions.

- The industry has planted about 27500 trees so far in the plant since 1983 and also proposed to plant about 1500 saplings every year for the next five years in the plant. The survival rate of the plants was found to be about 60-65%.

As part of the environmental impact assessment study of the expansion scheme, an attempt has been made to assess the environmental scenario in the plant. Under this program the following parameters have been studied to know the performance of the pollution control systems, stack gas emission tests have been conducted in two units.

3.9 EMISSION TESTS

In order to take necessary management plan, ACL had engaged a consultancy for regularly monitoring the stack gas emission from all the pollution control systems in the plant on monthly basis. During

the EIA study period, emission tests have been conducted for all the major pollution control systems to know the performance of each pollution control system in two units.

Stack gas quality tests for dust concentrations have been conducted as per the test procedures recommended by the central pollution board and also EPA method –5. Isokinetic dust samples have been colleted by using stack-monitoring kit with suitable nozzles and other accessories.

Gaseous pollutants such as SO_2 and NO_x emission have been measured in the fuel firing system such as kiln. Gas samples were collected from kiln in the cement plant have been analyzed for SO_2 and NO_x in addition to the PM concentration. The summary of result have been discussed hereunder.

- The maximum PM concentrations at the outlet of the kiln ESP was 98 mg/ Nm^3.

- Emissions from chimneys have been measured during the study period and were compared with the values reported during the last financial year. Summary of the data is given in the following tables. It was observed from the field data that the Particulate Matter concentration at the outlet of pollution control systems was found to be less than 100 mg/nm^3.

SUMMARY OF STACK EMMISSIONS DURING STUDY PERIOD

[mg/Nm^3]

Stack Attached	Kiln/Raw Mills	Cooler	Coal Mill – 1	Coal Mill - 2	Cement Mill – 1	Cement Mill - 2
Particulate matter	98	70	78	74	86	80
Sulphur-Dioxide	Traces	---	---	-	---	-
Oxides-of-Nitrogen	578	---	---	-	---	-

CHAPTER - 4

MODIFICATION OF CEMENT PLANT

4.0 MODIFICATION OF CEMENT PLANT

Modification of the Cement plant will increase the clinker production to 2.00 MTPA and Cement production to 2.31 MTPA. The details of proposed modification in the plant are discussed below

ACL will takeup modification of the following equipment to enhance the clinker output. The major units of the process line are

a. Limestone crusher
b. Raw Mill
c. Kiln
d. Cooler
e. Coal Mill
f. Cement Mill

A CRUSHER

The capacity of the crusher at present is 450 tph. The capacity of the crusher will be increased to 600 tph by undertaking the following modifications

a. bypassing < 75 mm
b. increasing the strokes
c. To increase the capacity of the crusher to 600 TPH, ACL

Presently the crushed limestone is stored in a covered storage yard of 25000 tonnes capacity. Under the modification, it is proposed to introduce a stacker of 600 tph and reclaimer of 500 tph capacity.

The existing laterite storage yard of 3000 tonnes capacity will be enhanced to 5500 tonnes

The raw meal transportation to the silo will be replaced with meachanical system of 500 tph capacity in place of existing pneumatic system.

B RAW MILL

Two raw mills are in operation i.e Raw Mill – 1 and Raw Mill – 2. Raw Mill – 1 is a ball mill of 125 tph capacity which will be increased to 240 tph capacity by installation of roller press as pre grinder.

Raw Mill – 2 is a Vertical Roller Mill of 190 tph capacity which will be increased to 225 tph capacity with the introduction of a new classifier with three fan system having a facility for reject recirculation.

Thus the overall capacity of the raw mills will be increased from the present 315 tph to 449 tph after modification. The present GCT and ESP of the raw mills will be replaced with a new Bag House forming a integral part of the dedusting arrangement along with the Kiln.

C PREHEATER

The present preheater of 4/5 stage will be replaced with a six stage pre heater which will be backed by the increased feed rate of raw meal. This will not only increases the production capacity of the unit but also will result in energy conservation. The Kiln hot gases in the 4 stage preheater are presently cooled from 370 °C to 140 °C in the gas conditioning tower where water of about 13 m^3/hr is used in the gas conditioning tower. With conversion of 4 stage preheater to 6 stage preheater, the preheater outlet gas temperature will be around 280 °C and these gases are directly utilized in the raw mill for raw material drying and will be vented out through bag house.

The increase of feed rate will be achieved by replacing the existing pneumatic feed transport system with mechanical system i.e bucket elevator

D KILN

The existing Kiln shell of 12 m length will be replaced with a new shell and brick lining of 40 m length with a girthgear, pinion and gear box.

The inlet and outlet seals and the T.A. Duct will be modified to suit to the new Kiln shell along with Kiln burner and P.A. fan.

With increase in length of the Kiln, the production capacity will be increased from 3000 to 6000 tpd.

The hot gases of the kiln will be routed through the pre heater and raw meal heating system before routing through the new Bag house for dedusting and releasing through the chimney.

A new stack of suitable height will be installed for the kiln flue gases to suit to the new pre heater.

E COOLER

To increase the capacity of the clinker cooling from 3000 tpd to 6000 tpd, a new grate cooler of 113 m^2 area will replace the existing three conventional grate cooler of 71.2 m^2 area.

The clinker after cooler will be stored in a new clinker silo of 40000 tonnes capacity provided with extraction, conveying and bulk loading system.

The present two multiclones of the cooler will be replaced with a ESP for dedusting of cooler gases

F COAL MILL

The present coal requirement of the plant is 540 t/day. with increase in clinker production capacity to 6000 tpd, The coal requirement increases to 1080 tpd. Two coal mills are in operation at present, one ball mill of 12 tph and other, vertical roller mill of 32 tph.

Both the coal mills are operated for about 12 hours to meet the present requirement. Though the capacity of the present mills is adequate to meet the enhanced coal grinding, a new classifier will be introduced in the circuit of Vertical roller mill for optimizing its grinding capacity to 35 tph.

The existing coal mills i.e Coal Mill – 1 is provided with Bag filter and coal Mill – 2 is provided with ESP.

The coal at present is stored in an open yard of 5000 tonnes capacity. A new stacker/reclaimer of 100 tph capacity will take care of the fuel handling system from two stock piles of 6500 tonnes capacity after modification.

G CEMENT MILL

Two cement mills with a closed circuit arrangement of 90 tph each are in operation. The separators of these mills will be replaced with high efficiency separators to achieve higher output. The existing cement mills provided with ESPs.

Apart from this, a new ball mill of 150 tph capacity will be installed to take care of increased grinding capacity. A new Bag filter will be provided for the new cement mill

4.1 CAPACITY OF UNITS

The capacities and operational hours of the units after modification will be as follows :

4.1.1 CRUSHER

The operational details of the crusher before and after modification are given below

CAPACITY OF THE CRUSHER

	Before MODIFICATION	AFTER MODIFICATION
Quantity of limestone, tpd	4500	9000
Capacities of crusher	450	600
Operational hours	10	15

4.1.2 RAW MILLS

The operational details of the raw mills before and after modification are given below

CAPACITY OF THE RAW MILLS

		Before MODIFICATION	AFTER MODIFICATION
Quantity of limestone and Laterite/Bauxite tpd		4600	9500
Capacities of raw mill	Raw Mill -1	125	240
	Raw Mill – 2	190	225
	Total	315	465
Operational hours		15	21

4.1.3 KILN

The operational details of the kiln before and after modification are given below

CAPACITY OF THE KILN

	Before MODIFICATION	AFTER MODIFICATION
Quantity of limestone and Laterite/Bauxite tpd	4600	9500
Capacities of Kiln	3000	6000
Operational hours	24	24

4.1.4 COOLER

The operational details of the cooler before and after modification are given below

CAPACITY OF THE COOLER

	Before MODIFICATION	AFTER MODIFICATION
Grate area, m^2	71.20	113
Capacities of cooler	3000	6000
Operational hours	24	24

4.1.5 COAL MILL

The operational details of the coal mills before and after modification are given below

CAPACITY OF THE COAL MILLS

		Before MODIFICATION	AFTER MODIFICATION
Quantity of coal, tpd		540	1080
Capacities of coal mill	Coal Mill -1	12	12
	Coal Mill – 2	32	35
	Total	44	47
Operational hours		13	23

4.1.6 CEMENT MILLS

ACL is presently producing cement of 0.80 MTPA. Total cement production after modification is planned at 2.31 MTPA. The capacity of the cement mills at present is 180 tph. with installation of the new cement mill, the capacity of the cement mills will increase to 330 tph

The operational details of the cement mills before and after modification are given below

CAPACITY OF THE CEMENT MILLS

		Before MODIFICATION	AFTER MODIFICATION
Quantity of cement , tpd		2600	6994
Capacities of cement mill	Cement Mill - 1	90	90
	Cement Mill – 2	90	90
	Cement Mill – 3	-	150
	Total	180	330
Operational hours		15	21

4.2 GAS FLOWS

An attempt has been made to identify the possible increase in gas flows and due to enhancement of production capacity of the plant from various units.

The increase of flows of various units before and after modification are given in **Table – 4.1**

TABLE – 4.1
UNIT WISE FLOWS DUE TO UPGRADATION

SL. No	Location	M^3/HR	
		BEFORE UPGRADATION	AFTER UPGRADATION
1	Crusher	30000	45000
2	Raw Mill – 1 & 2/Kiln	385000	1000000
3	Coal Mill – 1	30000	30000
4	Coal Mill – 2	60000	60000
5	Cooler	225000	550000
6	Cement Mill – 1	45000	45000
7	Cement Mill – 2	45000	45000
8	Cement Mill – 3	-	100000

CHAPTER - 5

BASELINE ENVIRONMENT

5.0 BASELINE ENVIRONMENT

The baseline environment quality represents the background environmental scenario of various environmental components such as air, water, noise, land, and socio economic status of the study area. The sources of emission in the study area are the Cement industries, Mining activities, unpaved roads and fuel burning in the villages.

Agriculture is the main activity in the area. The study area is dominated by the mining activities and cement plants of the above industries.

5.1 MICRO METEOROLOGY OF THE STUDY AREA

5.1.1 Micro Meteorology

Regional Climate

In general, the study area experiences subtropical climate with cold winter nights with a minimum temperature of 16 °C and hot summer days with a peak temperature of 46 °C. Monsoon starts in the month of July with peak precipitation in the months of August and September. The average relative humidity is around 60 %.

Mean wind speeds observed in the area were between 8 -16 kmph with predominant winds from N-NE-E-SE-S sector for 7 months of the year in winter season and summer seasons and SW-W-NW sector for 5 months of the year during monsoon and Summer season. Wind speeds during winter season (3 months) were found to be low (< 9 kmph) when compared with other seasons (> 9 kmph and <17 kmph)

5.1.2 Site Meteorology

An auto weather monitoring station has been installed on top of mine office building to record micro meteorological data on Wind Speed (kmph), Wind Direction, Ambient Temperature (°C), Relative Humidity (%), and Rain fall (mm) on hourly basis.

Percentage frequencies of wind in 16 directions have been computed from the recorded data of study period covering December '06 to February'07. During the study period the wind roses were plotted at an interval for 8 hourly (00-08hrs, 08-16 hrs and 16-24 hrs) and 24 hrs (00-24hrs).

Wind pattern during 00-08 hours

The predominant wind direction during this period was from N to ESE sector direction accounting to about 53.2% of the total time with calm winds of less than 1.7 kmph for about 30.92% Wind speeds during this period were varying between 1.0-10 kmph.

Wind pattern during 08-16 hours

The predominant wind direction during this period was from N to ESE sector accounting to about 63.16 % of the total time with calm winds of less than 1.7 kmph for about 14.58 % Wind speeds during this period were varying between 1.0-10 kmph.

Wind pattern during 16-24 hours

The predominant wind direction during this period was from NNE to ESE sector accounting to about 63.66% of the total time with calm winds of less than 1.0 kmph for about 9.99% Wind speeds during this period were varying between 1.0-10 kmph.

Wind pattern during 00-24 hours (WINTER 2006-07)

The predominant wind direction during this period was from N to ESE sector accounting to about 62.11% of the total time with calm winds of less than 1.7 kmph for about 18.50 % Wind speeds during this period were varying between 1.0-10 kmph. **Fig – 5.1 & 5.2** represents the wind pattern of the study period. The summary of the wind pattern is given below:

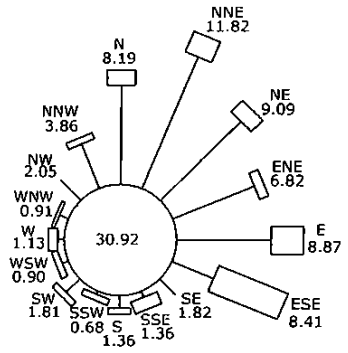
FIG - 5.1
WINDROSE DIAGRAM

PROJECT : ANDHRA CEMENTS LIMITED

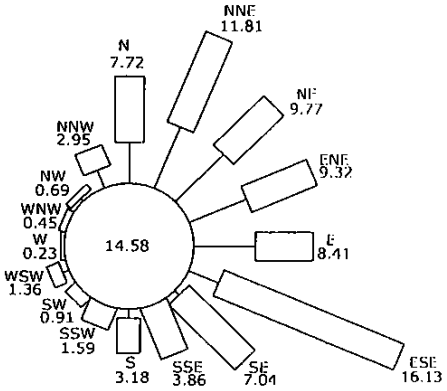
LOCATION : PLANT SITE

PERIOD : WINTER '06-'07

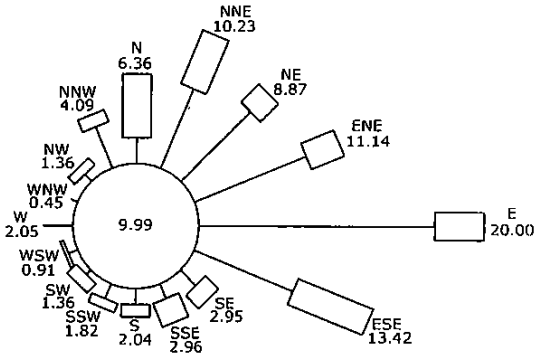
N



DURATION : 00 - 08 HRS.



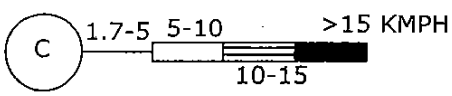
DURATION : 09 - 16 HRS.



DURATION : 17 - 24 HRS.

NOTE : All readings are in percentage occurance of wind

LEGEND



C = Calm Conditions in Percentage

SCALE

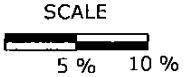


FIG - 5.2

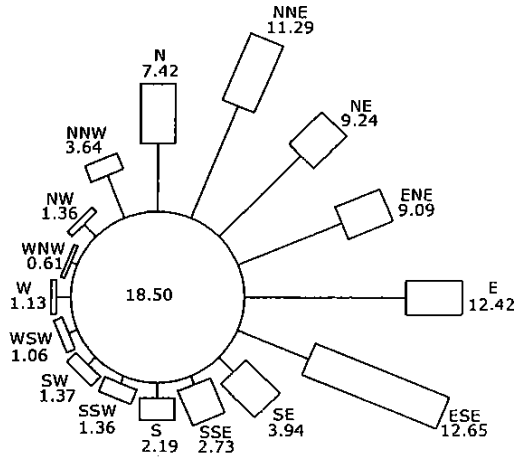
WINDROSE DIAGRAM

PROJECT : ANDHRA CEMENTS LIMITED

LOCATION : PLANT SITE

PERIOD : WINTER '06-'07

N



DURATION : 00 - 24 HRS.

NOTE : All readings are in percentage occurance of wind

LEGEND

0.0-1.7

C

1.7-5 5-10 >15 KMPH

10-15

C = Calm Conditions in Percentage

SCALE

5 % 10 %

SUMMARY OF WIND PATTERN

DURATION (HRS)	PREDOMINANT WIND DIRECTION
00:00 – 08:00 hrs	N to ESE Sector
08:00 – 16:00 hrs	
16:00 – 24:00 hrs	
00:00 – 24:00 hrs	

5.2 AMBIENT AIR QUALITY

In order to identify the background air quality data and also to represent the interference from various industrial and local activities, screening techniques have been used for identification of air quality stations in the study area.

The following activities are present in the 10 km radius of the cement plant, which are responsible for the background air quality. Due to the rich limestone belt in the area, the following are the major industries located within 10 km radius of the study area.

Industries, Cement plants & Limestone Plants	• India Cements Ltd– Wazirabad – 4 km from the plant site • Penna Cement Industries Ltd., –7 km from the plant site • Deccan Cements – 10 km from the plant site

The area experiences dry climate and most of the roads in the area are metalled. Though the route of limestone transportation was metalled, heavy traffic density has led to vehicular emissions and flying of carried dust.

The air pollution-monitoring network was designed to know the complex environmental scenario that exists as of now which would serve as baseline information prevailing in the area.

A Identification of Ambient air Quality Monitoring Stations:

Ambient air quality of the study area has been assessed through a network of 8 ambient air quality locations. Of the 8 locations, 6 ambient are located in the buffer zone and 2 stations within the Plant area [Core zone].

Fig –5.3 shows the locations of the air quality stations in the study area and Plant area. **Table – 5.2** gives the details of ambient air quality locations:

TABLE-5.2

DETAILS OF AMBIENT AIR QUALITY MONITORING STATIONS

Station Codes	Location	With respective to Plant		Activities Around Sampling Station
		Distance [km]	Direction	
A-1	Plant [Main Gate]	---	---	Plant activities
A-2	Colony	---	---	
A-3	Ramapuram village	3.8	NNW	Industrial activity, Human activities, Vehicular movement, bad road conditions.
A-4	Bhatrupalem village	4.3	NE	
A-5	Kotayyanagaram village	3.6	SW	
A-6	Gamalapadu village	4.0	SSE	
A-7	Shrinagar village	0.9	W	
A-8	Pondugula village	5.1	NW	

B ANALYSIS OF BASELINE CONCENTRATIONS

BUFFER ZONE (STATIONS A3 TO A8)

Suspended Particulate Matter - SPM

Study area: Suspended particulate matter monitored in the study area showed 98th percentile values in the range of 139.8 - 160.3 $\mu g/m^3$. The SPM concentration in the study area was found to be well within the norms prescribed for Rural and residential areas.

FIG - 5.3

PROJECT :
ANDHRA CEMENTS LIMITED.,
DURGAPURAM VILLAGE, DACHEPALLI MANDAL, GUNTUR DT, A.P.

TITLE :
AMBIENT AIR QUALITY

PREPARED BY:
B.S.ENVI-TECH (P) LTD., HYDERABAD

Respirable Particulate Matter - RPM

RPM values monitored at 2 locations showed 98th percentile values in the range of 50.9 – 58.3 $\mu g/m^3$. Highest value of 58.3 $\mu g/m^3$ was recorded at Plant Main gate. However, this value is well within the limits of NAAQ.

Sulphurdioxide - SO_2

98th percentile value of Sulphur dioxide in the study area from the monitored data was in the range of 13.6 – 16.1 $\mu g/m^3$. Maximum value of sulphurdioxide of 16.8 $\mu g/m^3$ obtained near the Haulage road. The values of SO_2 monitored in the study area are well within the limits of NAAQ standards.

Oxides of Nitrogen - NOx

Ambient air quality status monitored for nitrogen oxides in the study area were in the range with 98th percentile values between 14.8 – 17.4 $\mu g/m^3$. A maximum value of 18.1 $\mu g/m^3$ was prevailing at the time of sampling at haulage road sampling station.

Carbon Monoxide - CO

CO concentration at all the locations was found to be less than 1 ppm.

