FINAL
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

INCREASE OF CLINKER PRODUCTION CAPACITY FROM 2.0 MTPA TO 2.50 MTPA AND CHANGE OF PRODUCT MIX

JSW Cement

JSW Cement Ltd.

at

Bilakalagudur (V), Gadivemula (M),
Kurnool District, Andhra Pradesh.

GREEN BUSINESS

Prepared By

B.S. ENVI-TECH (P) LTD

Secunderabad - 500 017

NABET Accreditation No : NABET/EIA/1316/RA002
Cement plant sector - Accredited as Category "A"

October, 2015

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Of

JSW CEMENT PLANT
Bilakalagudur Village, Gadivemula Mandal,
Kurnool District, Andhra Pradesh

for

Expansion of clinker production capacity and change of production mix

from

2.0 MTPA to 2.50 MTPA AND 4.8 MTPA
(1.1 OPC + 3.7 PSC/GGBS)

Of

JSW Cement

JSW CEMENT Ltd.

EXECUTIVE SUMMARY

1.0 PROJECT DETAILS

The JSWCL Cement Plant is located at Bilakalagudur village, Gadivemula mandal, Kurnool District, Andhra Pradesh. The plant area is part of the Survey of India Toposheet No. 57/I/6 and is located between 15°40'15", - 15°41'24" North Latitude and 78°27'21"E, - 78°27'54" East Longitude with an average altitude of 260 m above MSL.

JSWCL proposes to increase the Clinker production from 2.0 to 2.5 MTPA through Optimization and de-bottlenecking of existing equipment & processes without affecting land, air and water environment. In addition to increase of clinker production, change of product mix is proposed keeping the production capacity of finished product at 4.8 MTPA.

Change in Product Mix is mainly from 1.10 MTPA – Ordinary Portland Cement (OPC) and 3.70 MTPA Portland Slag Cement (PSC) to 1.10 MTPA OPC and 3.70 MTPA PSC/ Ground Granulated Blast Furnace Slag (GGBS).

The Limestone requirement of the plant for 2.5 MTPA (total) Clinker production after expansion is 3.75 MTPA which is met from their Captive Mine located adjacent to the plant in 350.57 Ha.

The proposed expansion falls under Category - A project as per Environmental Impact Assessment (EIA) Notification SO 1533, of 14-09-2006 which necessitates obtaining the Environmental Clearance from Ministry of Environment and Forests (MoEF), New Delhi.

PROJECT COST

The capital cost of proposed expansion is nil as no changes in the machinery are required.

PRODUCTS AND CAPACITIES

PRODUCTION CAPACITY (MTPA)

Projects	Present Capacity	Proposed Expansion	Capacity After Expansion
Clinker Production (MTPA)	2.0	0.50	2.50
Cement Production (MTPA)	4.80 (1.10 OPC + 3.70 PSC)	Nil	4.80 (1.10 OPC+ 3.70 PSC/ GGBFS)*
Captive Power Plant (MW)	36 (18 x 2)**	-	36 (18 x 2)

**Total cement production not exceeding 4.80 MTPA; GGBFS is an intermediate product and now is included as intermediate/finished product*

***CPP capacity remains at 36 MW*

2.0 REQUIREMENTS OF PROJECT

LAND

Cement Plant is located in an area of 263.05 ha owned by JSWCL. No additional area will be required for expansion. No R&R is involved/ required .No Forest area is involved.

RAW MATERIAL

Raw Material	Quantity (in MTPA)		
	Before Expansion	After Expansion	Sourced from
Limestone	3.0	3.75	Captive Mines
Coal	0.30	0.375	Imported
Aluminous Laterite	0.015	0.019	Kerala
Flue Dust	0.062	0.077	JSW Steel, Bellary
Gypsum	0.10	0.125	Sterlite Industries, Tuticorin
Slag	2.4	3.7	JSW, Bellary

WATER

Water requirement of the cement plant is estimated to be about 4500 m^3/day. This requirement will be met from Ground water. No additional ground water is required for the proposed expansion.

POWER

The peak power consumption in the JSWCL Cement plant complex including mine is 40 MW. Total power requirement for the JSWCL cement plant complex is met from APCPDCL with a dedicated 132 kV overhead grid line. No additional power requirement is envisaged for the expansion project.

However JSWCL already received Environmental Clearance for the proposed 2x18 MW coal based captive power plant. And the required power will be tapped from CPP, once it is commissioned.

TRANSPORT

Major quantity of transportation for the cement plant is limestone and finished product. No additional material will be transported by road. Additional clinker produced from expansion will be dispatched to clinker grinding unit by rail. Hence no additional impact on surrounding villages or traffic on road will be there due to expansion.

3.0 PROCESS DESCRIPTION

Being a modern Cement Plant, JSW Cements has adopted State-of-art in line calciner (ILC) technology for manufacturing of the clinker. It is proposed to install bag-filter system for cleaning of the kiln flue gas and hence no gas - conditioning tower is envisaged. Various stages of cement manufacture are given below.

First time in India JSW Cement going for a Process bag Filter for such huge capacity to minimize the air pollution.

- Lime Stone Crushing
- Raw material grinding
- Blending of raw material
- Coal grinding and fine coal handling
- Preheating of Raw Meal in the six-stage precalciner string
- Clinkerisation in Kiln
- Clinker cooler and storage
- Cement grinding & packing

4.0 DESCRIPTION OF ENVIRONMENT

JSWCL has carried out Environmental Impact Assessment over a radial distance of 10 km around the plant during Summer season - 2015 covering the months of March to May' 15.

The predominant wind directions during these hours were from WSW-W sector accounting to about 45.55% of the time. Calm winds of less than 1.65 kmph prevailed for 2.74% of the time. Wind speed during this period was mostly above 15 kmph.

Ambient air quality of the study area has been assessed through a network of eight ambient air quality locations.

Results of the ambient air quality at all the locations were found to be well within the limits of National Ambient Air Quality (NAAQ) standards specified for Industrial, Residential, Rural and other areas.

Noise levels were recorded at eight locations within the core zone for spot noise levels and eight locations in the buffer zone for equivalent noise levels at each location.

The day equivalent noise levels were found to be high due to local activities in the villages. Noise levels recorded in the day and night time were found to be less than 68 dB (A).

Eight Ground water and two surface water sample were collected. The water quality of the samples showed compliance of all parameters with the drinking water standard of IS 10500.

Eight soil samples were analyzed to study the soil quality. The soil samples revealed low to medium fertility.

There are no wild life sanctuaries, national parks, elephant/tiger reserves within 10-km radius of the study area.

There are no endangered, threatened, rare plants species observed or recorded during study period. There are no industries within 10 km radius of the plant site.

Nearest Forests to the plant site are

- Gani RF – 3.1 km – SW

Socio economic status of the study area is found to be moderate with total population of about 1,87,006.

5.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 AIR ENVIRONMENT

The baseline air environment quality monitored during the study period of Summer, 2015 reflect the emissions from all the existing sources including emissions from other cement plant and mines. The additional emissions are mainly from the JSWCL cement plant due to additional clinker production of 0.5 MTPA.

The maximum cumulative ground level concentrations of PM10 from the Plant are about 3.28 $\mu g/m^3$.

5.2 AIR ENVIRONMENT – ENVIRONMENTAL MANAGEMENT PLAN

JSWCL will provide one Bag House, Three Bag filters and one ESP for main process units as given below:

POLLUTION CONTROL EQUIPMENT

Process Unit	Pollution Control Equipment
Cement plant	
Rawmill/Kiln	Bag house
Coal mill	Bag filter
Cooler	Bag house
Cement Mill	Bag filter
Slag Mill	Bag filter

5.3 NOISE ENVIRONMENT

The major noise generating sources are coal mill, Kiln/Raw mill, packers of cement plant and compressors. These sources are located far off from each other. Under any circumstances the noise level at

6.0 IDENTIFICATION OF HAZARDS IN HANDLING, PROCESSING AND STORAGE OF HAZARDOUS MATERIAL AND SAFETY SYSTEM PROVIDED TO MITIGATE THE RISK.

This stage is crucial to both on-site and off-site emergency planning and requires to systematically identify what emergencies could arise in the plant.

Most major hazard accidents come within the following categories:

Events pertaining to the manufacturing process of cement

The following areas are identified as hazard prone in case of cement plant where Disaster management plan is required.

- Handling of coal
- Handling of fine dust
- Handling of hot clinker
- Handling of cement
- Packing areas

The management system to be provided in cement plant and power plant to avoid/minimize the disasters are detailed below :

Alarm and Communication Systems

Communication is crucial factor in handling an emergency. It is the practice at many plants that any employee can raise an emergency alarm, so allowing the earliest possible action to be taken to control the situation.

HAZARDOUS WASTE MANAGEMENT

JSWCL 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 is disposed to the authorized vendors as per the Hazardous Wastes (Management and Handling) Amendment Rules.

Authorization for collection, treatment, storage, and disposal of hazardous wastes has been obtained from APPCB vide letter no APPCB/KNL/KNL/124/HO/CFO/2012-955 Dt: 03.01.2015.

7.0 EMERGENCY PREPAREDNESS PLAN

The purpose of the Emergency Preparedness Plan is to minimize the danger to life and property in the event of a Plant emergency. To achieve this goal, well-defined, clear-cut steps are to be taken. For the purpose of this Plan, emergency procedures will be implemented for fires and explosions, material spills or natural disasters which require immediate emergency action and/or evacuation of the Plant.

An important element of mitigation is emergency planning, i.e. recognizing that accidents are possible, assessing the consequences of such accidents and deciding on the emergency procedures, both onsite and offsite, that would need to be implemented in the event of an emergency.

OBJECTIVES

The overall objectives of an emergency plan are:

- To localize the emergency and, if possible, eliminate it; and
- To minimize the effects of the accident on people and property.

8.0 ISSUES RAISED DURING PUBLIC HEARING (IF APPLICABLE) AND RESPONSE GIVEN

Public Hearing for the proposed expansion of the project is exempted.

9.0 CSR PLAN WITH PROPOSED EXPENDITURE.

JSWCL is continuously contributing toward welfare & community development activities under its CSR programmes not only at villages where it is operating its units but also in other parts of the Telangana and Andhra Pradesh states.

PROPOSED CSR BUDGET

JSW has incurred an amount of Rs 250 lakhs for implementing various CSR activities during the year 2014-15

JSW has budgeted an amount of Rs 10756 lakhs for implementing various CSR activities during the year 2015-20.