Percentile values of ambient air quality in core zone are presented in **Annexure – 5 A.** The values of SPM, RPM, SO_2, NOx and CO monitored at all locations are well within the limit of AAQ standards.

C OVERALL BASELINE AMBIENT AIR QUALITY

Results of the ambient air quality at all the above locations were found to be well within the limits of National Ambient Air Quality (NAAQ) standards specified for Residential and industrial areas. Concentrations of SPM, RPM, SO_2 and NOx are mainly contributed due to vehicular traffic and local activities.

The 98th percentile values of SPM, RPM, SO_2 and NOx at all the locations in the study area during winter season 2006-07 are given below.

Summary of Ambient Air Quality (μg/m³)

CODE	Location Name	98TH PERCENTILE VALUES			
		SPM	RPM	SO_2	NOx
A-1	Plant [Main Gate]	168.1	58.3	16.1	17.4
A-2	Colony	136.8	50.9	13.6	14.8
A-3	Ramapuram village	156.3	57.1	14.7	15.6
A-4	Bhatrupalem village	145.3	52.1	13.7	15.0
A-5	Kotayyanagaram village	139.8	54.0	14.0	14.8
A-6	Gamalapadu village	149.3	49.7	15.0	16.0
A-7	Shrinagar village	155.8	56.7	14.6	15.6
A-8	Pondugula village	160.3	60.2	15.5	16.5

Note: CO values are observed less than 1 ppm during study period.

5.3 NOISE ENVIRONMENT

The acoustical environment varies dynamically in magnitude and character through out most communities. The noise level variation can be temporal, spectral and spatial. The residential noise level is that level below which the ambient noise does not seem to dropdown during the given interval of time and is generally characterized by unidentified sources. Ambient noise level is characterized by significant variations above a base or a residential noise level. The maximum impact of noise is felt on urban areas, which is mostly due to the commercial activities and vehicular movement during peak hours of the day.

Measured noise level displayed as a function of time provides a useful scheme for describing the acoustical climate of a community. Noise levels recorded at each station with a time interval of about 30 minutes are computed for equivalent noise levels. Equivalent noise level is a single number descriptor for describing time varying noise levels. The equivalent noise level is defined as mathematically

$$10\text{Log}1/T\ \Sigma\ (10^{Ln/10})$$

where L = sound pressure level a function of time dB (A)
T = Time interval of observations

Noise levels during the night time generally drop, therefore to compute Equivalent noise levels for the night time, noise levels are increased by 10 dB (A) as the night time high noise levels are judged more annoying compared to the day time.

Noise levels at a particular station are represented as Day-Night equivalent (Ldn). Day-Night equivalent is the single number index designed to rate environmental noise on daily/24 hourly basis. Mathematically Ldn is given by

$$Ldn = 10 \log \{1/24\ (15 \times 10^{(Ld/10)} + 9 \times 10^{(Ln+10)/10)}\}$$

Where
Ld = A weighed equivalent for day time period (7 am to 10 pm)
Ln = A weighed equivalent for night time period (10 pm to 7 am)

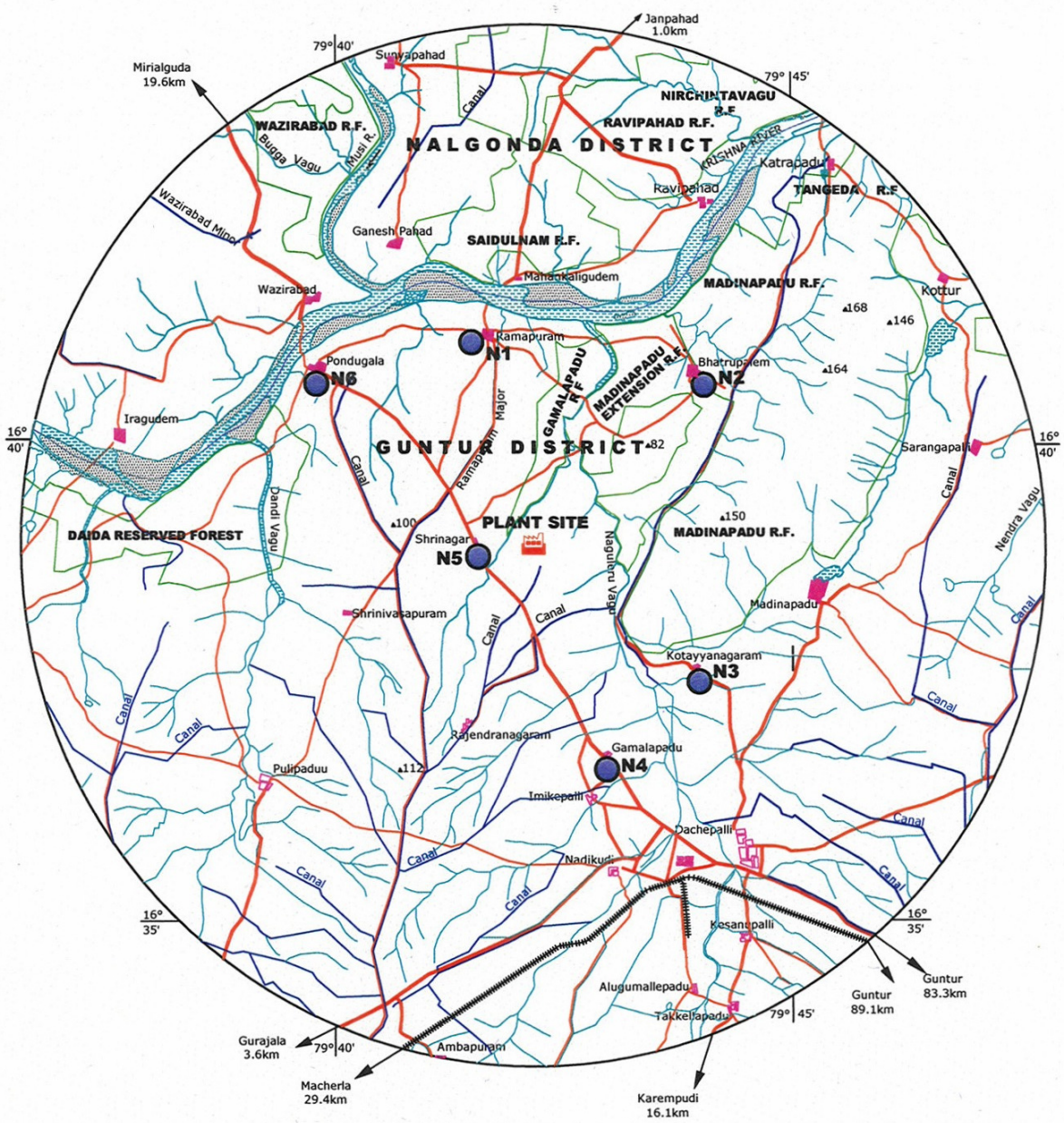
A NOISE LEVELS MONITORING

Noise levels in buffer zone were measured near residential areas and other settlements located within 10 km radius around the Plant area.

The noise recording stations at Plant area and buffer zone are shown in **Fig- 5.4** and are given in the following **Table - 5.2.**

TABLE – 5.2
NOISE MONITORING STATIONS

Station	Code	Distance From The Plant (Km)	Direction wrt Plant Site
Ramapuram village	N-1	3.8	NNW
Bhatrupalem village	N-2	4.3	NE
Kotayyanagaram village	N-3	3.6	SW
Gamalapadu village	N-4	4.0	SSE
Shrinagar village	N-5	0.9	W
Pondugula village	N-6	5.1	NW



LEGEND

- ROAD
- STREAM/ TANK
- CONTOUR
- FOREST
- CANAL
- RIVER
- SETTLEMENT
- ▲146 SPOT HEIGHT
- RAILWAY LINE
- DISTRICT BOUNDARY
- NOISE LEVEL

SHEET TO INDEX

56 P/5	56 P/9	56 P/13
56 P/6	56	56 P/14
56 P/7	56 P/11	56 P/15

SCALE

0 1 2 3 4Km

FIG - 5.4

PROJECT :
ANDHRA CEMENTS LIMITED.,
DURGAPURAM VILLAGE, DACHEPALLI MANDAL,
GUNTUR DT, A.P.

TITLE :
NOISE LEVEL

PREPARED BY:
B.S.ENVI-TECH (P) LTD.,
HYDERABAD

B AMBIENT NOISE LEVELS IN BUFFER ZONE - WITHIN 10 KM RADIUS

Noise levels recorded were found to be in the range of 53 – 59 dB (A) during day time and in the range of 41 – 50 dB (A) during night time.

NOISE LEVELS IN THE STUDY AREA (10 KM RADIUS)

Location	Code	Noise Level dB (A)		
		Day Equivalent	Night Equivalent	Day-Night Equivalent
Ramapuram village	N-1	56.4	46.7	56.5
Bhatrupalem village	N-2	54.1	44.3	53.3
Kotayyanagaram village	N-3	53.8	42.6	53.4
Gamalapadu village	N-4	55.6	41.8	54.5
Shrinagar village	N-5	56.8	47.7	57.1
Pondugula village	N-6	59.0	49.3	59.1

C NOISE LEVELS IN CORE ZONE – PLANT AREA

Noise levels at the following locations were monitored to assess the noise level due to various operations of the plant.

SPOT NOISE LEVELS IN THE PLANT AREA

Location	Noise Level in DB(A)
Near main gate	63
Near Loading area	78
Near Packer area	68
Near crusher	83
Raw mill area	70
Cooler area	79

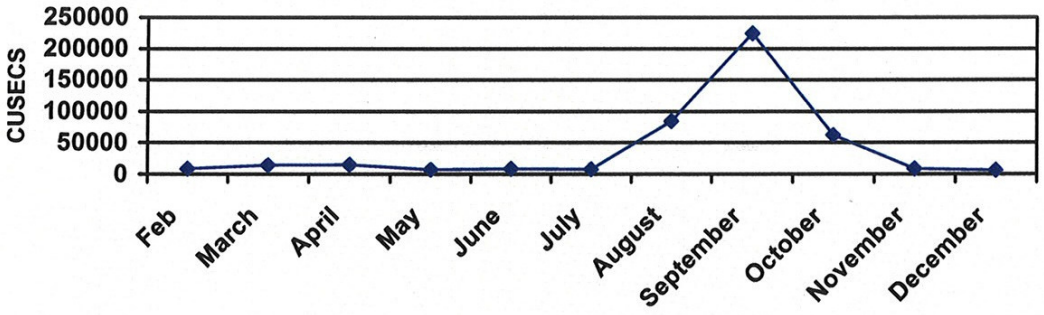
5.4 WATER ENVIRONMENT

5.4.1 Surface water regime

The major water sources in the study area are river Krishna and their tributaries. River Krishna enters in the Guntur district after traveling a distance of 85 km in the Nalgonda district in the easterly direction

The river Krishna is flowing at a distance of about 4.3 km on the northern side of plant site. The tributary, Naguleru Vagu is flowing at a distance of -1.1 km in eastern direction from the plant and joins Krishna River. The other stream joining the Krishna in the study area is Musi River and Dandi vagu at distances of 5.8 km & 4.8 km from the plant. All these streams experience perennial flow for almost 6-8 months in a year. The following figure shows the flow variation in Krishna River.

Average flows of Krishna River



As the major river Krishna is flowing with its tributaries, the ground water potential is good in the study area. The ground water table occurs at a depth of 40 m near the plant site area.

In the area, top black clay soil varying in thickness from 0.5 to 1.5m is followed by semi-hard or compact pink and grey limestone. The semi-compact limestone is followed by semi-weathered limestone: weathered and fractured limestone and semi massive limestone. The semi massive limestone is followed by hard compact limestone, which are non-water bearing. Recharge is totally controlled by local streams and Krishna River.

5.4.2 WATER QUALITY

Assessment of baseline data on Water environment includes

a) Identification of surface water sources
b) Identification of ground water sources

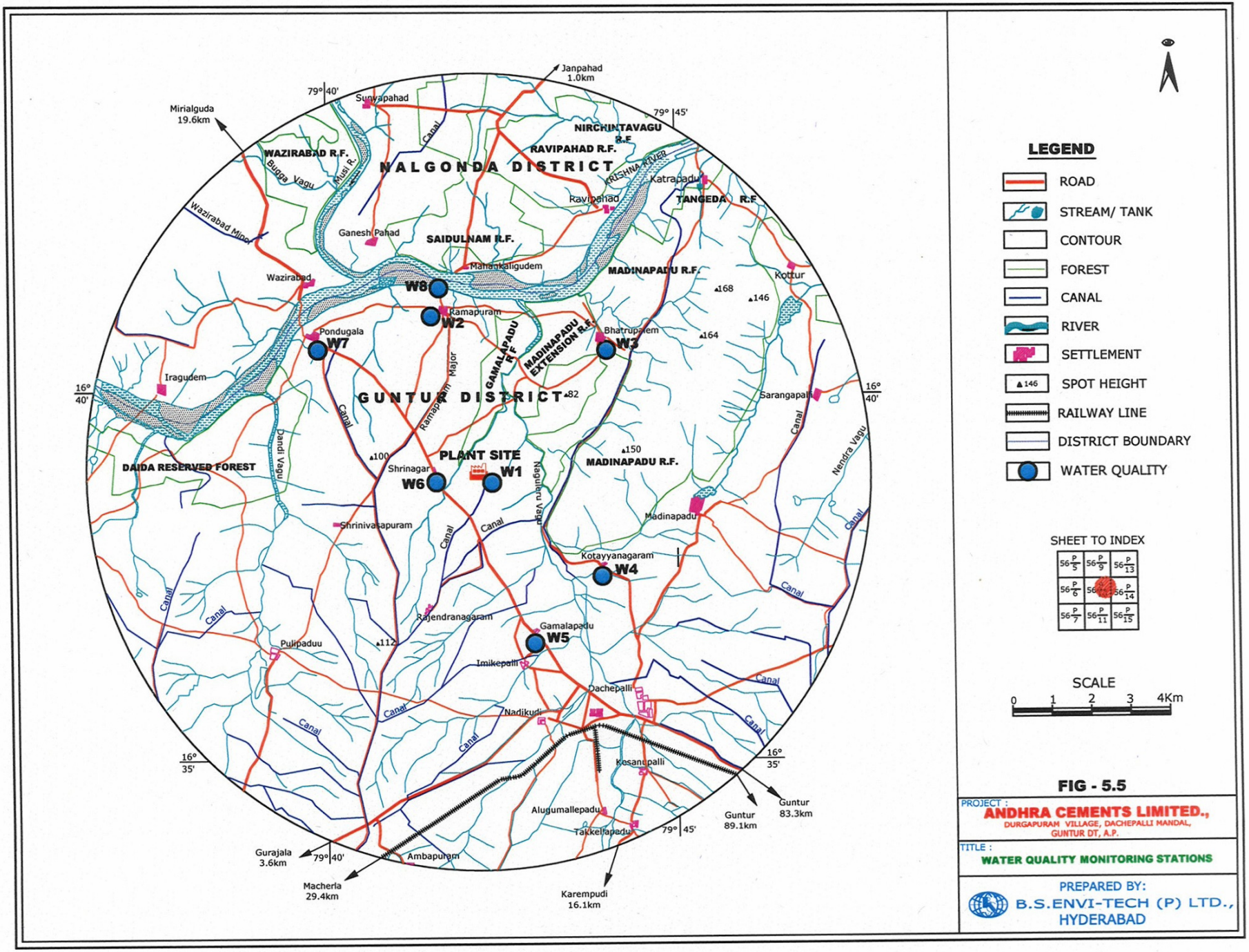
c) Collection of water samples
d) Analyzing water samples collected for physico-chemical and biological parameters

The details of the above are presented below Assessment of water quality in the study area includes the quality assessment of parameters as per the Indian standard IS 10500 (drinking water standard). About eight water samples have been collected from various locations of the study area, out of the eight samples, one sample from plant, 5 samples were collected from bore wells of the surrounding villages, two sample from surface water sources. The location of water sampling stations is shown in **Fig-5.5** and **Table-5.4.**

TABLE - 5.4
WATER SAMPLING LOCATIONS

Station Code	Location	Source	Distance From Plant Site (Km)	Direction Wrt Plant Site	Usage
W1	Plant [Potable water]	Bore well	---	---	Domestic & Drinking
W2	Ramapuram village	Borewell	3.8	NNW	
W3	Bhatrupalem village	Borewell	4.3	NE	
W4	Kotayyanagaram village	Borewell	3.6	SW	
W5	Gamalapadu village	Borewell	4.0	SSE	
W6	Shrinagar village	Borewell	0.9	W	
W7	Pondugula village	Borewell	5.1	NW	
W8	Krishna River	Surface water	4.3	Northern	Industry, Domestic & Drinking

Summary of water quality of surface and ground water samples analysed for various parameters are give below


Janpahad
1.0km
Mirialguda
19.6km
79° 40'
79° 45'
Sunyapahad
NIRCHINTAVAGU R.F
RAVIPAHAD R.F.
WAZIRABAD R.F.
NALGONDA DISTRICT
KRISHNA RIVER
Katrapadu
TANGEDA R.F
Ravipahad
Bugga Vagu
Musi R.
Canal
Wazirabad Mine
Ganesh Pahad
SAIDULNAM R.F.
Mahankaligudem
MADINAPADU R.F.
Kottur
Wazirabad
W8
Ramapuram
W2
Pondugala
W7
GAMALAPADU R.F
MADINAPADU EXTENSION R.F.
Bhatrupalem
W3
Iragudem
GUNTUR DISTRICT
Ramapuram Major
Canal
Sarangapalli
16° 40'
DAIDA RESERVED FOREST
Dandi Vagu
PLANT SITE
W1
Shrinagar
W6
Regulen Vagu
MADINAPADU R.F.
Nendra Vagu
Shrinivasapuram
Madinapadu
Kotayyanagaram
W4
Rajendranagaram
Gamalapadu
W5
Pulipaduu
Imikepalli
Dachepalli
Nadikudi
16° 35'
Kosanupalli
Alugumallepadu
Takkellapadu
Guntur
83.3km
Guntur
89.1km
Gurajala
3.6km
Ambapuram
Macherla
29.4km
Karempudi
16.1km
LEGEND
ROAD
STREAM/ TANK
CONTOUR
FOREST
CANAL
RIVER
SETTLEMENT
SPOT HEIGHT
RAILWAY LINE
DISTRICT BOUNDARY
WATER QUALITY
SHEET TO INDEX
SCALE
0 1 2 3 4Km
FIG - 5.5
PROJECT :
ANDHRA CEMENTS LIMITED.,
DURGAPURAM VILLAGE, DACHEPALLI MANDAL,
GUNTUR DT, A.P.
TITLE :
WATER QUALITY MONITORING STATIONS
PREPARED BY:
B.S.ENVI-TECH (P) LTD.,
HYDERABAD

Water Quality in the Study Area

PARAMETERS	River Krishna	Plant Water	Ground Water
pH	8.10	7.56	7.32-8.14
Total Hardness as $CaCO_3$ [mg/l]	166	280	110-310
Total Dissolved Solids [mg/l]	440	570	260-650
Chlorides as Cl [mg/l]	86	56	42-110
Sulphates as SO_4 [mg/l]	58	114	34-76
Nitrates as NO_3 [mg/l]	8	12	12-26
Fluoride as F [mg/l]	0.7	0.98	0.8-0.95
Iron as Fe [mg/l]	0.15	0.16	0.15-0.20

Surface water samples collected from river Krishna showed compliance of all parameters with the drinking water standard of IS 10500 except presence of coliforms.