10.0 OCCUPATIONAL HEALTH MEASURES

All the plant operations are carried out strictly in accordance with the Industrial Act, Rules & regulations and maintaining the supervision standard high by competent persons.

All the persons undergo preplacement examination at the time of joining for the following test.

- General physical tests
- Audiometric tests
- Full chest, X-ray, Lung function tests, Spirometric tests

JSWCL has an established a dispensary. The medicines are being provided free of cost to the patients.

The first aid box is made available at the plant for immediate treatment.

Employees will be monitored for occupational diseases by conducting the following tests

- Periodic medical examination – yearly
- Lung function test – Yearly, those who are exposed to dust
- Audiometry – yearly
- Chest X-ray once in five years
- Eye test

First aid training is imparted to the selected employees of all departments regularly.

JSWCL is carrying out the Occupational Health survey for the all the workers including the contract and sub-contract workers. The fund allocation is part of the occupational health budget which is about 50 Lakhs per year.

11.0 ENVIRONMENTAL MONITORING PROGRAMME

A dedicated Environmental cell was established to monitor and analyze the various environmental components of the cement plant.

Post project monitoring of various environmental components is being carried out as per the norms of APPCB, MoEF and CPCB

12.0 ENVIRONMENTAL MANAGEMENT PLAN

As part of Environment management, we have so far invested around Rs. 34.12 Crores till 31.03.2015 (including slag unit and mines). We also spent Rs. 120 Lakhs as recurring expenditure towards environment and pollution control during 2014-15.

CHAPTER - 1

INTRODUCTION

CHAPTER – 1 : INTRODUCTION

1.1 PURPOSE OF THE REPORT

M/S. JSW CEMENT LIMITED (JSWCL) is operating a 2.0Million Tonnes Per Annum (MTPA) Clinker & 4.8 MTPA Cement manufacturing unit at Bilakalagudur Village, Gadivemula Mandal, Kurnool District, Andhra Pradesh.

JSWCL proposes to increase the Clinker production capacity of cement plant from 2.0 to 2.5 MTPA through Optimization and de-bottlenecking of existing equipment & processes not affecting land, air and water environment. In addition to increase of clinker production, change of product mix is proposed keeping the production capacity of finished product at 4.8 MTPA.

Change in Product Mix is mainly from 1.10 MTPA – Ordinary Portland cement (OPC) and 3.70 MTPA Portland Slag Cement (PSC) to 1.10 MTPA OPC and 3.70 MTPA PSC/ Ground Granulated Blast Furnace Slag (GGBS)

The proposed expansion falls under Category - A project as per Environmental Impact Assessment (EIA) Notification SO 1533, of 14-09-2006 which necessitates obtaining the Environmental Clearance from Ministry of Environment and Forests (MoEF), New Delhi.

As per the requirement of EIA notification, JSWCL had submitted the necessary application to MoEF for approval of Terms of Reference (TOR). The Terms of Reference was approved by MoEF for carrying out the Environmental Impact Assessment study vide MoEF letter no J-11011/889/2007 IA.II(I) dated 22nd October, 2014 and Amendment letter vide MoEF letter no. J-11011/889/2007 IA.II (I) dated 12th June, 2015 (enclosed as **Annexure – 1A**). The project was exempted from Public Hearing by MoEF as per approved TOR. Compliance of Terms of Reference issued by MoEF & CC is enclosed as **Annexure – 1 B.**

Subject report is Final EIA Report incorporating the Terms of Reference issued by MoEF prepared by M/s B S Envi-Tech (P) Ltd, Accredited by NABET, QCI under certificate no : NABET/EIA/1316/RA002. Cement plant sector accreditation is as

Category "A". Copy of NABET accreditation certificate is enclosed as **Annexure – 1 C**

1.2 JSW CEMENT

India, one of the fastest growing economies in the world, is witnessing an unprecedented growth in infrastructure. JSW Cement believes that this growth needs to be sustainable and is consciously contributing to creating a self-reliant India by manufacturing the building blocks of the Indian development story with its world-class cement.

JSW entered the cement market in 2009 with a vision to ensure a sustainable future for the country by producing eco-friendly cement, using industrial by-products such as slag. Its plants at Vijayanagar in Karnataka, Nandyal in Andhra Pradesh and Dolvi in Maharashtra utilise slag from the JSW Steel plants to produce green cement. By converting industrial by-product into a useful product, it has reduced the carbon footprint of the Group. Not only does this ensure optimal utilisation of resources but also saves the ecological risk of industrial by-product dumping. Though, JSW Cement is a relatively late entrant into the industry but with a capacity to produce over 6 million tons per year, it is fast becoming a force to reckon with.

Not only does JSW Cement manufacture one of the most eco-friendly cements in India, but it also engineers its products for superior strength and durability. Its flagship plant in Nandyal uses world-class technology (including the advanced Combi-Finish Mode Roller Press Circuit and automated loading system) to manufacture cement. It has won prestigious award for its energy-saving processes.

JSW Cement produces three varieties of cements: Portland Slag Cement (PSC), Ordinary Portland Cement (OPC), and Ground Granulated Blast Furnace Slag (GGBS). With key markets in Telangana, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala, Maharashtra, Orissa, and Goa, JSWCL has been delivering high-quality product to several prestigious and large infrastructural projects in the southern and western regions of the country.

Vision, Mission & Core Values

JSWCL envisages a self-reliant India. Its aim is to become a global leader in the cement sector and to make India an infrastructural force to reckon with. It is committed to its vision and values.

Vision	:	Global recognition for Quality and Efficiency while nurturing Nature and Society.
Mission	:	Supporting India's growth in core economic sectors with speed and innovation.
Core Values	:	Transparency, Strive for Excellence, Dynamism, Passion for learning

1.2.1 JSW CEMENT LTD - NANDYALA, KURNOOL UNIT

The flagship Nandyal plant of JSWCL is designed to produce Clinker ~ 2.0 MTPA and Cement ~ 4.80 MTPA. It has state-of-the-art technology sourced from global vendors. JSW Cement has commissioned a Green Field and the State of Art Technology cement Production Unit at Bilakalaguduru village near Kurnool District, Andhra Pradesh. The main objective is to complete utilization of Blast Furnace (BF) Slag generated by JSW Steel Ltd This is a giant step by the company towards providing a product that is durable and at the same time eco-friendly.

VIEW OF PLANT SITE

The plant is notably environment friendly and also one of the most energy-efficient cement plants in India. By using blast furnace slag as raw material, the plant has dramatically reduced its consumption of limestone, a natural resource.

Unique features

- First cement plant in India with Combi-Comflex technology
- First plant with multiple systems to control air and dust pollution
- Unique automatic packing and truck loading system that cuts down on air pollution
- Consumes half the amount of limestone required by conventional cement plants
- Reduces pollution and wastage by utilising slag as a raw material
- A net water-surplus unit
- Green processes that have earned several prestigious awards

Product portfolio

The Prime objective of Nandyal Cement works is for making Portland Slag Cement (PSC), which is mix of Blast Furnace Slag with Ordinary Portland Cement, it also Produces Ground Granulated Blast Furnace Slag (GGBS) and Ordinary Portland Cement (OPC) of 43, 53 Gr.

The quality of the GGBS produced by JSWCL is superior due to presence of high glass content (>90%) and higher fineness. Hence, JSWCL PSC is meeting strength as well as durability requirements beyond customer expectations. PSC constitutes the most successful and widely used variety of slag cements throughout the world.

No Litigation case is pending against the unit.

1.3 PRESENT PROPOSAL

JSWCL proposes to increase the Clinker production from 2.0 to 2.5 MTPA through Optimization and de-bottlenecking of existing equipment & processes without affecting land, air and water environment.

Limestone requirement of the plant is met from their Captive Mine located adjacent to the plant in 350.57 Ha. JSWCL has obtained

Environmental Clearances for both the Cement Plant (along with 2 X 18 MW Coal based Captive Power plant) and Limestone mine are enclosed as **Annexure- 1D.** Caplive Power Plant is yet to be commissioned. EC validity for the same was extended up to the year 2018.

The limestone requirement for 2.5 MTPA (total) Clinker production after expansion is 3.75 MTPA. JSWCL has obtained necessary clearances for limestone production of 7.0 MTPA from Captive Limestone Mines.

As per the market conditions prevailing, with demand for Ground slag for Ready Mix Plants, JSWCL proposes change of product mix keeping the production capacity of finished product at 4.8 MTPA which is mainly to manufacture GGBS, as a part/full component of PSC. Change in Product Mix is mainly from 1.10 MTPA – Ordinary Portland Cement (OPC) and 3.70 MTPA Portland Slag Cement (PSC) to 1.10 MTPA OPC and 3.70 MTPA PSC/ Ground Granulated Blast Furnace Slag (GGBS) as per the following table.

PRODUCTION CAPACITY (MTPA)

Projects	Present Capacity	Proposed Expansion	Capacity After Expansion
Clinker Production (MTPA)	2.0	0.50	2.50
Cement Production (MTPA)	4.80 (1.10 OPC + 3.70 PSC)	Nil	4.80 (1.1 OPC + 3.7 PSC/GGBS)
Captive Power Pland (MW)	36 (18 x 2)**	-	36 (18 x 2)

**Total cement production not exceeding 4.80 MTPA; (GGBS is an intermediate product and now is included as intermediate/finished product*

Certified Compliance of the earlier Environmental Clearance issued by Regional Office, MoEF, Bangalore is enclosed as **Annexure – 1E.** Compliance of Consent to Operate for the ongoing existing operation of the project from SPCB is enclosed as **Annexure – 1F.**

1.4 PROJECT COST

The capital cost of proposed expansion is nil as no changes in the machinery are required.

1.5 LOCATION DETAILS

The JSWCL Cement Plant is located at Bilakalagudur village, Gadivemula mandal, Kurnool District, Andhra Pradesh. Average altitude of plant site is about 260 m above mean sea level and is located between 15°40'15" - 15°41'24"North Latitude and 78°27'21" - 78°27'54" East Longitude. The plant is part of Survey of India Topo sheet No. 57/I/6 (Scale: 1:50000).**Fig – 1.1** shows the location map of the Plant Site.

Nearest railway line connecting Kurnool – Nandyal of South Central Railway line is located at a distance of 24.0 km to Southern direction from the site. Kurnool is major town located at a distance of 48.0 km in WNW. Key map showing the location of various features around the Plant site is shown in **Fig – 1.2.**

The National Highway (NH-18) connecting Kurnool – Nandyal is located at a distance of about 22.4 km in SW direction.