Ground water samples collected from seven locations within the study area showed compliance of all parameters with the drinking water standard of IS 10500.

The water quality data of the study area are given in **Annexure – 5B**.

5.5 LAND ENVIRONMENT

5.5.1 LAND USE PATTERN

Landuse pattern of the study area has been assessed through Remote Sensing methodology using IRS-1D, LISS-III geocoded images. Level – I landuse / landcover categories identified in the area are built-up, agricultural land, wasteland, forest, water bodies and others.

Their spatial distribution and areal extent is given in **Table – 5.4** and **Fig 5.6 & Fig – 5.7**.

TABLE – 5.4
SPATIAL DISTRIBUTION OF LEVEL-II LAND USE / LAND COVER CLASSES WITH IN 10KM RADIUS AREA

SL.NO.	LAND USE/LAND COVER	AREA	
		Km²	Percentage
1.	Built-up land		
	1.1 Residential	1.54	0.49
	1.2 Industrial	3.78	1.20
2.	Agricultural land		
	2.1 Single crop	97.78	31.14
	2.2 Double crop	39.29	12.52
3.	Forest		
	3.1 Scrub forest	85.64	27.27
4.	Wastelands		
	4.1 Land with scrub	58.01	18.40
5.	Water bodies		
	5.1 River/Stream/Reservoir/Tank	19.76	6.28
6.	Others		
	6.1 Mining area	4.71	1.6
	6.2 Quarry	1.14	0.36
	6.3 Cement Plant	2.35	0.74
TOTAL		314.00	100.00

5.5.2 DESCRIPTION OF LAND USE/LAND COVER CLASSES

1. Built-up Land

It is defined as an area of human habitation developed due to non-agricultural activities. It comprises dwellings, roads, railway line and vacant land, etc. In the study area the built-up land consists of settlements like Pondugala, Ramapuram, Ganeshpahad, Wazirabad & Shrinagar etc. The total area estimated in this category is 5.32 sq.km or 1.69% of the total study area. The major industries mapped are ICL, Deccan Cements, Andhra Cements, Deccan Chromites Ltd. and Penna Cement Industries Ltd.

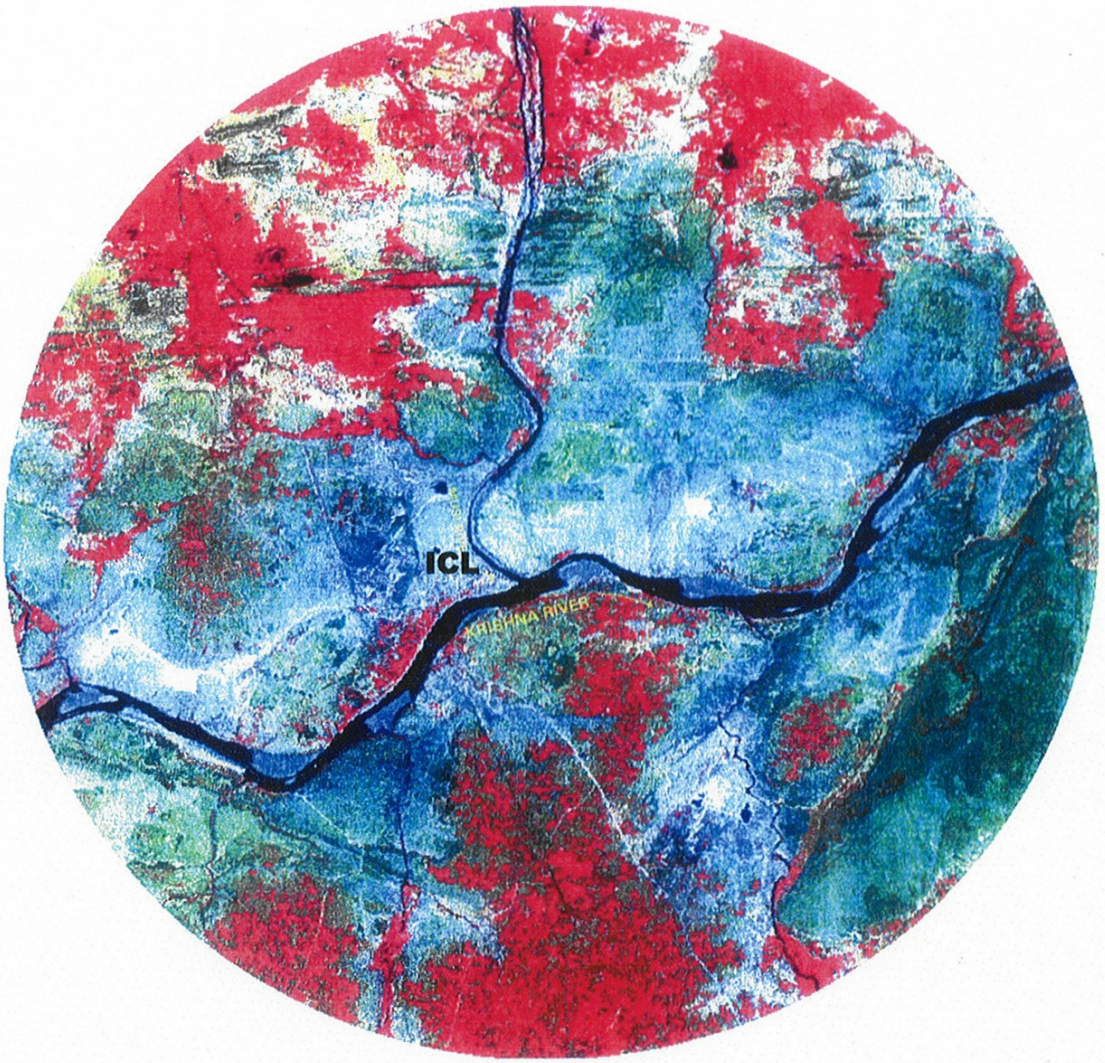
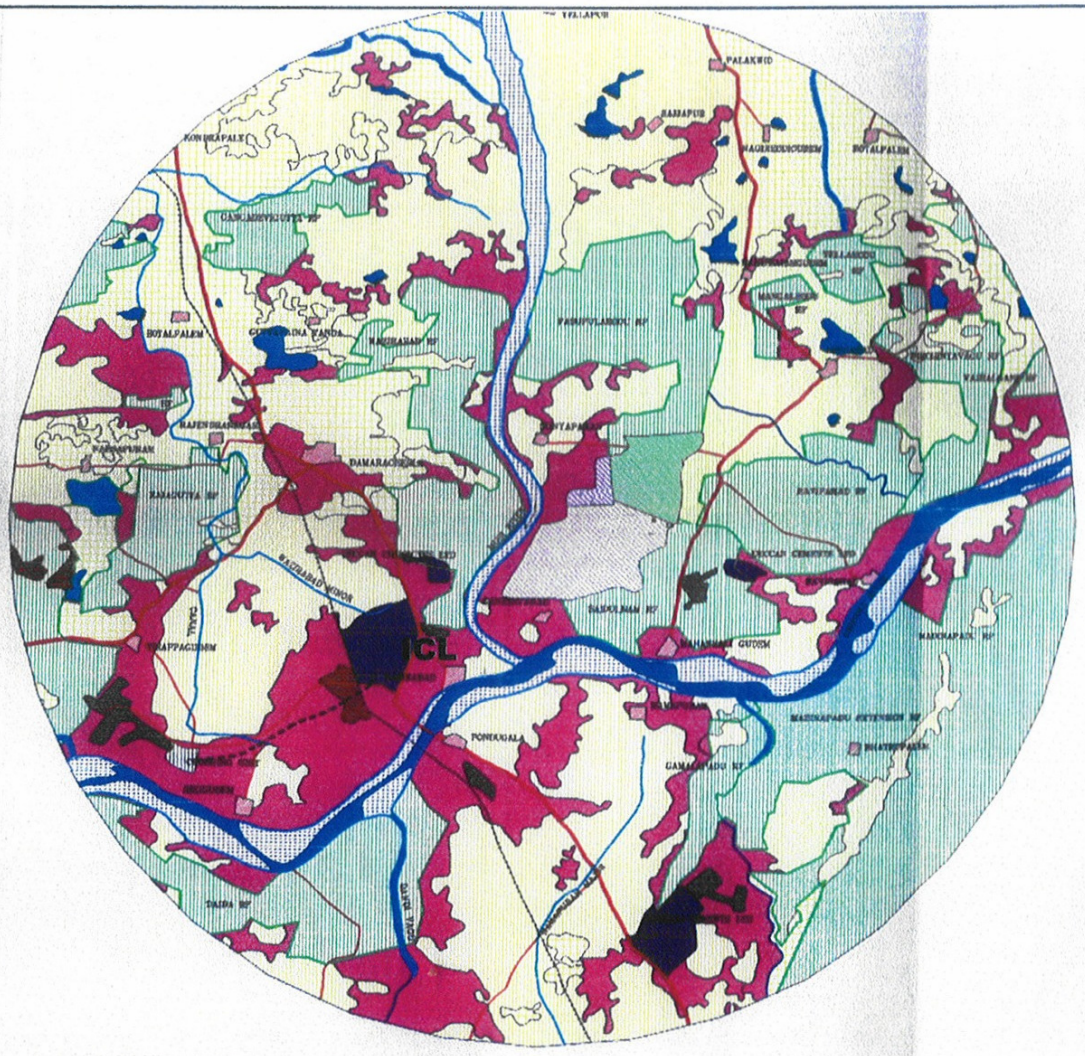


FIG – 5.6

IRS-1C, SATELLITE DATA (LISS – III)



LEGEND

BUILT UP LAND	Town	
	Village	
	Industry	
AGRICULTURE LAND	Single Crop	
	Double Crop	
FOREST	Scrub Forest	
WASTELAND	Land with Scrub	
OTHERS	Mining Area	
	Quarry	
	Janapahad Mine Lease	
	Sunyapahad Mine Lease	
	Ganeshpahad Mine Lease	
WATER BODIES	River	
	Stream	
	Major Canal	
	Minor Canal	
	Tank	
TRANSPORT NETWORK	Major Road	
	Minor Road	
	Railway Line	
	Ropeway	
	Forest Boundary	
	District Boundary	

SOURCE :

Satellite Data IRS ID LISS-III GEOCODED FCC

Dated 13th November 1998

8th March 1999

Colleteral Data SOI Toposheet Nos.56 P/L [illegible]

FIG – 5.7

LANDUSE/LANDCOVER MAP AROUND

2. Agricultural Land

It is defined as the land primarily used for cultivation of agricultural crops. The major crops are Paddy, Cotton, Chillies and Redgram. The main source of water for this activity is through canals/tanks/rivers. The Agricultural land in the study area accounts for 137.07 square km or 43.66% of the total study area.

Single crop

This category observed in the uplands towards the northern and southern portions of the Krishna river. The main crops in this category are cotton, chillies and redgram. This category occupies an area of 97.78 square km or 31.14% of the total area. Generally in this area the cropping season starts from July-August to February – March.

Double Cropped area

Double-cropped area refers to standing crops during both Kharif and Rabi seasons. Western portion of the study area is under double crop. Paddy is the major crop in both the seasons. It covers an area of 39.29 sq. km. or 12.52% of the study area.

3. Forest-Scrub Forest

This is an area of degraded forest due to excessive biotech interference and natural causes consist of mainly stunted tree or bushes/shrubs which belong to xerophytes. In the study area most of the reserved forest belongs to scrub forest category. It occupies an area of 85.64 sq. kms or 27.27% of the total area.

4. Waste land-Land with Scrub

These are the lands, which are lying un-utilised and can be brought under good vegetative cover. This category is mainly observed on the fringes of the forest areas which predominantly consists of shrubs.

This category is observed in patches in the entire study area. It occupies an area of 58.01 sq. kms or 18.40% of the total area.

5. Water bodies: River/Stream

These classes comprise areas of surface water either impounded in the form of ponds, lakes and reservoirs or flowing streams etc. The major rivers drained in the study area are Krishna river, Musi river. The water bodies account for 19.76 sq. km or 6.28% of the total study area.

6. Others-Mining area

It is an area under excavation of ores/plantrals. It consists of active excavated sites and overburden of the waste material. Lime stone mining is observed near Irkigudem, Shrinagar & Wazirabad villages adjacent to cement plants. It is occupied by an area of 4.71 sq. kms. Or 1.6% of the total study area.

Quarry

Quarries occupies an area of 1.14 sq. kms. Or 0.36% of the total study area.

5.5.3 Landuse & Land cover Observations

The following are the observations in 10 km radius of the study area

a. Land with scrub is the proplantnt class in and around the plant site
b. Major industries like Deccan cements, Deccan Chromates Ltd., Penna Cement Industries Ltd. and India Cements Ltd. are located in the study area
c. Nearest settlement Shrinagar is around 0.9 km from the plant site.
d. Nadikudi-Bibinagar broadguage railway line runs 6.8 km of the plant site.
e. Ramapuram major irrigation canal is observed near the plant site.

f. The reserved forest areas are devoid of any species of economic value. The forest is mostly of scrub type consisting of thorny bushes and shrubs of xerophytic group.
g. In the study area 43% of the area falls under agricultural land 27% under scrub forest and 18% under wasteland categories.
h. Cotton, chillies and redgram are major rainfed crops categorised as single crop.
i. Paddy is the only double crop in the study area.
j. In the study area industries and mining areas occupy 5.32 and 1.69 sq. km respectively.

5.5.4 REGIONAL GEOLOGY

This region forms part of the Indian Peninsula, which remained a stable landmass. The oldest known geological formations are the Dharwars which were deposited in shallow basins and subsequently intruded by the basic rocks. Later, these rocks were subjected to intense earth movements and have undergone metamorphism compiled with large scale invasion of granitic magma which by metamorphism assumed gneissic structure at places. These granites and gneisses were subsequently intruded by dykes of dolerite and veins of pegmatite and quartz.

After a gap of 500 million years, inland basins, where sand, stones, shales, limestone and dolomites were deposited, were formed. These basins were further affected by uplifts caused by igneous activity and earth movements, which folded and faulted the sedimentary basin.

Along the Krishna River i.e. in the southern part of the Nalgonda district, sedimentary rocks of Purana group consisting of quartzites, shales and limestones are exposed. This area lies north of the sedimentary formations of Huzurnagar and Miryalguda taluks which is made up of granites of Peninsular Complex. In other words, the area comprising Devarakonda, Bhongiri, Suryapet and part of Achampet taluks mostly represents this group.

5.5.5 SOIL QUALITY

Seven soil samples were collected from the study area for assessing the quality. The location of the sampling stations is shown in **Fig - 5.7** and are given in **Table - 5.5.**

TABLE-5.5
SOIL SAMPLING STATIONS

STATION CODE	STATION	DISTANCE FROM THE PLANT (KM)	DIRECTION WRT PLANT SITE
S1	Ramapuram village	3.8	NNW
S2	Bhatrupalem village	4.3	NE
S3	Kotayyanagaram village	3.6	SW
S4	Gamalapadu village	4.0	SSE
S5	Shrinagar village	0.9	W
S6	Pondugula village	5.1	NW

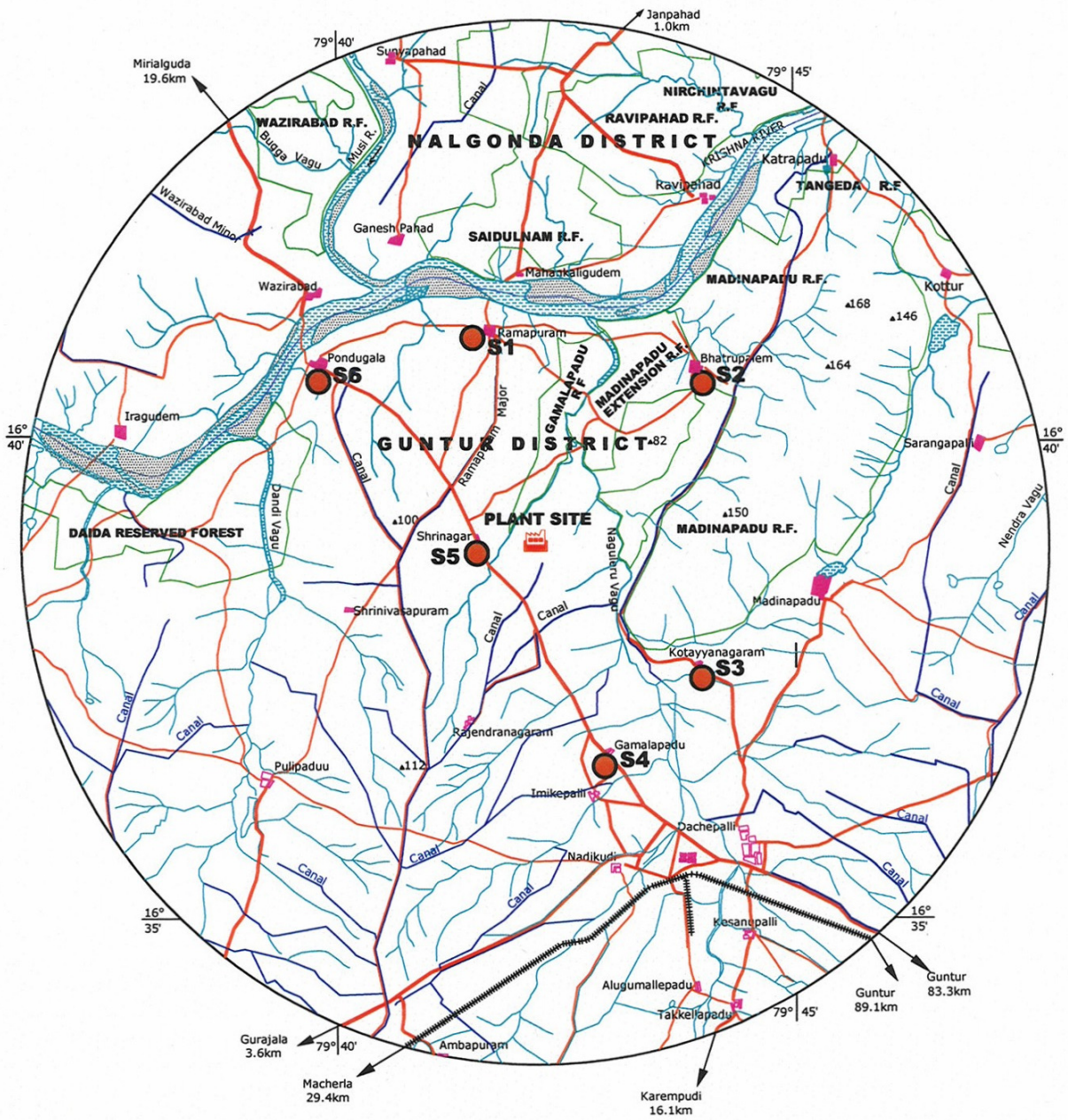
SOIL SAMPLES WITHIN 10 KM RADIUS

- pH of the all soil samples were found to be in the range of 6.98-8.34.
- Soluble salts were found to be in the range of 286-530 mg/kg
- Organic content of the soil samples was found to be medium exhibiting and average fertility
- Soils in the area were found to be sandy clayey Loam in texture with sand percentage in the range between 38-46%, silt between 23-38% and Clay 20-36%.
- Chloride content of the soil samples were in the range of 119-190 mg/kg

Results of soil sampling analysis are given in **Annexure – 5 C.**

5.5.6 AGRICULTURE AND IRRIGATION

The undulating character of terrain of the area and availability of water in the rivers, canals, favour the irrigation in this area. During



LEGEND

- ROAD
- STREAM/ TANK
- CONTOUR
- FOREST
- CANAL
- RIVER
- SETTLEMENT
- ▲146 SPOT HEIGHT
- RAILWAY LINE
- DISTRICT BOUNDARY
- SOIL QUALITY

SHEET TO INDEX

56 P/5	56 P/9	56 P/13
56 P/6	56	56 P/14
56 P/7	56 P/11	56 P/15

SCALE

0 1 2 3 4Km

FIG - 5.8

PROJECT :
ANDHRA CEMENTS LIMITED.,
DURGAPURAM VILLAGE, DACHEPALLI MANDAL,
GUNTUR DT, A.P.