The State Highway (SH-27) connecting Atmakur – Velugodu is located at a distance of about 10.5 km in Eastern direction, The nearest railway station is located at Nandyal RS which 24.0km in Southern direction.

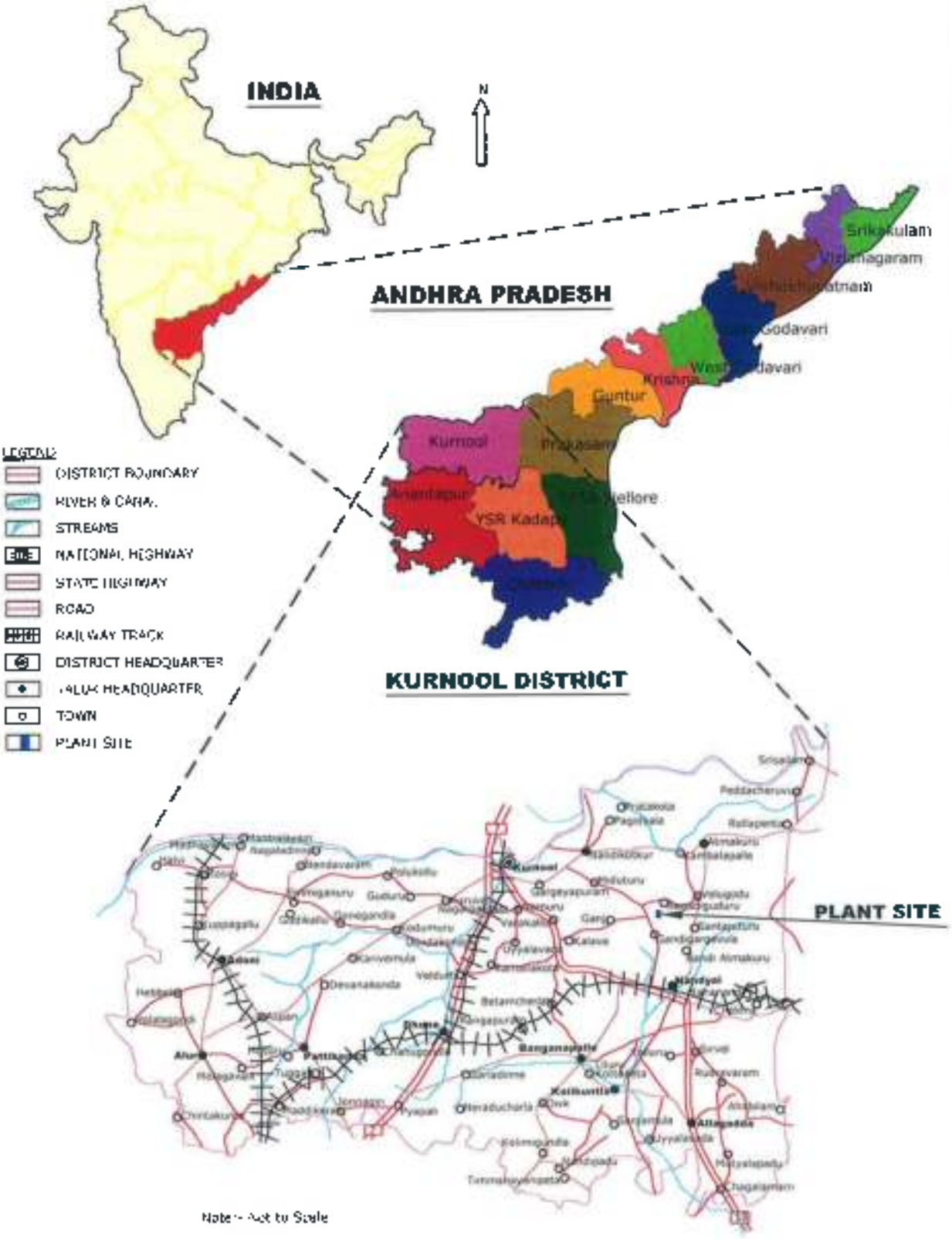
There are no wild life sanctuaries, national parks, elephant/tiger reserves within 10km radius of the study area.