TITLE :
SOIL QUALITY MONITORING STATIONS

PREPARED BY:
B.S.ENVI-TECH (P) LTD.,
HYDERABAD

isolated hills which are located in different ranges existing in the district.

The study area is drained by the river Krishna, Musi, Gadidela,& Dandi, Among these, the Krishna is the most important river forming the North western most boundary of the district.

The study area falls under following types of forest types as classified by Champion & Seth (1965).

1. Southern Dry Mixed Deciduous Forest
2. Southern Tropical Thorn Forest

Reserve forests (14.51%) in the study area are highly degraded due to extensive biotech interference and natural causes consists of mainly stunted tree or bushes / shrubs which belong to xerophytes and hardy species dominating. The following are the Reserve forests belonging to scrub forest category exists in the study area.

Pasupulabodu	Saidulnam
Ravipahad	Madinapadu
Gamalapadu	Wazirabad
Rajagutta	Gangadevigutta
Daida	Mangalbodu
Yellabodu	

The major plant species observed in the reserve forest areas are:

Trees:
Acacia Catechu
Acacia ferruginea
Acacia leucophloea
Adina cardifolia
Aegle marmelos
Albizzia lebbek
Bassia latifolia
Bauhinia serrata
Bridelia retusa

Shrubs:
Celastrus senagalensis
Dodonea viscose
Randia dumetorum
Streblus asper
Woodfordia floribanda

Climbers:
Bauhinia vahlii
Derris scandens

the monsoon season substantial water flow can be seen in all the surface water bodies and also in the lean season, favorable ground water potential encourages the local farmers to go for mixed cropping pattern. All the villages are provided with bore wells/dug wells and tube wells to cater to the agricultural needs.

There are two cropping seasons namely Kharif from June to September and Rabi from November to March. There is however, a little variation in these periods with regards to paddy, which is cultivated in both seasons. The major Kharif crops are Paddy, Chillies, Vegetables, Jowar, Ragi and Groundnut. The major commercial crop in this area is castor. The crop yield in the area is low to moderate. The average crop yield for Kharif and Rabi Season in the study area are given below:

AVERAGE YEILD OF THE CROPS

S.NO.	CROP	YIELD (TONNES/HA)
Kharif		
1	Black Gram	0.89
2	Red Gram	0.75
3	Chilly	2.54
4	Sugar Cane	74.28
5	Cotton	0.40
6	Paddy	2.70
Rabi		
1	Black Gram	0.57
2	Paddy	2.87

5.5.7 FLORA AND FAUNA

A FORESTS

The study area is a dry part of Dachepalli & Gurazala of Guntur district and Damaracherla mandal, Miryalguda Taluk of Nalgonda district. The general terrain is apparently rolling. The district slants from West and North-West to South-East. There are a number of

Cleistanthus collinus
Chloroxylon sweitenia
Lantana camara
Calycopteris floribunda
Abrus precatorius
Decandrum arikota
Acacia instia
Zizyphus Oenoplia
Cissus quadrangularis

B FLORA

During field survey, it was observed that the flora of the study area is very poor when compared to other parts of the district. The inhospitable terrain with little or no-top soil could afford only hardy species, which can withstand the onslaught of Man, Cattle and extremely dry climate.

The vegetation in the study area can be broadly stratified into 4 classes depending on their area of existence.

1. Vegetation along the banks of Rivers / Canals
2. Vegetation around mine area.
3. Vegetation along side avenue and habitations

C VEGETATION ALONG THE BANKS OF RIVERS / CANALS

During field survey, it was observed that bamboo (Bambusa arundanecea) occurs along the river Krishna in small patches. To check soil erosion and promote soil binding, canal plantations were undertaken by the Social Forestry Division along major rivers in the study area such as River Krishna, Musi, and Dandi. Notable among the species afforested along the canals include Cassia Siamea, Dalbergia sisoo, Helianthus excelsa and Terminalia arjuna.

It is noteworthy to mention that the banks of river Krishna are very much disturbed. The disturbed locals had no tree cover. Bushes and rickets dominated the entire area with scanty grass cover and few herbs. Fuel wood species such as Prosphis juliflora was seen growing abundantly along the banks of river Krishna. A few water weeds such

as Eichornia and Pistia along with Phytoplankton were observed floating near the banks of river Krishna.

D SPECIES IN THE STUDY AREA

There are no threatened/ rare/endangered species of flora existing in the area and as such the flora existing in the proposed area has neither ecological nor economic importance for conservation.

The following table gives the species in the study area:

Common Name	**Botanical Name**	**Common Name**	**Botonical Name**
Asoka	*Saraca Indica*	Manga	*Randia Species*
Balusu	*Canthium parviflora*	Marri	*Ficusa Bengalensis*
Billudu	*Chloroxylon Sujeteveir*	Miryalu	*Cerissa Carindus*
Buddareni	*Capparis divaricater*	Narepi	*Hardwickia Binata*
Chigara	*Albizzia Amova*	Nimma	*Citras Medica*
Chintha	*Tamarindus Indica*	Paoadi	*Pavetta Indica*
Danti	*Celastrus Senegagalensis*	Pulivailu	*Dodonca Viscoa*
Darisanam	*Albizza Lebbek*	Ravi	*Ficcus Religiosa*
Gotti	*Zizyphus Xylopyrus*	Regu	*Zizyphus jujube*
Jama	*Psidium Guajava*	Sandra	*Acacia Sundra*
Jilledu	*Calotropis Gigantea*	Sithapal	*Squamosa Anomaceae*
Kanerugu	*Flacortia Indica*	Sonri	*Soymida Febrifua*
Korinta	*Plerolobium Indicum*	Tella bittu	*Mundelea Suberosa*
Velturu	*Dichrostachaya Cinerca*	Thgra magoli	*Morinda Tinctoria*
Vepa	*Azaadirachta Indica*	Usiri	*Officinals Euphorbiaceae*

E FAUNA

A rapid survey of wildlife of the study area brings out the salient features:

TERRESTRIAL FAUNA

Due to the scanty vegetation and openness of the area, there was no evidence of wild animals existence. However, it was reported that small mammals such as hare (lepus negricolis) wild bear (Sus scrofa cristatus), Porcupine (Hystrix indica) and Mungoose (Herpestes edwardsi) occur in very small numbers in the adjoining reserve forest areas.

AVI FAUNA

The broken terrain with absence of fruit yielding trees and roosting sites, supports mostly ground nesting birds such as grey patridge & quails. The other commonly occurring birds include Red Vented Bulbul, Babblers, kingfishers, Common Crow and Brahminy kite.

AQUATIC FAUNA

Survey along the major rivers in the study, area, for aquatic fauna revealed the occurrence of many fresh water fishes, crustaceans and mollusks.

HERPATO FAUNA

There was no sight of land reptiles such as snakes and lizards in the study area. However, it was reported that reptiles such as mabuya carinata (nelkis), Monitor lizard (Varanus sp.) along with snakes occur in the area. The most commonly occurring non-poisonous snake in the area is Rat snake (Dhaman) poisonous snake such as Cobra krait occur very few in number.

In a nutshell, the mine area does not harbour any rare/endangered/threatened species of flora and fauna as scheduled in the Wildlife Protection Act. (1972).

5.6 SOCIO-ECONOMIC ENVIRONMENT

As part of the Environmental Impact Assessment studies of proposed mines, information has been collected to define the socio-economic profiles of the study area.

Information on socio-economic environment includes description of the demography, available basic amenities like housing, health, medical services, transportation, education and cultural activities.

Baseline information was collected from villages in the study area and detailed information from the Government agencies. The study area falls under Guntur. River Krishna is the common boundary line for the two mandals, Wazirabad in Nalgonda and Daida in Guntur district.

The study area comprises 25 revenue villages with total population of 57,762. The salient observations obtained as a result of the study are discussed hereunder.

- Agriculture is the major activity in this area. A left canal laid from Srisailam project and Nagarjuna sagar passes through the study area.

- The total population density of the study area is about 184 persons / sq. km. However the major villages are thickly populated.

- The average literacy rate in the study area is observed to be low when compared to the other parts of the area which is about 46.02 percent.

- About 54.31% of the total population is engaged in working category with main working population 26255 and marginal working population 5121

- Percentage of non working category in study area is 45.69%.

- SC and ST population in the study area is about 14.6 % and 11.3 % of the total population respectively.

- The male female ratio was found to be 1000:977

- Literacy rate of male Population is relatively high than the female population. Only 11490 [27.90%] males are literate where as the female literacy population is 6330 [15.37%].

- Due to the abundance of lime stone mines in the study area, large cement industries such as Andhra, Raasi, Deccan Cement, Penna Cement Industries etc., located within 10 Km radial distance from the mine.

- Due to presence of cement plants in the vicinity of study area considerable share of total population either directly or indirectly is working in mines and cement industries.

- The major crops are Paddy, Cotton, Chillies and Redgram. The main source of water for this activity is through canals/tanks/rivers.

- Most of the villages are electrified.

- The social activities such as literacy camps, family planning and eye camps have been organized both by the local government bodies and industries in association with voluntary agencies.

- Nadikudi and Dachepalli are the local market place in this area. All the villages are connected to both villages either with metal or cart roads.

- Nadikudi and Miryalaguda are the major market centre for paddy, groundnut and chillies. There are also many small scale rice and oil mills.

- Telephone and Telegraph facilities are available within 5 km radial distance.

- Medical facilities are available at all mandal head quarters and regional medical centre at Miryalaguda.

Annexure – 5 D shows the demographic profile and occupational status of the study area in 10 km radius.

CHAPTER - 6

PREDICTION AND IMPACTS

6.0 PREDICTION OF IMPACTS

Prediction of impacts is the most important component in the Environmental Impact Assessment studies. Several scientific techniques and methodologies are available to predict impacts of developmental activities on physical, ecological and socio-economic environments. Such predictions are superimposed over the baseline (pre-project) status of environmental quality to derive the ultimate (post-project) scenario of environmental conditions. The prediction of impacts helps to minimize the adverse impacts on environmental quality during pre and post project execution.

The proposed increase in capacity of clinker and cement production has will be achieved by modification of the process equipment and installation of new cement mill.

An attempt has been made to predict the incremental rise of various ground level concentrations above the baseline status in respect of air pollution. The mathematical models used for predictions in the present study is an EPA approved ISCST3 model which is based on steady state Gaussian plume dispersion model designed for point sources and area sources for air quality.

The predicted ground level concentrations computed using EPA approved ISCST3 model and plotted as isopleths using the **SURFER – 7** package of Golden Software.

In case of water, land, biological and socio-economic environments, the predictions have been made based on available scientific knowledge and judgements.

In the earlier Chapters, various process and pollution sources were identified. In this chapter, an attempt has been made to predict the incremental rise of ground level concentrations above the base line status due to the emissions from the proposed expansion of the cement production capacity.

6.1 AIR ENVIRONMENT

The major emissions are due to increase in gas volumes and dust loads from crusher, raw mill/kilns, coolers section, coal mills and Cement mills. Due to increase in production, emission load of various pollutants will increase as given below.

- *Increase in dust emissions from crusher, raw mill/kiln, cooler stacks, coal mills and cement mills.*
- *Increase in SO_2 emission from raw mill/kiln due to firing of additional coal in kiln (about 80% of Sulphur will be absorbed by clinker)*
- *Increase in NOx emissions from kiln due to more gas volumes handled.*

6.1.1 EMSSIONS FROM CEMENT PLANT

The increase in emission load of Particulate Matter (PM), SO_2 and NO_X concentrations due to modification are presented in **Table – 6.1**

The details of dust emissions from various major units of the cement plant after modification are detailed in **Table – 6.2**

6.1.2 STACK HEIGHTS

The existing stack heights of all the units have been checked for compliance with the following Central Pollution Control Board formula due to increase in feed material at various units and fuel firing in the kilns

Based on Particulate emission rate	Based on SO_2 emission rate
$H = 74 (Q)^{0.27}$ H_t=Theoretical height of proposed stack in mts. Q_s = Emission rate of Particulate Matter in T/hr.	$H= 14 (Q)^{0.3}$ H_t = Theoretical height of proposed stack in mts. Q_s = Emission rate of SO_2 kg/hr

TABLE – 6.1

OVERALL INCREASE IN THE EMISSIONS FROM THE PLANT

S.No.	Stack Connected To	Present Emission Rate	Emission Rate After Expansion	Increase In Emissions
		Kg/day	Kg/day	Kg/day
Particulate Mater				
1	Crusher	31.2	46.9	15.7
2	Raw Mill – 1 & Raw Mill – 2 & Kiln	596.4	626.75	30.30
3	Cooler	375.37	870.42	415.05
4	Coal Mill – 1	34.94	58.24	23.30
5	Coal Mill – 2	69.88	116.48	46.60
6	Cement Mill – 1 Ball Mill	65.53	78.63	13.10
7	Cement Mill – 2 (VRM)	65.53	78.63	13.10
8	Cement Mill – 3	-	174.74	174.74
Sulphur Dioxide (SO_2)				
Raw Mill – 1 & Raw Mill – 2 & Kiln		648	1134	486
Oxides Of Nitrogen (NOx)				
Raw Mill – 1 & Raw Mill – 2 & Kiln		702	1278	526

TABLE – 6.2
EMISSION DETAILS

NO	SOURCE	STACK HT	DIAMETER	VELOCITY	TEMP	EMISSION, gm/sec		
		m	m	m/sec	K	SPM	SO_2	NOx
1.	Crusher	30	1.0	12	343	0.18	-	-
2	Raw Mill – 1 & Raw Mill – 2 & Kiln	70	3.5	10	393	0.34	5.58	6.04
3	Cooler	30	3.0	10	493	5.69	-	-
4	Coal Mill – 1	30	1.0	14	353	0.26	-	-
5	Coal Mill – 2	30	1.0	14	353	0.52	-	-
6	Cement Mill – 1 Ball Mill	32	1.25	12	353	0.15	-	-
7	Cement Mill – 2 (VRM)	31	1.0	12	353	0.15	-	-
8	Cement Mill – 3	35	1.25	12	353	2.00	-	-

ACL has provided stack of 90 m height for kiln. Due to the installation of 6 stage preheater and bag house for the kiln and as the bag house is located away from preheater ACL proposes to install anew stack of 70m for dedusting after the bag house.

All other stacks connected to non fuel firing systems in the cement plant and where the emission expected are only particulate matter, stack heights are based on the CPCB formula specified for Particulate Matter. However where stack heights computed from the above formula are less than 30 m, in order to comply with APPCB norms, a minimum stack height of 30 m provided are adequate.

The flue gas quantity and emission rate from these stacks will be minimum.

6.1.3 METEOROLOGICAL DATA

The meteorological data recorded continuously during winter season '2006-07 on hourly basis on wind speed, wind direction and temperature has been processed to extract the 24 – hourly mean meteorological data as per the guidelines of IMD and MoEF for application of ISCST3 model. Stability classes computed for the mean hours is based on guidelines issued by CPCB on modeling. Mixing heights representative of the region have been taken from the available published literature. The meteorological data inputs as per the IMD guidelines are enclosed as **Annexure –6 A.**

6.1.4 APPLICATION OF ISCST3

ISCST3 Model with the following options has been employed to predict the ground level concentrations due to emissions from the increase of production.

1. Area being rural, rural dispersion parameters are considered.
2. Predictions have been carried out to estimate concentration values over radial distance of 10 km around the sources.
3. Cartesian receptor network has been considered.

4. Emission rates from the point sources and area sources were considered as constant during the entire period.
5. Consideration of settling velocity of the particles
6. The ground level concentrations computed were as is basis without any consideration of decay coefficient.
7. Calm winds recorded during the study period were also taken into consideration.
8. 24 hourly (for 24-hour mean meteorological data as per guidelines of IMD and MoEF) mean groundlevel concentrations were estimated for the Winter season '06-07 using the meteorological data of December 2006 – February 2007.
9. An option for creation of data file giving average groundlevel concentrations for the mean meteorological data of winter season has been used for post processing in **SURFER – 7** graphics package .

6.1.5 PREDICTED GROUND LEVEL CONCENTRATIONS

Ground level concentrations due to the increase in emissions from the proposed expansion scheme have been computed and presented hereunder. Based on the mean meteorological data collected for the study winter season, the maximum ground well concentrations occur in the WSW-NW sector. The concentrations presented hereunder represent the maximum values that could occur in the study area.

Suspended Particulate Matter

24-hourly average ground level concentrations of SPM computed for 24-hour mean meteorological data showed maximum value of 3.79 $\mu g/m^3$ of SPM at a distance of about 0.5 km from the source in the western direction.

The concentrations are observed within a short distance from the source due to settling velocity of particulate matter and low temperature of the flue gas of the cement plant.

The distribution of concentration due to particulate emission sources of the proposed expansion of cement plant is plotted as isopleths and

are shown in **Fig – 6.1.** From the figure, it can be observed that high concentrations are obtained near to the source. Beyond 5 km, the concentrations are found be insignificant. The high fifty 24-hourly average ground level concentrations of SPM are presented in **Annexure - 6 B**

Sulphur Dioxide And Oxides Of Nitrogen

24-hourly cumulative ground level concentrations of SO_2 and NOx computed for 24-hour mean meteorological data showed maximum values of SO_2 and NOx are less than 1 ug/m^3 at a distance of about 0.5 km from the source in the western direction.