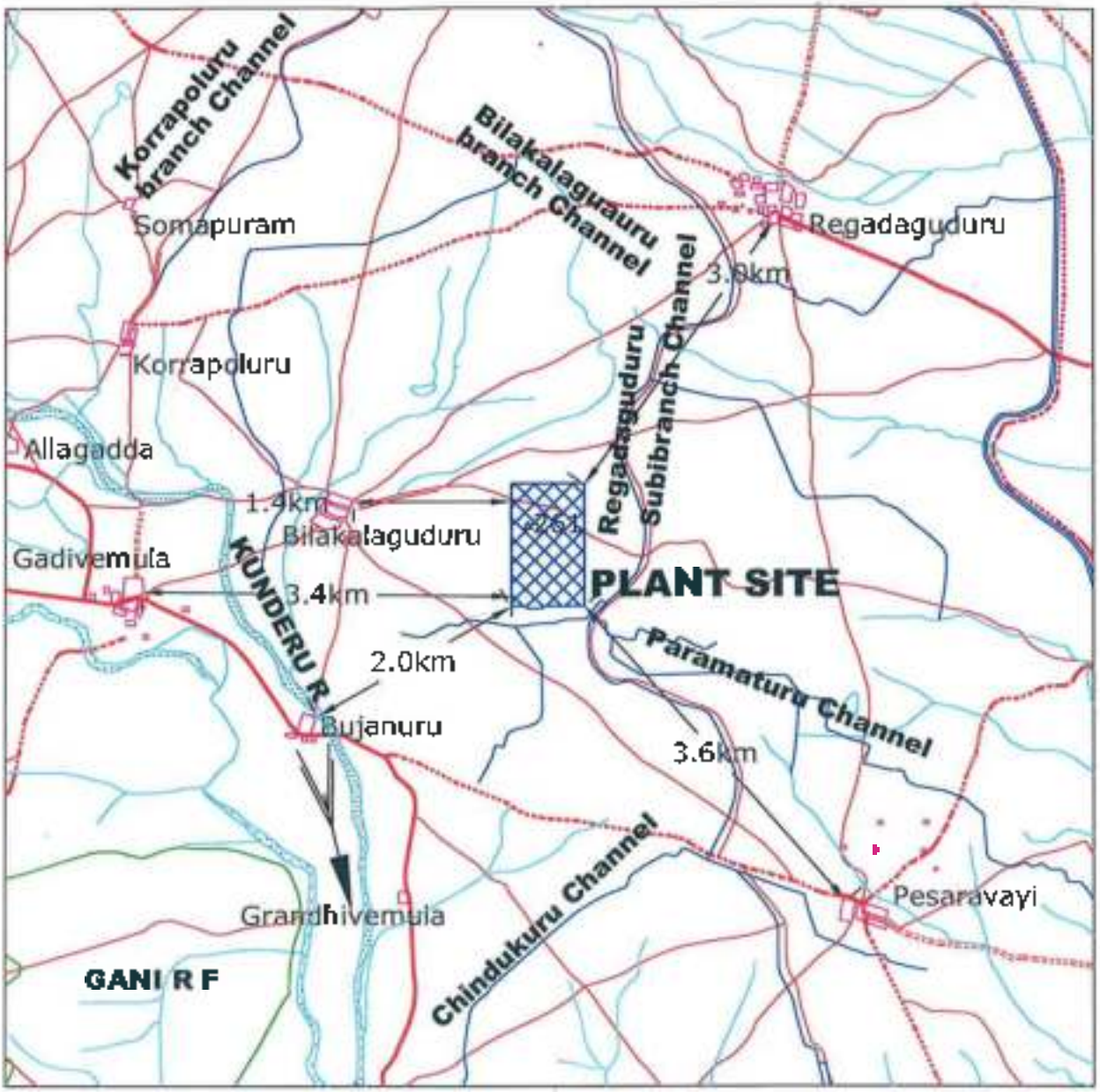
Nearest Settlements to the Plant Site are:

- Bilakalaguduru – 1.4 km – W
- Regadaguduru –3.0 km – NE
- Pesaravayi – 3.6 km – SE
- Bujanuru – 2.0 km – WSW
- Gadivemula – 3.4 km - W

Nearest Forest to Plant Site is Gani RF located at 3.1 km in SW direction

FIG - 1.1
LOCATION MAP





LEGEND

- ROADS
- STREAMS/ TANKS
- FOREST
- CANALS
- RIVER
- SETTLEMENTS
- SPOT HEIGHT
- PLANT SITE

SCALE

0 1 2km

FIG - 1.2

CLIENT : **M/s. JSW CEMENT LIMITED**

PROJECT : **2.8 MTPA CLINKER PRODUCTION & 4.6 MTPA OPC/PSC/GGBS PRODUCTION**

Bilakalaguduru Village, Gadivemula Mandal, Kurnool District, Andhra Pradesh.

TITLE : **KEY MAP**

PREPARED BY

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

SECUNDERABAD

No industries are located within 10 km radius. The site is not falling in Critically Polluted Areas listed by MoEF.

Coordinates of the plant site on topo sheet are shown in **Fig – 1.3**

Salient features of Plant Site are given in **Table – 1.1** and **Fig-1.4** shows the study area of 10 km radius around the Plant Site. A site location map on Survey of India topo sheet of 1:50,000 scale on A3 sheet with next 10 km of terrains i.e. circle of 10 km and further 10 km with longitude/latitude is shown as **Fig – 1.5.**The 3 dimensional view and the Digital Elevation Model of the study area from different directions are shown in **Fig - 1.6.**

Google map-Earth down loaded of the project site is enclosed as **Fig – 1.7.**

1.6 RESOURCES AVAILABILITY

1.6.1 RAW MATERIALS

The major raw material for manufacture of cement is Limestone. Limestone will be sourced from the Captive Limestone Mine. The requirement of raw material is given below

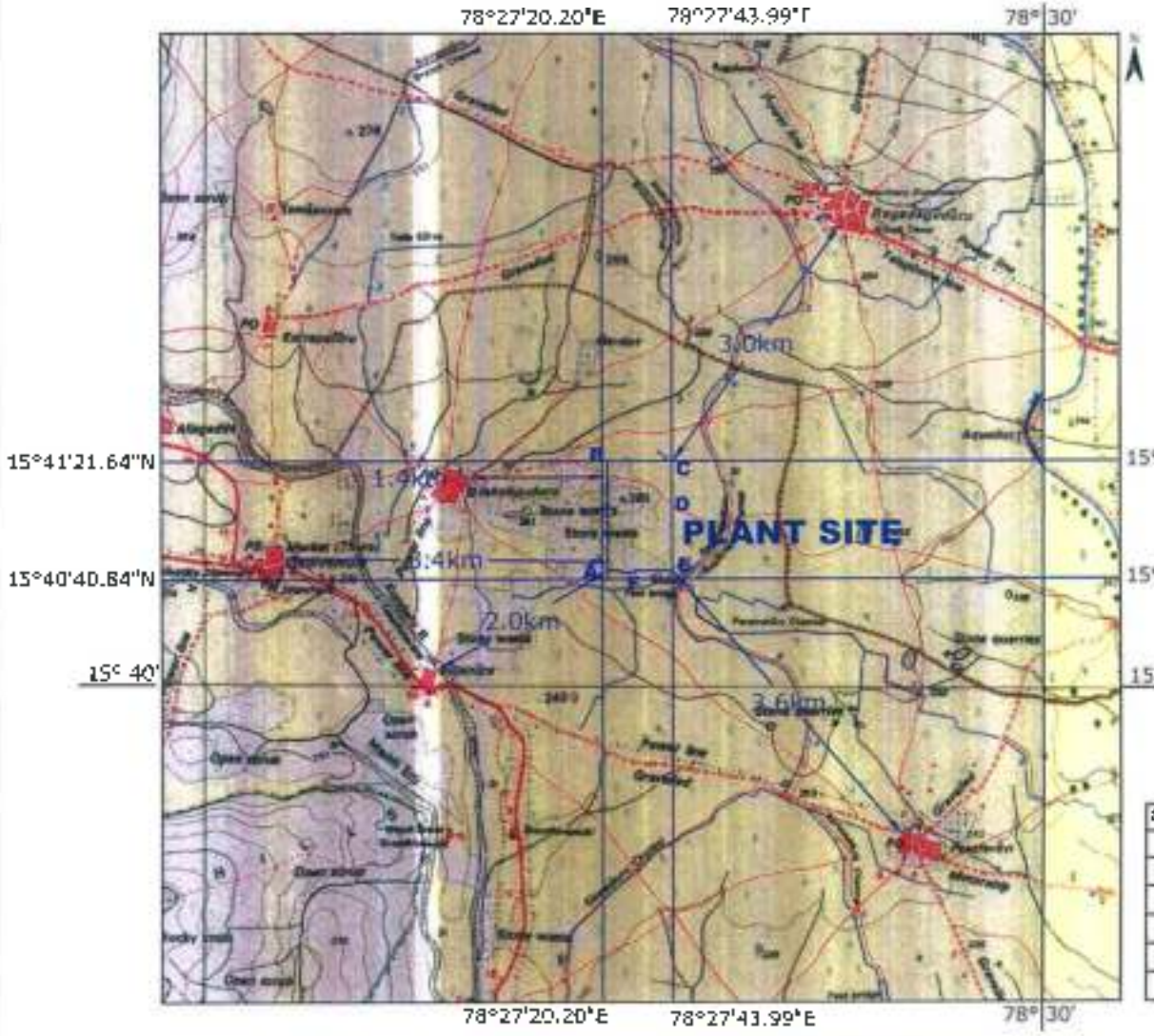
Raw Material Requirement

Raw Material	Quantity (in MTPA)			
	Before Expansion (present)	After Expansion (proposed)	Sourced from	Mode of Transport
Limestone	3.0	3.75	Captive Mines	Closed Belt Conveyor
Coal	0.30	0.375	Imported	Road/ Railway line being laid
Aluminous Laterite	0.015	0.019	Kerala	Road
Flue Dust	0.062	0.077	JSW Steel, Bellary	Road
Gypsum	0.10	0.125	Cochin/Imported	Road
Slag	2.4	3.7	JSW Steel, Bellary	Road
**Power plant – coal , MTPA		Imported coal - 0.18	Imported	Rail