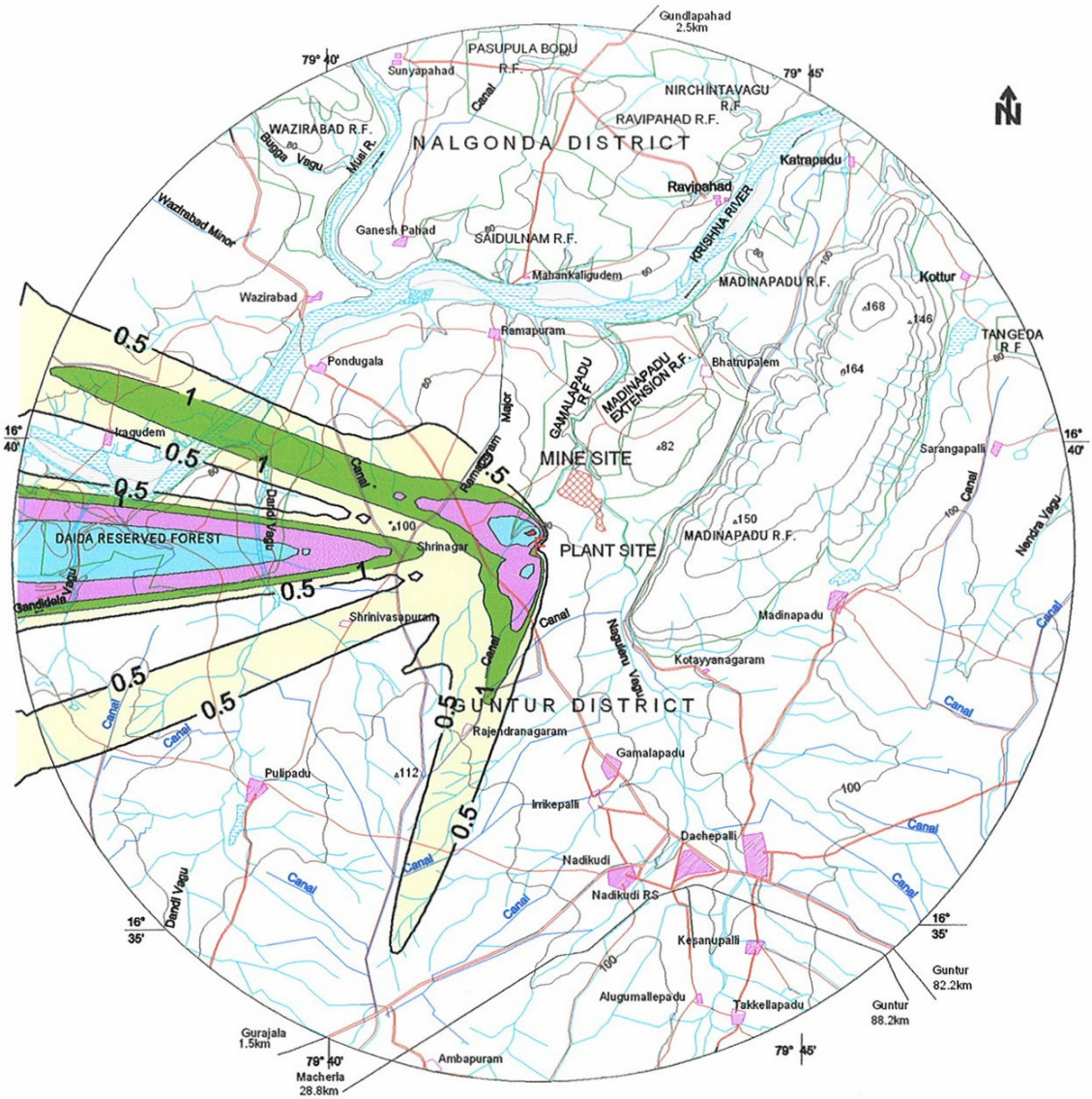
The distribution of cumulative ground level concentrations due to SO_2 and NOx emission from the kiln are plotted as isopleths and are shown in **Fig–6.2 and Fig – 6.3.** High fifty 24-hourly average ground level concentrations of SO_2 and NOx due to additional emissions from the kiln are presented in **Annexure – 6 C** and **6 D.**

6.1.6 OVERALL SCENARIO

Predicted maximum average ground level concentrations considering 24-hour mean meteorological data of summer season superimposed on the downwind baseline concentrations obtained during the study period to estimate the post project scenario. The Post Project Scenario with predicted groundlevel concentrations over the baseline is shown below.

POST PROJECT SCENARIO (μg/m^3)

24-Hourly Concentrations	**Suspended Particulate Matter (SPM)**	**Sulphur Dioxide (SO_2)**	**Oxides Of Nitrogen (NOx)**
Baseline Scenario, max	168.1	16.1	17.4
Predicted Groundlevel Concentration (Max)	3.79	<1	<1
Overall Scenario (worst case)	**171.89 {200}**	**17.1 {80}**	**18.4 {80}**
NOTE: The values in parentheses is the CPCB limit for rural and residential areas.			



ISOPLETH INTERVAL (ug/m3)

3.5	2.5	1.5	1	0.5

FIG - 6.1
PREDICTED GROUND LEVEL CONCENTRATIONS OF SPM DUE TO INCREASE OF CLINKER PRODUCTION FROM 1.00 TO 1.75 MTPA AND CEMENT FROM 0.9 TO 2.0 MTPA

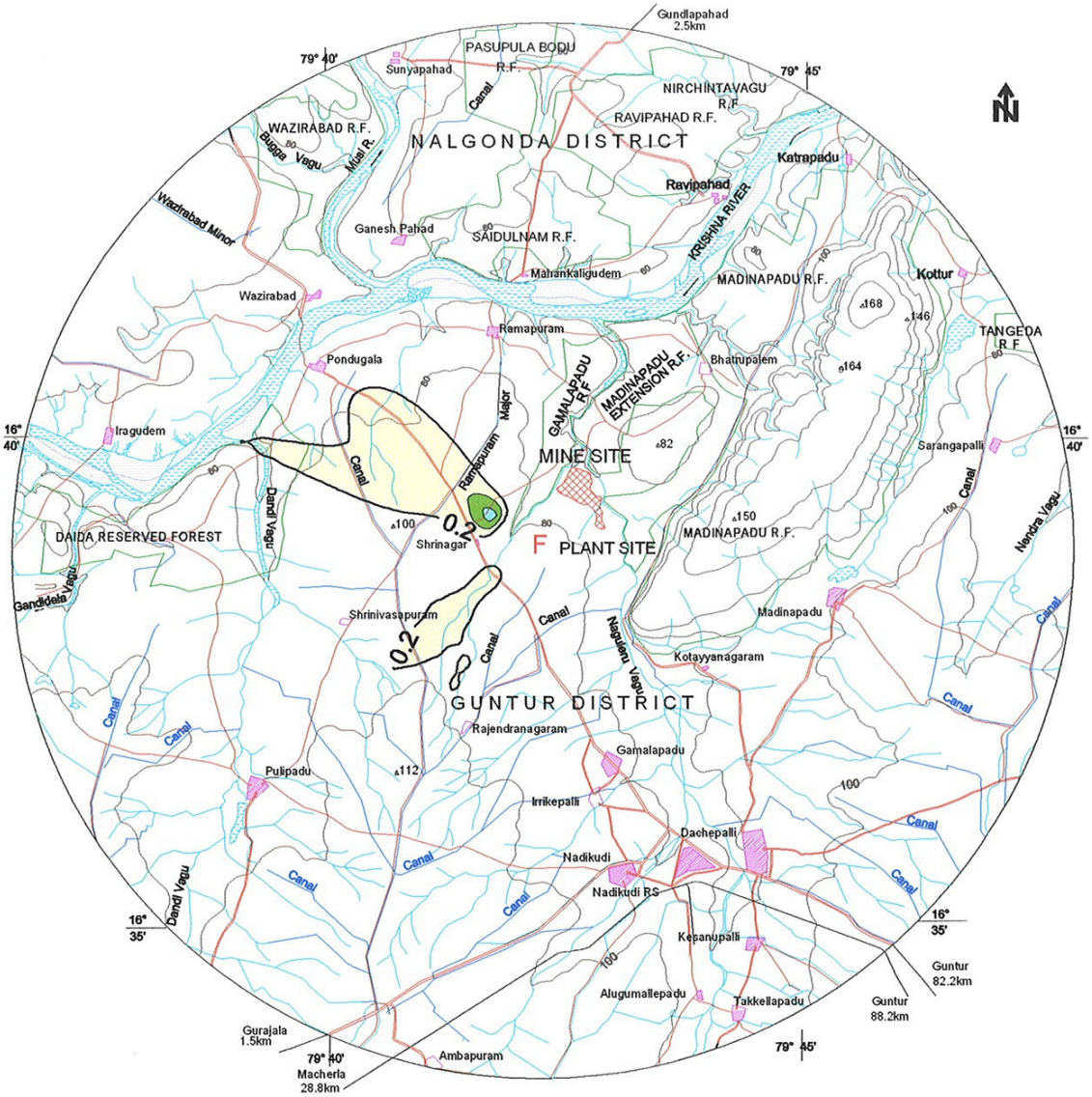
SEASON : WINTER '06-07

SCALE (M)

0 2000 4000

CLIENT : ANDHRA CEMENTS LTD
PROJECT : REIA STUDY

PREPARED BY
B.S. ENVI-TECH PVT. LTD., HYD.



ISOPLETH INTERVAL (ug/m3)

0.7 0.6 0.4 0.2

FIG - 6.2
PREDICTED GROUND LEVEL CONCENTRATIONS OF SO2
DUE TO INCREASE OF CLINKER PRODUCTION FROM 1.00 TO 1.75 MTPA
AND
CEMENT FROM 0.9 TO 2.0 MTPA

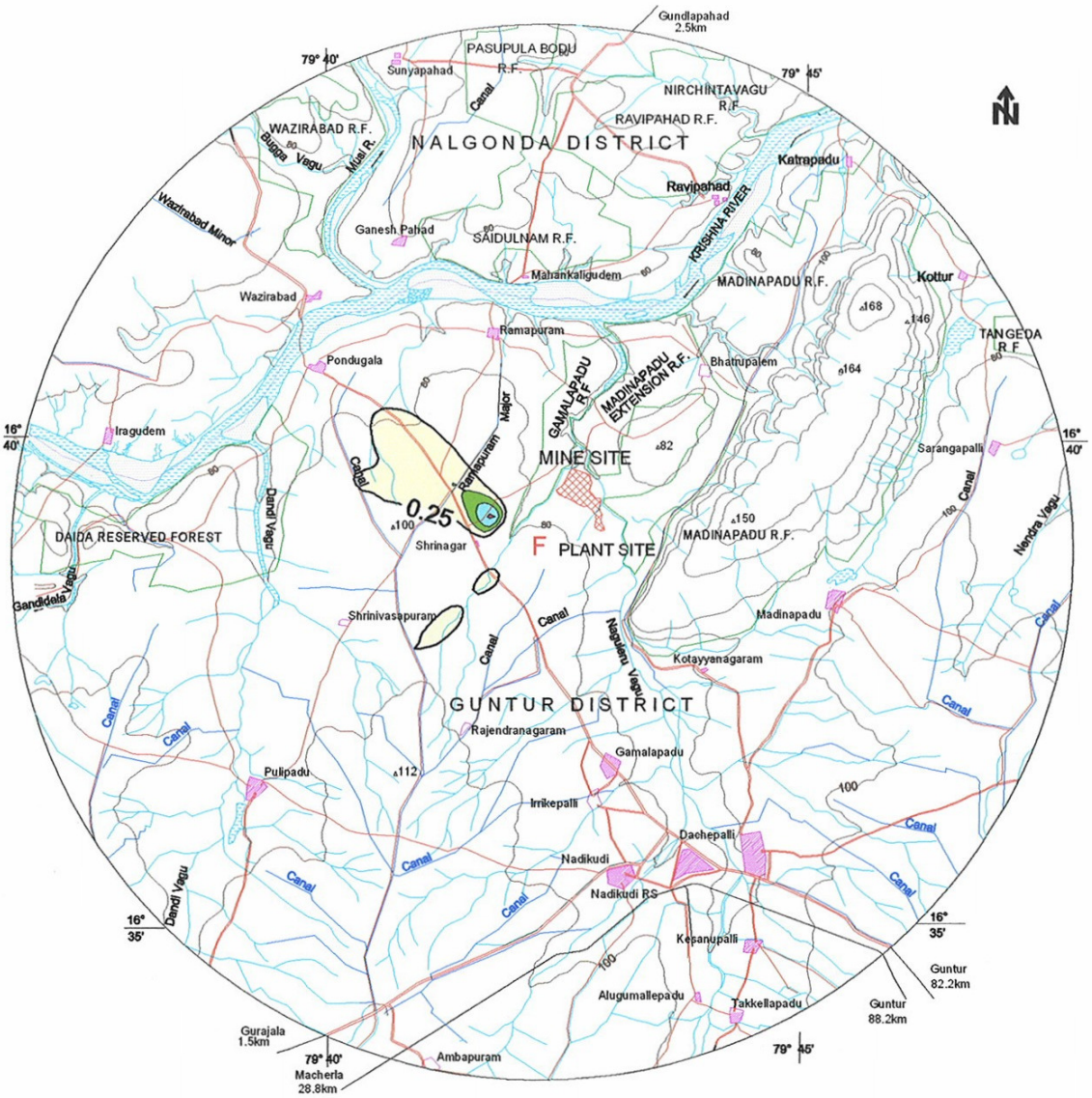
SEASON : WINTER '06-07

SCALE (M)

0 2000 4000

CLIENT : ANDHRA CEMENTS LTD
PROJECT : REIA STUDY

PREPARED BY
B.S. ENVI-TECH PVT. LTD., HYD.



ISOPLETH INTERVAL (ug/m3)

0.7 0.55 0.4 0.25

FIG - 6.3
PREDICTED GROUND LEVEL CONCENTRATIONS OF NOX DUE TO INCREASE OF CLINKER PRODUCTION FROM 1.00 TO 1.75 MTPA AND CEMENT FROM 0.9 TO 2.0 MTPA

SEASON : WINTER '06-07

SCALE (M)

0 2000 4000

CLIENT : ANDHRA CEMENTS LTD
PROJECT : REIA STUDY

PREPARED BY
B.S. ENVI-TECH PVT. LTD., HYD.

6.2 NOISE ENVIRONMENT

Noise levels in the plant have been measured at various places within the plant to know the back ground noise levels. The major noise generating sources in the cement plant are cooler fans, compressor house and cement mill section. The noise levels at 1m from various noise generating sources were found to be less than 85 dB(A) and the noise levels out side the cement mill and raw mill rooms were found to be less than 75 d B(A). Noise levels have been measured at the plant boundary was found to be about 63 d B(A) and the same has been found to be less than 50 d B(A) in the colony, which is located at about 1.0 km from the main plant gate.

In the expansion scheme, one more cement mill will be added which will increase the noise levels by an additional 3-5 dB(A).

6.3 WATER ENVIRONMENT

Total water consumption in the cement plant, domestic requirement, greenbelt development and colony at present is about 750 m^3/day.

Cement is manufactured by dry process technology. In the entire process water is used only at very few stages in the process at Cement mill, coal mill and raw mill for cooling. Cooling include the circulating cooling water for bearings and gear boxes. The other areas of water consumption other than process is for domestic purposes in the plant canteen, colony and also for greenbelt development.

The major water requirement of the cement plant is in gas conditioning tower of existing ESP provided for Kiln where the total water is consumed/evaporated.

With the modification of cement plant, the water consumption of the plant is will reduce by 250 m^3/day. The reduction in water consumption is mainly due to replacement of ESP with Bag house for Kiln and Installation of sewage treatment plant for treating and recycling of treated wastewater for use in process.

The details of water consumption of the plant before and after modification is given below :

WATER REQUIREMENT (M^3/DAY)

S.NO.	DESCRIPTION	BEFORE MODIFICATION	AFTER MODIFICATION
1	Cement plant including greenbelt	650	400
2	Domestic (colony) including individual garden	100	120
Total		**750**	**520**
Wastewater recycling		Sewage Treatment plant	(-)100
Fresh water requirement			**420**

6.3.1 WASTEWATER GENERATION AND DISPOSAL

No wastewater is generated from cement plant process and cooling as the total water undergoes evaporation during the exchange of heat.

DOMESTIC WASTEWATER – PLANT AND COLONY

About 100 houses have been constructed in the colony to facilitate the employees.

About 120 m^3/day water is being supplied to the colony. ACL is presently treating domestic wastewater (100 m^3/day) in a septic followed by soak pit.

In the proposed modification scheme, ACL proposes to setup a full-fledged sewage treatment plant (STP) designed for a maximum load of 150 m^3/day. The treated wastewater will be recycled to the cement plant for use in the process.
Details of the treatment and its use in various areas of the cement plant are detailed in Chapter – 7 under EMP.

6.4 LAND ENVIRONMENT

The cement plant along with colony and greenbelt is located in an area of 141.547 Ha. Of the 141.547 ha, the colony is located in an area of 39.18 ha and the cement plant is located in an area of 61.03 ha. About 24 ha of the area is covered under greenbelt. The new units will be located within the vacant land available within the plant complex. No additional area for increase of production is required.

Therefore the overall impact on land environment will be minimum.

6.4.1 Solid Waste generation

The main solid waste generated from the cement plant is cement dust collected from various pollution control devices. This cement dust will be recycled to the process.

6.5 SOCIO ECONOMIC ENVIRONMENT

Socio Economic Status in the study area is found to be moderate with respect to livelihood, amenities etc. The management of ACL has given preference to local people for recruitment in semi skilled and unskilled categories for plant operation. A total of about 200 persons are given direct employment in the cement plant. No additional manpower required.

ACL has already constructed a full fledged township comprising of housing facilities for plant, mines and security personnel and supporting staff. The township is provided with all the amenities such as school, guest house, health center, hospital, shopping complex etc.

The overall impact on the socio economic environment will be beneficial.

CHAPTER - 7

ENVIRONMENTAL MANAGEMENT PLAN

7.0 ENVIRONMENTAL MANAGEMENT PLAN

Any developing project exerts certain adverse and beneficial impacts on immediate surroundings.

ACL strongly believes in the eco-friendly industrialization in the area. Since the inception of the cement plant, the management had implemented Environmental Management Plan to minimize the adverse impacts on the surrounding areas.

All the process units are provided with pollution control equipment like bag filters and electrostatic precipitators (ESPs). These dust abatement measures were installed at all the dust prone points and are working efficiently by proper maintenance and upkeep.

ACL proposes to modify the process units of the cement plant to increase the production of both clinker and cement. Accordingly ACL proposes to upgrade some of the air pollution control equipment to comply with CREP and CPCB norms. The modification of the cement plant will be done by adopting the latest technology. Installation of the Bag House in place of Kiln ESP will result in reduction of water consumption by about 250 m^3/day. Apart from this the proposed sewage treatment plant will recycle about 100 m^3/day of treated wastewater for reuse at cement plant. There by the reduction in water consumption is to the tune of about 350 m^3/day.

ACL proposes to increase the Portland Pozzolona Cement manufacture in phased manner based on market demand using flyash upto about 30 % and more which results in lower Clinker consumption.

ACL has updated the environmental management plan of the cement plant to comply with norms stipulated by APPCB and CPCB.

The Environmental Management Plan of the cement plant details the environmental quality control measures to be taken in the post up gradation of the cement plant. EMP also details the post project monitoring undertaken by the plant authorities in order to maintain

monitoring undertaken by the plant authorities in order to maintain environmental quality within the stipulated standard limits specified by APPCB and CPCB

7.1 ENVIRONMENTAL MANAGEMENT PLAN DURING CONSTRUCTION PHASE

ACL will extend the existing infrastructure facilities available at the cement plant for the construction labour during the modification of the cement plant. The following factors would be given consideration to maintain good environmental quality during construction phase.

7.1.1 Air Environment

The modification of the cement plant would result in the increase of SPM concentrations due to fugitive dust. Frequent water sprinkling in the vicinity of the construction sites would be undertaken and will be continued after the completion of plant construction, as there is continuous movement of trucks. It will be ensured that both gasoline and diesel powered vehicles are properly maintained to comply with exhaust emission requirements.

7.1.2 Noise Environment

Noise levels generated during construction activity sometimes may be high. Onsite workers working in noise prone areas would be provided with ear muffs & plugs.

7.1.3 Water Environment

During implementation phase, provision for infrastructural services including water supply, sewage, drainage facilities and electrification will be made from the already available existing facilities. The construction labour would be provided with toilet facilities near the existing cement plant /power plant area to allow proper standards of hygiene.

7.1.4 Land Environment

The site for the proposed units is free from vegetation and is within the plant premises. All the units will be located adjacent to existing units based on the engineering aspects.

7.1.5 Socio-economic Environment

Any construction activity will benefit the local population in a number of ways. Management of M/s ACL will give preference to local people through indirect employment in the implementation of the expansion .

7.1.6 Safety and Health During Construction Phase

The construction, fabrication, erection etc work of Civil / Mechanical / Electrical will be awarded to contractors who will mobilize the manpower. ACL will provide accommodation to contractors in their colony. Adequate space will be provided for construction of temporary sheds for construction workers mobilized by the contractors. ACL will supply potable water for the construction workers. The safety department will supervise the safe working of the contractor and their employees. Work spots will be maintained clean, provided with optimum lighting and enough ventilation to eliminate dust/fumes.

7.2 ENVIRONMENTAL MANAGEMENT PLAN DURING OPERATIONAL PHASE

Environmental management plan which is being implemented in the existing plant and which is proposed for implementation in the implementation phase to comply with APPCB and MOEF standards are detailed below :

7.2.1 AIR ENVIRONMENT

ACL has invested about Rs 24 Crores for the installation of various pollution control systems in the existing cement plant. **Electro Static Precipitators** and **Bag filters** have been installed in the plant to

emission norms. The emissions from all the chimneys are maintained well within the prescribed norms of APPCB.

Under modification of the cement plant, ACL proposes to undertake the following for control of air pollution.

a. Replacement of Kiln ESP with Bag House
b. Replacement of Multiclones of cooler with ESP
c. Installation of clinker silo for storage of clinker
d. Installation of Bag Filter for cement mills
e. Pneumatic system for flyash handling
f. Mechanical system for kiln feed transport in place of Penumatic system

All the material handling systems are covered with aprons. Ventilation systems are provided with bag filters in the plant. About 21 bag filters have been provided at various points in the cement plant. All the pollution control equipment is designed to meet outlet particulate emission as per APPCB norms.

FUGITIVE DUST CONTROL IN THE CEMENT PLANT

ACL has paved all the roads in the plant area to control fugitive dust emission.

For control of fugitive dust, water spray arrangement is provided to spray water all round the coal stock piles to suppress the dust and to wet the coal while compacting to minimize the dust nuisance. Adequate ventilation and dust suppression systems will be implemented in the coal conveyer system.

All raw material storage areas are covered. ACL has planned to construct clinker storage tank of 40,000 MT capacity to control fugitive dust emissions.

7.2.2 NOISE POLLUTION CONTROL MEASURES

The noise generating sources are enclosed in the existing cement plant, wherever feasible. Plant machinery like cement mills, raw mills, coal mills,ID fans, compressors and Crusher are the major sources of noise pollution. The following measures have been implemented for control of noise pollution:

- Provision of acoustic dampeners in foundations and insulators in the interiors
- Encasement of noise generating equipment wherever feasible.
- A thick greenbelt all around the cement plant site to act as noise attenuator.
- In addition, personnel working near high noise level generating sources are provided with ear muffs.
- Effective preventive maintenance and vibration measurement of all rotating equipment are helping in the improvement of plant life and also noise reduction.
- Implementation of source control measures and occupational safety measures
- Automatic door enclosures for control room and physical laboratory etc.

No additional noise pollution control measures are envisaged in the modification scheme.

Greenbelt area will be increased from 10 ha to 20 ha in the plant area which will act as attenuation and reduce the noise levels.

7.2.3 WATER ENVIRONMENT

The water consumption of the cement plant and colony is about 750 m^3/day. Due to the proposed modification of the cement plant, the water consumption will reduce by 250 m^3/day. Hence the total water consumption of the cement plant will reduce by 250 m^3/day. Details of recycling of the wastewater from various units is detailed below

7.2.3.1 WASTEWATER GENERATION, TREATMENT AND REUSE

In cement plant water is used for cooling, gas conditioning and raw material addition at various stages. This water is totally absorbed in the process or will be subjected to evaporation and hence no wastewater will be released from the cement plant.

No additional wastewater will be generated from the modification scheme.

DOMESTIC WASTEWATER - CEMENT PLANT AND COLONY

ACL has provided about 182 houses in the colony to facilitate the employees. 120 m^3/day water is being supplied to the colony.

No additional manpower is envisaged in the plant and no additional quarter at colony. Hence there will be no increase in domestic wastewater generation.

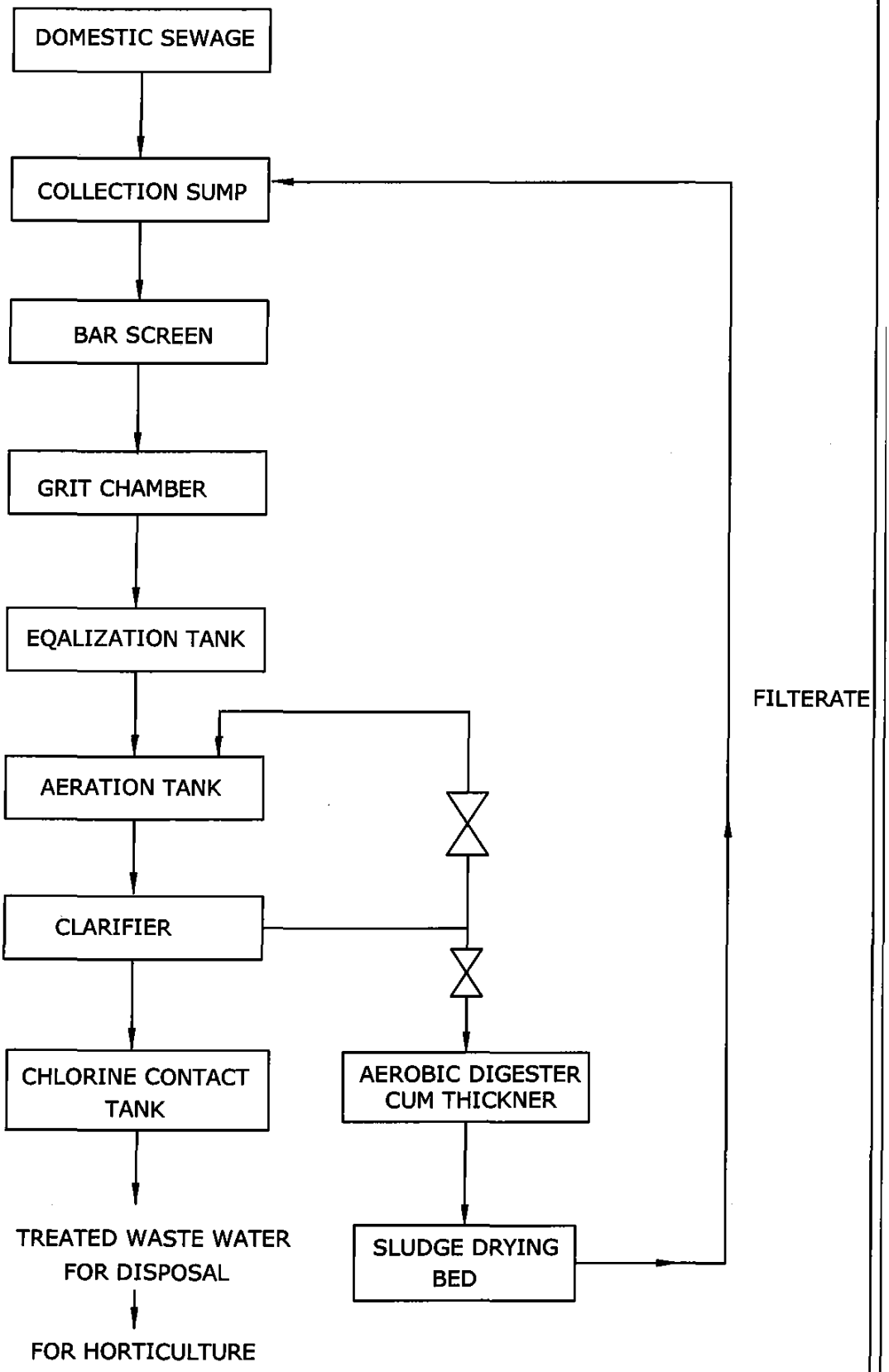
To treat the sewage generated from the plant and colony a full-fledged sewage treatment plant (STP) is proposed. The STP will be designed for a maximum load of 150 m^3/day with an average BOD of 150 - 200 mg/lt for raw sewage and after treatment for less than 20 mg/lt. **Fig – 7.1** shows the schematic diagram of existing sewage treatment plant.

The domestic wastewater generated from the plant is treated in individual septic tanks followed by septic tanks at respective buildings

7.2.4 LAND ENVIRONMENT

The cement plant is located in an area of 61.03 ha. Therefore no additional area will be acquired.

FIG - 7.1
FLOW DIAGRAM OF SEWAGE TREATMENT PLANT



7.2.4.1 SOLID WASTE GENERATION AND HANDLING

CEMENT PLANT

No solid waste is generated from the cement plant.

The cement dust collected in the pollution control devices is being recycled back to the process.

SOLID WASTE FROM COLONY AND SEWAGE TREATMENT PLANT

Solid waste generated from colony and sewage treatment plant will be disposed after segregating the waste into bio-degradable and nondegradable. Bio degradable waste is subjected to composting and non degradable waste will be land filled at identified areas.

HAZARDOUS WASTE MANAGEMENT RULES

ACL is storing the hazardous waste in a designated area. This area is isolated from the other utility areas.

Spent Oil from the gear boxes and automobile batteries are disposed to the authorized vendors as per the Hazardous Wastes (Management and Handling) Amendment Rules, 2003.

7.2.5 GREEN BELT DEVELOPMENT & PLANTATION PROGRAM

ACL has taken up massive green belt development plan. Approximately 24000 saplings have been planted in an area of 24 ha in the plant, colony and mining area. In spite of dry weather conditions and poor water availability in summer seasons, a remarkable survival rate of 89 % was achieved.

In order to develop the green belt and afforestation in scientific way, M/s. ACL has setup a horticulture department, which is headed by an experienced horticulturist. This department looks after the plantation of trees in colony, mines and factory areas. The saplings required for

plantation are produced in ACLs own nursery and purchased from government agencies such as Forest/Horticulture Dept.

PROPOSED GREENBELT DEVELOPMENT PLAN

ACL proposes to develop an other 10 ha of the land under greenbelt. **Fig –7.2** shows the proposed afforestation area.

7.2.6 SOCIO ECONOMIC ACTIVITIES UNDERTAKEN BY ACL

ACL has undertaken various social welfare measures to improve the social status of the region. Salient feature of the measures implemented are :

a. Drinking water for neighbouring villages.
b. Contributions for construction of roads.
c. Contributions for lighting arrangements.
d. Cement is issued on concessional rates for constructionof drains, water tanks, compound walls.
e. Medical camps are being conducted in the surrounding villages by arranging outside doctors and medicines are provided to the patients.

7.3 OCCUPATIONAL SAFETY & HEALTH MANAGEMENT

One dispensary is existing with one Male doctor (Chief Medical Officer) and dresser. Essential medicines are kept in the dispensary for giving to the patients. Medicines are being provided on chargeable basis. Ambulance facility is provided to the employees whenever necessary.

The health center is provided with all emergency medicines and ambulance.

Periodical health checkup are done for all the employees. Individual health cards of all the employees and their family members are maintained.

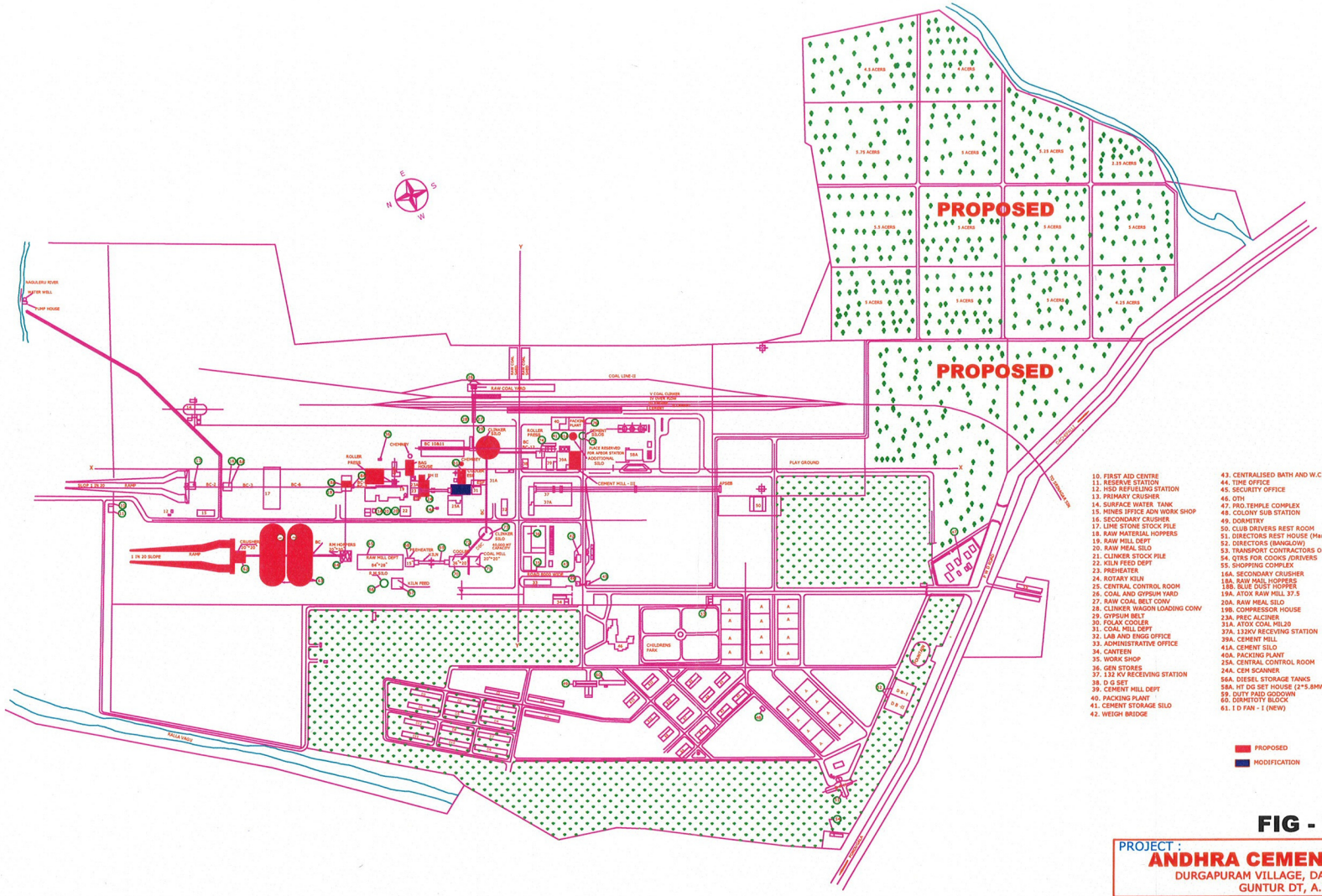


FIG - 7.2

PROJECT :

ANDHRA CEMENTS LIMITED.,

DURGAPURAM VILLAGE, DACHEPALLI MANDAL,
GUNTUR DT, A.P.

TITLE :

GREEN BELT PLAN

PREPARED BY:

B.S.ENVI-TECH (P) LTD.,
HYDERABAD

Periodical health checkup are done for all the employees. Individual health cards of all the employees and their family members are maintained.

ACL is participating in the State and central government immunization programs. Free medical camps in health center are conducted regularly.

First-aid materials are maintained in all the areas in the factory. One first- aid center in the mines 'e' stretcher, splints and torn quite is provided in the cement plant.

ACL has also established a training department to give the need based training to the staff and workers on safety. Training programmes are conducted regularly as per training calendar based on training needs assessed by the concerned departments.

ACL has prepared the trainer faculty list for imparting the training as and when required. Regular sponsorship of the employees for the external trainings/seminars/meetings is part of ACLs activity. The safety Policy has been made under Factory Act. The safety slogans/cartoons are displayed at strategic places in the factory premises.

7.4 MONITORING OF ENVIRONMENTAL PARAMETERS

ACL is implementing various productivity management programs in the plant to improve the work environment, effective house keeping and environmental quality. All the necessary steps were taken in the plant to meet standards prescribed by the State Pollution Control Board and Central Pollution Control Board.

7.4.1 ENVIRONMENTAL MANAGEMENT CELL

In order to implement an effective environmental management plan in the plant, M/s. ACL has constituted a full-fledged environmental cell. Vice president (Mfg) of the company heads the Environmental cell supported by the following personnel

The environmental cell with well-established laboratory is regularly monitoring all the pollution sources in the existing plant. Pollution control systems have shown satisfactory performance with respect to the prescribed emission norms. Approximately 50% reduction in the emission rate was reported against the prescribed standards. This helped in the reduction of ground level concentrations in the neighboring areas. ACL will further strengthen this cell for effective monitoring of the environmental parameters of various process units in the complex.

The organisation setup of the Environmental cell is depicted in **Fig – 7.3.**

7.4.2 MONITORING OF ENVIRONMENTAL QUALITY

Monitoring of various environmental parameters is carried out on a regular basis to ascertain the following:

- state of pollution within the plant and in its vicinity;
- generate data for predictive or corrective purpose in respect of pollution;
- examine the efficiency of Pollution Control Systems installed in the complex
- to assess and monitor environmental impacts

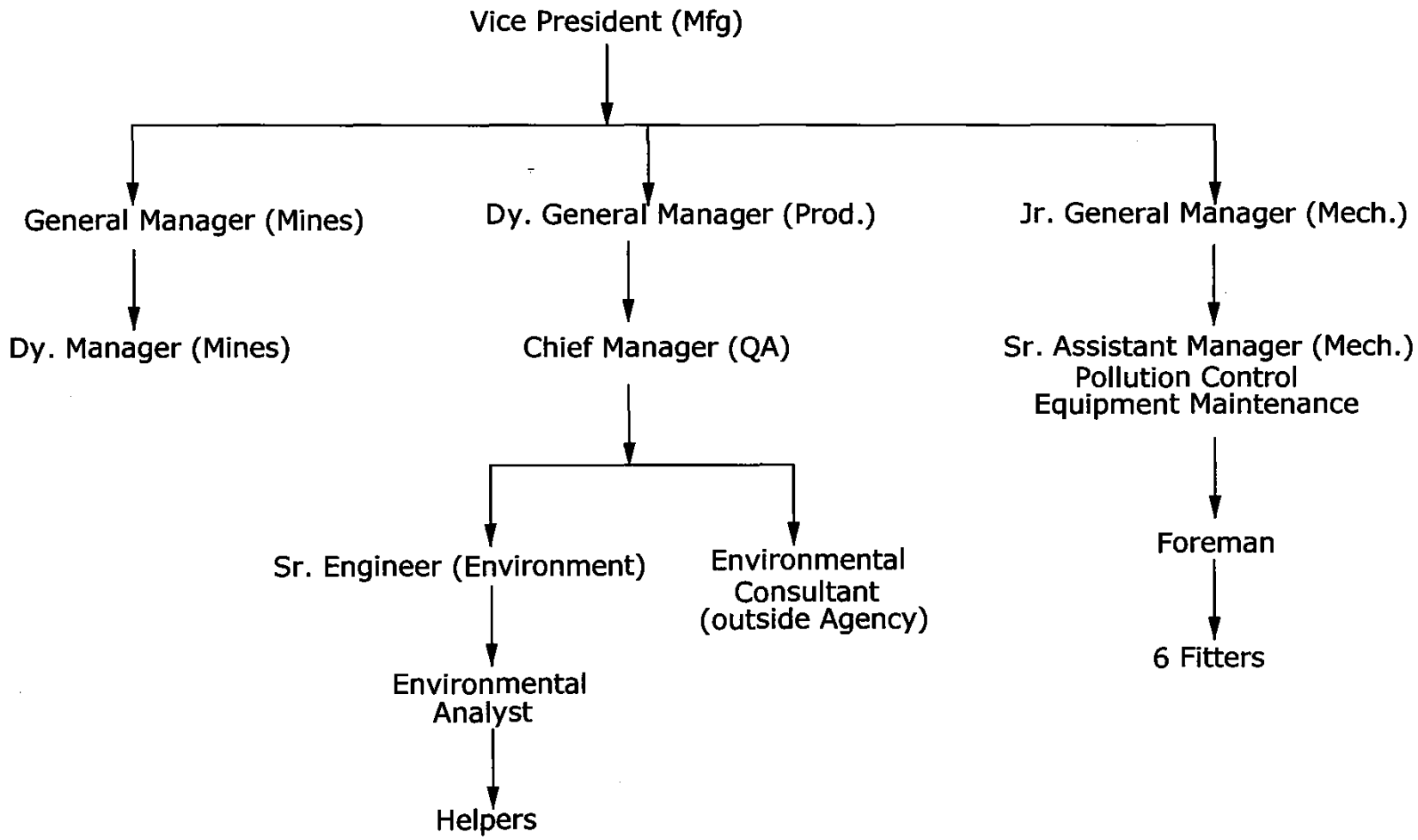
A CONTINUOUS EMISSION MONITORING INSTRUMENTS

ACL will install seven Continuous Emission Monitoring Systems at the following locations :

- Kiln/Raw Mill – 1 & 2
- Coal Mill -1
- Coal Mill – 2
- Cooler
- Cement Mill – 1
- Cement Mill – 2
- Cement Mill – 3

Fig - 7.3

ORGANISATION CHART
OF ENVIRONMENT MONITORING CELL



B AMBIENT AIR QUALITY

In order to identify the air quality in the surrounding areas, 3 number of fixed air quality monitoring stations are under operation and the samples are regularly analyzed as per APPCB/ CPCB norms.

C WASTEWATER SAMPLING

The wastewater samples will be regularly collected at the outlet of sewage treatment plant to assess the pollutant concentrations.

7.5 BUDGET FOR ENVIRONMENTAL MANAGEMENT PLAN

The following is the estimated budget for implementing various environmental measures like installation of pollution control equipment, monitoring of environmental parameters etc.

BUDGET FOR ENVIRONMENT MANAGEMENT PLAN

(amount in Rs crores)

Pollution Control Equipment	25.0
Online Monitoring Equipment	2.0
Greenbelt development	1.0
TOTAL	**28**

ANNEXURES

ANNEXURE-5 A

SUMMARY OF AMBIENT AIR QUALITY IN THE STUDY AREA
(Buffer Zone)

CODE	µg/M³			PERCENTILE VALUES (µg/M³)									
	MAX	MIN	AVG	10	20	30	40	50	60	70	80	90	98
Suspended particulate matter (SPM)													
A-1	169.7	112.5	138.6	114.5	119.5	126.2	122.7	138.6	145.2	151.2	157.6	165.3	168.1
A-2	138.2	88.5	113.6	89.5	96.2	102.6	108.4	113.6	119.4	124.8	129.3	135.5	136.8
A-3	158.3	94.2	125.3	97.2	106.5	113.3	119.7	125.3	133.3	140.4	147.3	154.1	156.3
A-4	148.7	90.1	116.7	93.2	99.6	105.9	110.2	116.7	123.6	129.8	135.0	143.6	145.3
A-5	142.1	86.8	112.2	88.8	94.5	99.3	106.7	112.2	118.7	124.6	130.2	137.3	139.8
A-6	150.1	95.0	124.5	97.3	105.7	112.9	118.6	124.5	130.6	136.0	142.2	148.5	149.3
A-7	157.3	95.3	121.6	98.4	105.5	110.3	116.1	121.6	128.2	136.5	144.6	152.2	155.8
A-8	163.1	109.5	130.6	111.3	116.5	121.0	125.4	130.6	137.5	144.2	150.5	158.5	160.3
Respirable Particulate Matter (RPM)													
A-1	59.5	36.2	47.1	38.3	41.2	43.2	45.5	47.1	49.6	51.6	53.4	56.8	58.3
A-2	51.2	31.4	40.7	32.6	34.5	36.7	38.6	40.7	42.5	44.6	46.8	49.3	50.9
A-3	58.6	35.3	47.5	37.2	39.2	42.4	45.4	47.5	49.3	52.1	54.2	56.2	57.1
A-4	53.5	31.3	41.6	32.7	35.2	37.1	39.2	41.6	44.2	46.5	48.1	51.6	52.1
A-5	55.0	33.0	43.3	34.3	36.5	38.3	41.4	43.3	46.1	48.4	50.2	53.1	54.0
A-6	50.2	31.0	40.2	32.7	34.1	36.6	38.6	40.2	42.8	44.6	46.2	48.9	49.7
A-7	57.6	32.8	44.5	34.1	37.2	39.5	42.4	44.5	47.2	49.2	52.3	55.3	56.7
A-8	61.2	35.8	47.2	37.5	40.2	43.4	45.3	47.2	50.2	52.7	55.5	59.1	60.2
Sulfur Dioxide (SO_2)													
A-1	16.5	10.1	13.2	10.5	11.2	11.9	12.6	13.2	13.9	14.5	15.1	15.8	16.1
A-2	13.9	8.5	10.8	8.7	9.2	9.8	10.3	10.8	11.5	12.1	12.7	13.4	13.6
A-3	14.9	8.5	11.3	8.8	9.4	10.0	10.7	11.3	12.0	12.7	13.5	14.4	14.7
A-4	13.8	7.9	10.7	8.2	8.8	9.5	10.1	10.7	11.4	12.0	12.6	13.4	13.7
A-5	14.2	8.2	11.4	8.5	9.1	9.9	10.7	11.4	12.0	12.6	13.2	13.8	14.0
A-6	15.2	9.2	12.5	9.5	10.1	10.9	10.7	12.5	13.2	13.8	14.3	14.8	15.0
A-7	14.8	8.3	11.4	8.5	9.2	9.9	10.6	11.4	12.1	12.8	13.5	14.3	14.6
A-8	15.6	9.0	12.2	9.4	10.1	10.8	11.5	12.2	13.0	13.7	14.5	15.2	15.5
Oxides of Nitrogen (NO_x)													
A-1	17.6	11.3	14.3	11.6	12.3	12.9	13.6	14.3	15.0	15.6	16.3	17.0	17.4
A-2	15.0	9.5	12.0	9.8	10.4	10.9	11.5	12.0	12.6	13.2	13.9	14.6	14.8
A-3	15.7	9.6	12.5	9.8	10.5	11.2	11.9	12.5	13.2	13.9	14.6	15.3	15.6
A-4	15.1	8.8	12.1	9.1	9.8	10.6	11.4	12.1	12.9	13.5	14.2	14.8	15.0
A-5	15.0	9.3	12.5	9.6	10.3	11.0	11.7	12.5	13.0	13.5	14.0	14.6	14.8
A-6	16.2	10.5	13.5	10.7	11.4	12.1	12.8	13.5	14.1	14.6	15.2	15.8	16.0
A-7	15.8	9.4	12.7	9.6	10.3	11.0	11.8	12.7	13.5	14.1	14.7	15.4	15.6
A-8	16.7	11.1	14.2	11.3	12.0	12.7	13.5	14.2	14.8	15.3	15.5	16.3	16.5

Plant [Main Gate]	A-1	Colony	A-2
Ramapuram village	A-3	Bhatrupalem village	A-4
Kotayyanagaram village	A-5	Gamalapadu village	A-6
Shrinagar village	A-7	Pondugula village	A-8

ANNEXURE-5 B

WATER QUALITY DATA

SL. NO.	TESTS	RESULTS			IS 10500 [DRINKING WATER STANDARD]	
		RAMAPURAM VILLAGE	BHATRUPALEM VILLAGE	KOTAYYANA GARAM VILLAGE	DESIRABLE LIMITS	PERMISSIBLE LIMITS
		BOREWELL	BOREWELL	BOREWELL		
1	Odour	Un Objectionable	Un Objectionable	Un Objectionable	--------	-----
2	Taste	Agreeable	Agreeable	Agreeable	--------	-----
3	Colour (Hazen units)	<5	<5	<5	5	25
4	pH	7.95	7.42	7.32	6.5 to 8.5	6.5 to 8.5
5	Turbidity, NTU	2	2	2	5	10
6	Total Hardness as $CaCo_3$, mg/l	270	295	196	300	600
7	Mineral oil, mg/l	Nil	Nil	Nil	0.01	0.03
8	Iron as Fe, mg/l	0.18	0.16	0.14	0.3	1.0
9	Chlorides as Cl, mg/l	42	66	53	250	1000
10	Dissolved solids, mg/l	582	520	368	500	2000
11	Calcium as Ca, mg/l	56	48	40	75	200
12	Magnesium as Mg, mg/l			23.3	30	100
13	Copper as Cu, mg/l	BDL	BDL	BDL	0.05	1.5
14	Manganese as Mn, mg/l	BDL	BDL	BDL	0.1	0.3
15	Sulphate as SO_4, mg/l	46	57	76	200	400
16	Nitrate as NO_3, mg/l	22	12	18	45	100
17	Fluoride as F, mg/l	0.85	0.80	0.90	0.6-1.2	1.5
18	Mercury as Hg, mg/l	BDL	BDL	BDL	0.001	0.001
19	Cadmium as Cd, mg/l	BDL	BDL	BDL	0.01	0.01
20	Selenium as Se, mg/l	BDL	BDL	BDL	0.01	0.01
21	Cyanide as CN, mg/l	BDL	BDL	BDL	0.05	0.05
22	Lead as Pb, mg/l	BDL	BDL	BDL	0.05	0.05
23	Zinc as Zn, mg/l	BDL	BDL	BDL	5	15
24	Chromium as Cr^{+6}, mg/l	BDL	BDL	BDL	0.05	0.05
25	Pesticides	Absent	Absent	Absent	Absent	0.001
26	Alkalinity as $CaCo_3$, mg/l	336	269	165	200	600
27	Boron as B, mg/l	0.12	0.09	0.11	1	5
28	Arsenic as As, mg/l	BDL	BDL	BDL	0.05	No relaxation
29	Coliform count, MPN/100 ml	Nil	Nil	Nil	10 (e-coli absent)	10 (e-coli absent)

Note: BDL: Below Detectable Limit (for Hg, 0.001 mg/l and for all other parameters, 0.01 mg/l)

ANNEXURE-5 B (CONTD)

WATER QUALITY DATA

SL. NO.	TESTS	RESULTS			IS 10500 [DRINKING WATER STANDARD]	
		GAMALAPADU VILLAGE	**SHRINAGAR VILLAGE**	**PONDUGULA VILLAGE**	DESIRABLE LIMITS	PERMISSIBLE LIMITS
		BOREWELL	**BOREWELL**	**BOREWELL**		
1	Odour	Un Objectionable	Un Objectionable	Un Objectionable	-------	-----
2	Taste	Agreeable	Agreeable	Agreeable	-------	-----
3	Colour (Hazen units)	<5	<5	<5	5	25
4	pH	7.65	8.14	7.84	6.5 to 8.5	6.5 to 8.5
5	Turbidity, NTU	1	3	2	5	10
6	Total Hardness as $CaCo_3$, mg/l	310	276	110	300	600
7	Mineral oil, mg/l	Nil	Nil	Nil		
8	Iron as Fe, mg/l	0.15	0.20	0.16	0.3	1.0
9	Chlorides as Cl, mg/l	110	74	47	250	1000
10	Dissolved solids, mg/l	650	560	260	500	2000
11	Calcium as Ca, mg/l	62	60	26	75	200
12	Magnesium as Mg, mg/l				30	100
13	Copper as Cu, mg/l	BDL	BDL	BDL	0.05	1.5
14	Manganese as Mn, mg/l	BDL	BDL	BDL	0.1	0.3
15	Sulphate as SO_4, mg/l	70	48	34	200	400
16	Nitrate as NO_3, mg/l	26	20	12	45	100
17	Fluoride as F, mg/l	0.95	0.94	0.90	0.6-1.2	1.5
18	Mercury as Hg, mg/l	BDL	BDL	BDL	0.001	0.001
19	Cadmium as Cd, mg/l	BDL	BDL	BDL	0.01	0.01
20	Selenium as Se, mg/l	BDL	BDL	BDL	0.01	0.01
21	Cyanide as CN, mg/l	BDL	BDL	BDL	0.05	0.05
22	Lead as Pb, mg/l	BDL	BDL	BDL	0.05	0.05
23	Zinc as Zn, mg/l	BDL	BDL	BDL	5	15
24	Chromium as Cr^{+6}, mg/l	BDL	BDL	BDL	0.05	0.05
25	Pesticides	Absent	Absent	Absent	Absent	0.001
26	Alkalinity as $CaCo_3$, mg/l	366	348	160	200	600
27	Boron as B, mg/l	0.09	0.12	0.10	1	5
28	Arsenic as As, mg/l	BDL	BDL	BDL	0.05	No relaxation
29	Coliform count, MPN/100 ml	Nil	Nil	Nil	10 (e-coli absent)	10 (e-coli absent)

Note: BDL: Below Detectable Limit (for Hg, 0.001 mg/l and for all other parameters, 0.01 mg/l)

ANNEXURE-5 B [Contd.]

WATER QUALITY DATA

SL. NO.	TESTS	RESULTS		IS 10500 [DRINKING WATER STANDARD]	
		KRISHNA RIVER	POTABLE WATER	DESIRABLE LIMITS	PERMISSIBLE LIMITS
	CODE	Surface water	Surface water		
1	Odour	Un Objectionable	Un Objectionable	-------	-----
2	Taste	Agreeable	Agreeable	-------	-----
3	Colour (Hazen units)	<5	<5	5	25
4	pH	8.10	7.56	6.5 to 8.5	6.5 to 8.5
5	Turbidity, NTU	6	2	5	10
6	Total Hardness as $CaCo_3$, mg/l	166	280	300	600
7	Mineral oil, mg/l	Nil	Nil	0.01	0.03
8	Iron as Fe, mg/l	0.15	0.16	0.3	1.0
9	Chlorides as Cl, mg/l	86	56	250	1000
10	Dissolved solids, mg/l	440	570	500	2000
11	Calcium as Ca, mg/l	32	38	75	200
12	Magnesium as Mg, mg/l			30	100
13	Copper as Cu, mg/l	BDL	BDL	0.05	1.5
14	Manganese as Mn, mg/l	BDL	BDL	0.1	0.3
15	Sulphate as SO_4, mg/l	58	114	200	400
16	Nitrate as NO_3, mg/l	8	12	45	100
17	Fluoride as F, mg/l	0.70	0.98	0.6-1.2	1.5
18	Mercury as Hg, mg/l	BDL	BDL	0.001	0.001
19	Cadmium as Cd, mg/l	BDL	BDL	0.01	0.01
20	Selenium as Se, mg/l	BDL	BDL	0.01	0.01
21	Cyanide as CN, mg/l	BDL	BDL	0.05	0.05
22	Lead as Pb, mg/l	BDL	BDL	0.05	0.05
23	Zinc as Zn, mg/l	BDL	BDL	5	15
24	Chromium as Cr^{+6}, mg/l	BDL	BDL	0.05	0.05
25	Pesticides	Absent	Absent	Absent	0.001
26	Alkalinity as $CaCo_3$, mg/l	145	236	200	600
27	Boron as B, mg/l	0.12	0.09	1	5
28	Arsenic as As, mg/l	BDL	BDL	0.05	No relaxation
29	Coliform count, MPN/100 ml	276	Nil	10 (e-coli absent)	10 (e-coli absent)

Note: BDL: Below Detectable Limit (for Hg, 0.001 mg/l and for all other parameters, 0.01 mg/l)

ANNEXURE-5 C

SOIL QUALITY DATA

S.NO.	PARAMETERS	RESULTS					
		S1	S2	S3	S4	S5	S6
1	pH (1:2 Soil water Extract)	7.90	7.10	8.34	7.42	6.98	7.87
2	Electrical conductivity (micro mhos) (1:2 Soil water Extract)	320	366	280	204	426	415
3	Total Soluble salts, mg/kg	342	364	340	310	530	286
4	Nitrates as N, mg/kg	186	190	150	154	198	186
5	Phosphorous as P_2O_5, mg/kg	22	24	15	18	25	29
6	Potassium as K_2O, mg/kg	543	450	362	324	542	510
7	Sodium as Na_2O, mg/kg	985	1098	820	786	1182	2176
8	Calcium as Ca, mg/kg	6560	5860	6880	5840	8270	7240
	Magnesium as Mg, mg/kg	320	360	556	290	780	980
9	Chloride as Cl, mg/kg	184	170	155	119	190	180
10	Organic Carbon, %	0.46	0.48	0.36	0.50	0.42	0.38
11	Texture						
	Sand %	42	40	42	38	46	40
	Silt %	24	24	38	28	23	34
	Clay %	34	36	20	34	31	26

S1	Ramapuram village
S2	Bhatrupalem village
S3	Kotayyanagaram village
S4	Gamalapadu village
S5	Shrinagar village
S6	Pondugula village

ANNEXURE-5 D

DEMOGRAPHIC PROFILE OF THE STUDY AREA (10 km radius)

Name	Total/ Rural/ Urban	Number of households	Total population				0-6 years aged populatic			SC population				ST population			
			Total	Male	Female	Sex ratio	Total	Male	Female	SC%	Total	Male	Female	ST%	Total	Male	Female
0-3 km																	
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3-5 km																	
Bhatrupalem	Rural	395	2016	1030	986	957	362	183	179	12.5	251	131	120	66.0	1330	677	653
Madinapadu	Rural	1158	4977	2467	2510	1017	692	334	358	24.1	1201	612	589	9.8	490	232	258
Mahankaligudem	Rural	340	1444	712	732	1028	180	81	99	22.2	320	157	163	1.2	17	10	7
Ramapuram	Rural	515	2118	1102	1016	922	251	137	114	34.1	722	383	339	3.6	76	42	34
Shrinivasapuram	Rural	236	1060	528	532	1008	169	86	83	3.5	37	21	16	0.0	0	0	0
Total (3-5 km)		**2644**	**11615**	**5839**	**5776**	**989**	**1654**	**821**	**833**	**21.8**	**2531**	**1304**	**1227**	**16.5**	**1913**	**961**	**952**
5-7 km																	
Gamalapadu	Rural	990	4127	2105	2022	961	540	292	248	6.7	277	151	126	4.2	174	92	82
Pondugala	Rural	2140	8808	4496	4312	959	1123	578	545	19.9	1751	880	871	0.8	71	42	29
Ravipahad	Rural	202	873	459	414	902	111	64	47	8.8	77	36	41	52.0	454	241	213
Total (5-7 km)		**3332**	**13808**	**7060**	**6748**	**956**	**1774**	**934**	**840**	**15.2**	**2105**	**1067**	**1038**	**5.1**	**699**	**375**	**324**
7-10 km																	
Alugumallepadu	Rural	87	333	174	159	914	37	18	19	4.2	14	7	7	0.0	0	0	0
Dachepalli	Rural	3164	14256	7237	7019	970	2108	1073	1035	7.2	1023	529	494	2.8	403	197	206
Janpahad	Rural	821	3479	1764	1715	972	523	267	256	8.8	305	148	157	53.5	1862	950	912
Katrapadu	Rural	269	1056	529	527	996	119	61	58	14.0	148	77	71	1.1	12	7	5
Mutyalammapadu	Rural	1013	4368	2239	2129	951	476	259	217	16.6	727	391	336	5.9	258	129	129
Nadikudi	Rural	353	1632	791	841	1063	222	107	115	23.3	381	173	208	0.5	8	3	5
Pulipaduu	Rural	528	2531	1284	1247	971	381	189	192	25.3	641	334	307	0.0	0	0	0
Sunyapahad	Rural	312	1420	703	717	1020	247	118	129	4.4	62	31	31	88.3	1254	613	641
Takkellapadu	Rural	894	3264	1604	1660	1035	401	196	205	15.7	512	257	255	2.8	91	44	47
Total (7-10 km)		**7441**	**32339**	**16325**	**16014**	**981**	**4514**	**2288**	**2226**	**11.8**	**3813**	**1947**	**1866**	**12.0**	**3888**	**1943**	**1945**
Total		**13417**	**57762**	**29224**	**28538**	**977**	**7942**	**4043**	**3899**	**14.6**	**8449**	**4318**	**4131**	**11.3**	**6500**	**3279**	**3221**

Source:2001 Census Published Data

ANNEXURE-5 D

LITERACY STATUS (10 km radius)

Name	Total/ Rural/ Urban	No of Literates			No of Illiterates		
		Total	Male	Female	Total	Male	Female
0-3 km							
	-	-	-	-	-	-	-
3-5 km							
Bhatrupalem	Rural	689	463	226	1327	567	760
Madinapadu	Rural	1787	1152	635	3190	1315	1875
Mahankaligudem	Rural	1034	570	464	410	142	268
Ramapuram	Rural	1120	712	408	998	390	608
Shrinivasapuram	Rural	392	248	144	668	280	388
Total (3-5 km)		**5022**	**3145**	**1877**	**6593**	**2694**	**3899**
5-7 km							
Gamalapadu	Rural	1920	1179	741	2207	926	1281
Pondugala	Rural	4237	2615	1622	4571	1881	2690
Ravipahad	Rural	314	225	89	559	234	325
Total (5-7 km)		**6471**	**4019**	**2452**	**7337**	**3041**	**4296**
7-10 km							
Alugumallepadu	Rural	172	106	66	161	68	93
Dachepalli	Rural	6576	4091	2485	7680	3146	4534
Janpahad	Rural	1390	911	479	2089	853	1236
Katrapadu	Rural	693	380	313	363	149	214
Mutyalammapadu	Rural	2203	1377	826	2165	862	1303
Nadikudi	Rural	627	372	255	1005	419	586
Pulipaduu	Rural	1102	735	367	1429	549	880
Sunyapahad	Rural	487	353	134	933	350	583
Takkellapadu	Rural	1841	1068	773	1423	536	887
Total (7-10 km)		**15091**	**9393**	**5698**	**17248**	**6932**	**10316**
Total		**26584**	**16557**	**10027**	**31178**	**12667**	**18511**

Source:2001 Census Published Data

ANNEXURE-5 D

OCCUPATIONAL STRUCTURE OF THE STUDY AREA (10 km Radius)

Name	Total/ Rural/ Urban	Total Working Population			Total Non Working Population			Total Main Worker			Total Marginal Worker		
		Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
0-3 km													
	-												
3-5 km													
Bhatrupalem	Rural	1101	555	546	915	475	440	991	541	450	110	14	96
Madinapadu	Rural	3114	1557	1557	1863	910	953	3079	1546	1533	35	11	24
Mahankaligudem	Rural	456	403	53	988	309	679	432	397	35	24	6	18
Ramapuram	Rural	1231	636	595	887	466	421	728	406	322	503	230	273
Shrinivasapuram	Rural	625	318	307	435	210	225	495	304	191	130	14	116
Total (3-5 km)		**6527**	**3469**	**3058**	**5088**	**2370**	**2718**	**5725**	**3194**	**2531**	**802**	**275**	**527**
5-7 km													
Gamalapadu	Rural	2216	1280	936	1911	825	1086	2195	1277	918	21	3	18
Pondugala	Rural	4610	2472	2138	4198	2024	2174	3762	2247	1515	848	225	623
Ravipahad	Rural	428	234	194	445	225	220	315	190	125	113	44	69
Total (5-7 km)		**7254**	**3986**	**3268**	**6554**	**3074**	**3480**	**6272**	**3714**	**2558**	**982**	**272**	**710**
7-10 km													
Alugumallepadu	Rural	188	105	83	145	69	76	186	105	81	2	0	2
Dachepalli	Rural	7506	4267	3239	6750	2970	3780	6309	3864	2445	1197	403	794
Janpahad	Rural	2077	1025	1052	1402	739	663	1756	949	807	321	76	245
Katrapadu	Rural	547	335	212	509	194	315	533	334	199	14	1	13
Mutyalammapadu	Rural	2294	1265	1029	2074	974	1100	1739	985	754	555	280	275
Nadikudi	Rural	1001	513	488	631	278	353	807	462	345	194	51	143
Pulipaduu	Rural	1251	675	576	1280	609	671	1250	674	576	1	1	0
Sunyapahad	Rural	854	425	429	566	278	288	352	320	32	502	105	397
Takkellapadu	Rural	1877	994	883	1387	610	777	1326	746	580	551	248	303
Total (7-10 km)		**17595**	**9604**	**7991**	**14744**	**6721**	**8023**	**14258**	**8439**	**5819**	**3337**	**1165**	**2172**
Total		**31376**	**17059**	**14317**	**26386**	**12165**	**14221**	**26255**	**15347**	**10908**	**5121**	**1712**	**3409**

Source:2001 Census Published Data

ANNEXURE-5 D

CATEGORY OF WORKERS IN THE STUDY AREA (10 Km Radius)

Name	Total/ Rural/ Urban	Cultivators			Agricultural Labourers			House hold Industry Workers			Other workers		
		Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
0-3 km													
	-	-	-	-	-	-	-	-	-	-	-	-	-
3-5 km													
Bhatrupalem	Rural	503	328	175	457	185	272	1	0	1	30	28	2
Madinapadu	Rural	1251	691	560	1713	771	942	34	14	20	81	70	11
Mahankaligudem	Rural	2	2	0	16	8	8	2	2	0	412	385	27
Ramapuram	Rural	347	208	139	232	102	130	48	27	21	101	69	32
Shrinivasapuram	Rural	202	170	32	121	19	102	6	5	1	166	110	56
Total (3-5 km)		**2305**	**1399**	**906**	**2539**	**1085**	**1454**	**91**	**48**	**43**	**790**	**662**	**128**
5-7 km													
Gamalapadu	Rural	666	404	262	1121	544	577	15	6	9	393	323	70
Pondugala	Rural	1018	688	330	1783	818	965	101	71	30	860	670	190
Ravipahad	Rural	115	70	45	112	42	70	2	1	1	86	77	9
Total (5-7 km)		**1799**	**1162**	**637**	**3016**	**1404**	**1612**	**118**	**78**	**40**	**1339**	**1070**	**269**
7-10 km													
Alugumallepadu	Rural	57	33	24	100	48	52	4	3	1	25	21	4
Dachepalli	Rural	1019	590	429	3015	1310	1705	124	62	62	2151	1902	249
Janpahad	Rural	512	452	60	859	281	578	118	21	97	267	195	72
Katrapadu	Rural	211	146	65	268	143	125	8	4	4	46	41	5
Mutyalammapadu	Rural	1373	812	561	249	92	157	19	3	16	98	78	20
Nadikudi	Rural	333	177	156	384	215	169	3	0	3	87	70	17
Pulipaduu	Rural	347	256	91	641	206	435	49	41	8	213	171	42
Sunyapahad	Rural	175	170	5	25	16	9	14	11	3	138	123	15
Takkellapadu	Rural	603	362	241	553	265	288	8	3	5	162	116	46
Total (7-10 km)		**4630**	**2998**	**1632**	**6094**	**2576**	**3518**	**347**	**148**	**199**	**3187**	**2717**	**470**
Total		**8734**	**5559**	**3175**	**11649**	**5065**	**6584**	**556**	**274**	**282**	**5316**	**4449**	**867**

Source:2001 Census Published Data

ANNEXURE – 6 A

MEAN METEOROLOGY
WINTER '06-07

HOUR	WIND DIRECTION	WIND SPEED (M/SEC)	TEMPERATURE °K	STABILITY CLASS	MIXING HEIGHT (M)
1	E	0.9	290	6	210
2	NNE	0.85	290.1	6	200
3	NE	0.75	290.5	6	180
4	ESE	0.92	290.8	6	170
5	E	1	290.9	6	150
6	ESE	0.9	291.2	6	150
7	NNE	1.2	293.5	3	160
8	ENE	1.7	295	2	240
9	ESE	1.3	298.9	2	500
10	NE	1.5	302.9	2	750
11	NNE	1.4	303.4	2	810
12	SE	1.5	304.2	1	1220
13	ESE	1.8	303	1	1350
14	SE	1.7	302.2	1	1480
15	NE	1.6	301	1	1320
16	SE	1.5	300.2	2	1140
17	E	0.92	299	2	850
18	ESE	0.94	298	3	750
19	ENE	0.85	297	6	680
20	E	0.7	296	6	590
21	NE	0.75	295	6	500
22	ESE	0.6	294	6	420
23	E	0.65	293.8	6	380
24	ENE	0.71	291	6	340

ANNEXURE – 6 B

PREDICTED HIGH 50 24-HOURLY AVERAGE GROUNDLEVEL CONCENTRATIONS OF SUSPENDED PARTICULATE MATTER DUE TO THE INCREASE OF PRODUCTION

RANK	CONC	AT	RECEPTOR (XR,YR) OF		TYPE	RANK	CONC	AT	RECEPTOR (XR,YR) OF		TYPE
	µg/m3		(m,m)				µg/m3		(m,m)		
1	3.79125	AT	(-200.00,	346.41)	GP	26	3.17483	AT	(-6000.00,	0.00)	GP
2	3.6284	AT	(-250.00,	433.01)	GP	27	3.08949	AT	(-385.67,	459.63)	GP
3	3.61613	AT	(-383.02,	321.39)	GP	28	3.02709	AT	(-5500.00,	0.00)	GP
4	3.50179	AT	(-321.39,	383.02)	GP	29	2.94549	AT	(-689.44,	578.51)	GP
5	3.47722	AT	(-257.12,	306.42)	GP	30	2.94171	AT	(-300.00,	519.62)	GP
6	3.47595	AT	(-9000.00,	0.00)	GP	31	2.84297	AT	(-5000.00,	0.00)	GP
7	3.47353	AT	(-9500.00,	0.00)	GP	32	2.8416	AT	(-449.95,	536.23)	GP
8	3.47024	AT	(-8500.00,	0.00)	GP	33	2.83536	AT	(-321.39,	-383.02)	GP
9	3.46451	AT	(-10000.00,	0.00)	GP	34	2.81089	AT	(-257.12,	-306.42)	GP
10	3.45453	AT	(-8000.00,	0.00)	GP	35	2.78462	AT	(-845.72,	307.82)	GP
11	3.43072	AT	(-692.82,	400.00)	GP	36	2.78375	AT	(-751.75,	273.62)	GP
12	3.42648	AT	(-7500.00,	0.00)	GP	37	2.77952	AT	(-383.02,	-321.39)	GP
13	3.42185	AT	(-459.63,	385.67)	GP	38	2.76068	AT	(-375.88,	136.81)	GP
14	3.3883	AT	(-433.01,	250.00)	GP	39	2.75442	AT	(-306.42,	-257.12)	GP
15	3.37964	AT	(-7000.00,	0.00)	GP	40	2.7272	AT	(-787.85,	138.92)	GP
16	3.36015	AT	(-779.42,	450.00)	GP	41	2.7131	AT	(-469.85,	171.01)	GP
17	3.35802	AT	(-606.22,	350.00)	GP	42	2.69501	AT	(-689.37,	121.55)	GP
18	3.35189	AT	(-306.42,	257.12)	GP	43	2.68431	AT	(-150.00,	259.81)	GP
19	3.32632	AT	(-536.23,	449.95)	GP	44	2.66604	AT	(-514.23,	612.84)	GP
20	3.29788	AT	(-519.62,	300.00)	GP	45	2.6326	AT	(-385.67,	-459.63)	GP
21	3.29145	AT	(-6500.00,	0.00)	GP	46	2.62564	AT	(-459.63,	-385.67)	GP
22	3.21118	AT	(-136.81,	375.88)	GP	47	2.62331	AT	(-939.69,	342.02)	GP
23	3.20959	AT	(-612.84,	514.23)	GP	48	2.61842	AT	(-657.78,	239.41)	GP
24	3.18787	AT	(-346.41,	200.00)	GP	49	2.61729	AT	(-4500.00,	0.00)	GP
25	3.17599	AT	(-866.03,	500.00)	GP	50	2.59721	AT	(-766.04,	642.79)	GP

ANNEXURE – 6 B(CONTD)

PREDICTED HIGH 50 24-HOURLY AVERAGE GROUNDLEVEL CONCENTRATIONS OF SULPHUR DIOXIDE DUE TO THE INCREASE OF PRODUCTION

RANK	CONC	AT	RECEPTOR (XR,YR) OF	TYPE	RANK	CONC	AT	RECEPTOR (XR,YR) OF	TYPE
	µg/m3		(m,m)			µg/m3		(m,m)	
1	0.67887	AT	(-766.04, 642.79)	GP	26	0.26074	AT	(-1915.11, -1606.97)	GP
2	0.6154	AT	(-957.56, 803.48)	GP	27	0.25478	AT	(-766.04, -642.79)	GP
3	0.5768	AT	(-866.03, 500.00)	GP	28	0.25255	AT	(-692.82, -400.00)	GP
4	0.50965	AT	(-1082.53, 625.00)	GP	29	0.25185	AT	(-845.72, 307.82)	GP
5	0.49492	AT	(-689.44, 578.51)	GP	30	0.25109	AT	(-2598.08, 1500.00)	GP
6	0.44695	AT	(-1149.07, 964.18)	GP	31	0.24575	AT	(-2819.08, 1026.06)	GP
7	0.42499	AT	(-642.79, 766.04)	GP	32	0.24461	AT	(-2349.23, 855.05)	GP
8	0.41938	AT	(-779.42, 450.00)	GP	33	0.24375	AT	(-1082.53, -625.00)	GP
9	0.40972	AT	(-803.48, 957.56)	GP	34	0.24072	AT	(-1928.36, 2298.13)	GP
10	0.37843	AT	(-1532.09, 1285.58)	GP	35	0.24063	AT	(-689.44, -578.51)	GP
11	0.35366	AT	(-1299.04, 750.00)	GP	36	0.23752	AT	(-3288.92, 1197.07)	GP
12	0.35282	AT	(-1915.11, 1606.97)	GP	37	0.23413	AT	(-2298.13, -1928.36)	GP
13	0.34069	AT	(-939.69, 342.02)	GP	38	0.23363	AT	(-3064.18, 2571.15)	GP
14	0.31452	AT	(-866.03, -500.00)	GP	39	0.23062	AT	(-957.56, -803.48)	GP
15	0.31325	AT	(-779.42, -450.00)	GP	40	0.22856	AT	(-1149.07, -964.18)	GP
16	0.31241	AT	(-2298.13, 1928.36)	GP	41	0.22797	AT	(-3758.77, 1368.08)	GP
17	0.30922	AT	(-964.18, 1149.07)	GP	42	0.22509	AT	(-1409.54, 513.03)	GP
18	0.30308	AT	(-1174.62, 427.53)	GP	43	0.22478	AT	(-3031.09, 1750.00)	GP
19	0.30073	AT	(-578.51, 689.44)	GP	44	0.22311	AT	(-1879.39, 684.04)	GP
20	0.28724	AT	(-1732.05, 1000.00)	GP	45	0.21977	AT	(-4228.62, 1539.09)	GP
21	0.27471	AT	(-2165.06, 1250.00)	GP	46	0.21335	AT	(-2249.76, 2681.16)	GP
22	0.27433	AT	(-1285.58, 1532.09)	GP	47	0.21292	AT	(-4698.46, 1710.10)	GP
23	0.27057	AT	(-2681.16, 2249.76)	GP	48	0.20901	AT	(-1299.04, -750.00)	GP
24	0.26438	AT	(-1606.97, 1915.11)	GP	49	0.20745	AT	(-1250.00, -2165.06)	GP
25	0.26405	AT	(-1532.09, -1285.58)	GP	50	0.20671	AT	(-5168.31, 1881.11)	GP

ANNEXURE – 6 B(CONTD)

PREDICTED HIGH 50 24-HOURLY AVERAGE GROUNDLEVEL CONCENTRATIONS OF SULPHUR DIOXIDE DUE TO THE INCREASE OF PRODUCTION

RANK	CONC µg/m3	AT	RECEPTOR (XR,YR) OF (m,m)	TYPE	RANK	CONC µg/m3	AT	RECEPTOR (XR,YR) OF (m,m)	TYPE
1	0.73484	AT	(-766.04, 642.79)	GP	26	0.28223	AT	(-1915.11, -1606.97)	GP
2	0.66613	AT	(-957.56, 803.48)	GP	27	0.27578	AT	(-766.04, -642.79)	GP
3	0.62435	AT	(-866.03, 500.00)	GP	28	0.27337	AT	(-692.82, -400.00)	GP
4	0.55166	AT	(-1082.53, 625.00)	GP	29	0.27261	AT	(-845.72, 307.82)	GP
5	0.53572	AT	(-689.44, 578.51)	GP	30	0.27179	AT	(-2598.08, 1500.00)	GP
6	0.48379	AT	(-1149.07, 964.18)	GP	31	0.26601	AT	(-2819.08, 1026.06)	GP
7	0.46002	AT	(-642.79, 766.04)	GP	32	0.26478	AT	(-2349.23, 855.05)	GP
8	0.45395	AT	(-779.42, 450.00)	GP	33	0.26385	AT	(-1082.53, -625.00)	GP
9	0.4435	AT	(-803.48, 957.56)	GP	34	0.26057	AT	(-1928.36, 2298.13)	GP
10	0.40963	AT	(-1532.09, 1285.58)	GP	35	0.26047	AT	(-689.44, -578.51)	GP
11	0.38282	AT	(-1299.04, 750.00)	GP	36	0.2571	AT	(-3288.92, 1197.07)	GP
12	0.3819	AT	(-1915.11, 1606.97)	GP	37	0.25343	AT	(-2298.13, -1928.36)	GP
13	0.36877	AT	(-939.69, 342.02)	GP	38	0.25289	AT	(-3064.18, 2571.15)	GP
14	0.34044	AT	(-866.03, -500.00)	GP	39	0.24963	AT	(-957.56, -803.48)	GP
15	0.33908	AT	(-779.42, -450.00)	GP	40	0.2474	AT	(-1149.07, -964.18)	GP
16	0.33817	AT	(-2298.13, 1928.36)	GP	41	0.24676	AT	(-3758.77, 1368.08)	GP
17	0.33471	AT	(-964.18, 1149.07)	GP	42	0.24365	AT	(-1409.54, 513.03)	GP
18	0.32806	AT	(-1174.62, 427.53)	GP	43	0.24331	AT	(-3031.09, 1750.00)	GP
19	0.32552	AT	(-578.51, 689.44)	GP	44	0.24151	AT	(-1879.39, 684.04)	GP
20	0.31092	AT	(-1732.05, 1000.00)	GP	45	0.23789	AT	(-4228.62, 1539.09)	GP
21	0.29736	AT	(-2165.06, 1250.00)	GP	46	0.23094	AT	(-2249.76, 2681.16)	GP
22	0.29695	AT	(-1285.58, 1532.09)	GP	47	0.23047	AT	(-4698.46, 1710.10)	GP
23	0.29288	AT	(-2681.16, 2249.76)	GP	48	0.22624	AT	(-1299.04, -750.00)	GP
24	0.28618	AT	(-1606.97, 1915.11)	GP	49	0.22455	AT	(-1250.00, -2165.06)	GP
25	0.28582	AT	(-1532.09, -1285.58)	GP	50	0.22375	AT	(-5168.31, 1881.11)	GP