** - Power Plant not yet established

FIG - 1.3

CO-ORDINATES OF THE PLANT SITE

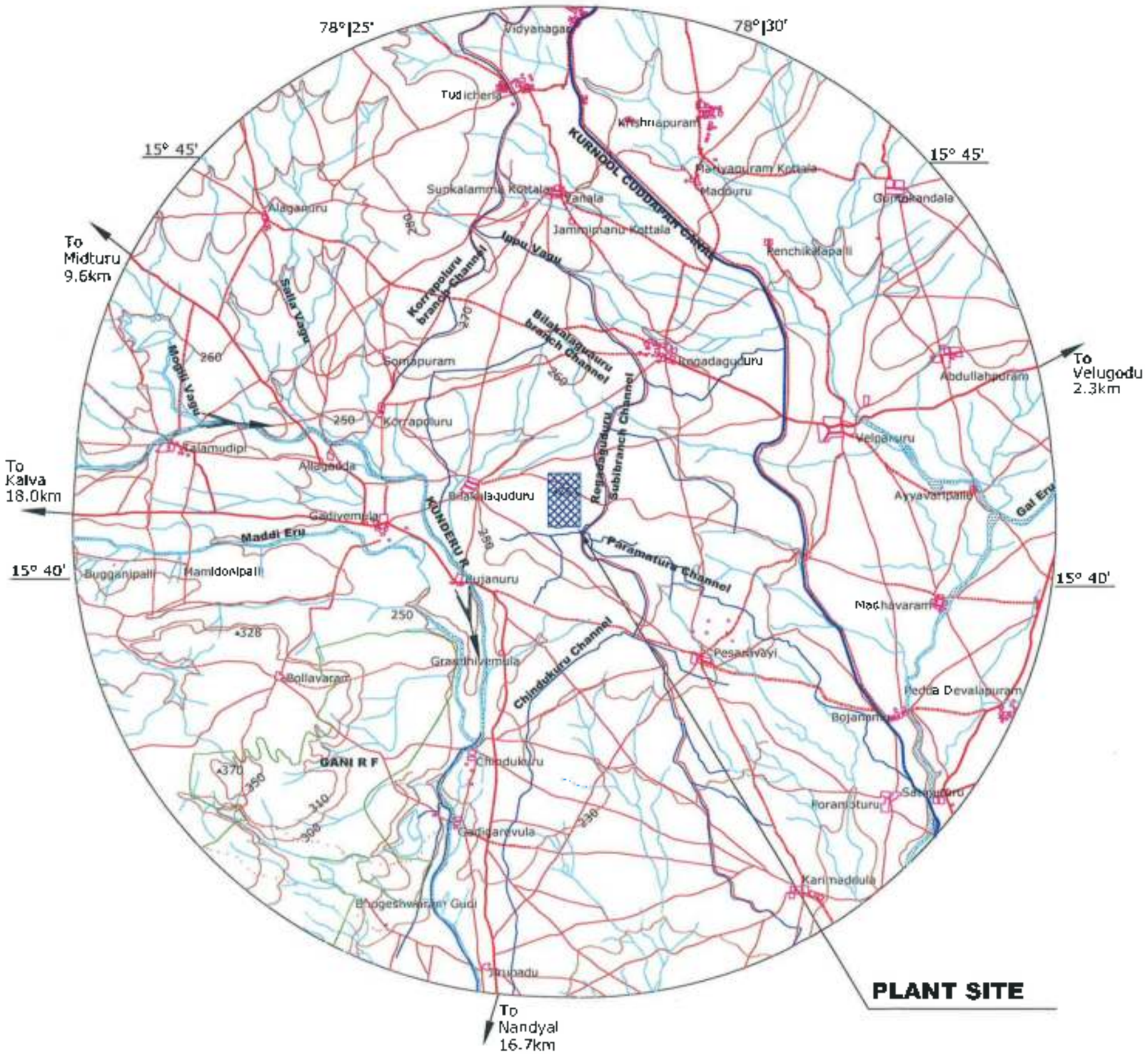


S.No.	LATITUDE N°	LONGITUDE E°
A	15°40'40.00"N	78°27'20.20"E
B	15°41'21.64"N	78°27'21.00"E
C	15°41'21.08"N	78°27'43.73"E
D	15°41'[illegible]"N	78°27'43.99"E
E	15°40'43.10"N	78°27'41.85"E
F	15°40'40.84"N	78°27'27.95"E

TABLE – 1.1
SALIENT FEATURES OF THE CEMENT PLANT SITE

Feature	Details
Altitude	260 m above msl
Latitude	15°40'15" to N 15°41'24" N
Longitude	78°27'21" to E 78°27'54" E
Village, Tehsil, District, State	Bilakalaguduru Village, GadivemulaMandal, Kurnool District of Andhra Pradesh.
Max. Temp., °C	45.6
Min. Temp. °C	16
Relative Humidity, %	25-77
Annual rainfall,mm	725.9
IMD Station	Kurnool
Topography	Plain
Soil Type	Black Cotton Soil
Nearest water bodies	Kundu River – 2.2 km - WSW Kurnool Cuddapah (KC) Canal – 3.8 km – E Gal Eru – 9.0 km - ESE
Nearest National Highway	The National Highway (NH-18) connecting Kurnool – Nandyal – 22.4 km – SW The State Highway (SH-27) connecting Atmakur – Velugodu – 10.5 km – E
Nearest Railway station	Nandyal RS – 24.0 km - S
Nearest Industries	None within 10 km Radius
Nearest Villages	Bilakalaguduru – 1.4 km – W Regadaguduru –3.0 km – NE Pesaravayi – 3.6 km – SE Bujanuru – 2.0 km – WSW Gadivemula – 3.4 km - W
Nearest Town	Kurnool – 48.0 km - WNW
District Head Quarter	Kurnool – 48.0 km - WNW
Nearest Port Area	Krishnapatnam Port – 237.6 km – SE
Inter State Boundary	Andhra Pradesh – Telangana – 91.0 km – NW
Nearest Air port	Hyderabad (Shamshabad) – 172 km – N
Nearest Forest	Gani RF – 3.1 km – SW
Historical places	None within 10 km radius

*all distances mentioned in the above table are aerial distances



LEGEND

- ROADS
- STREAMS/ TANKS
- CONTOURS
- FOREST
- CANALS
- RIVER
- SETTLEMENTS
- SPOT HEIGHT
- PLANT SITE

N

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57 I/3	57 I/7	57 I/11

SCALE

0 3 6 km

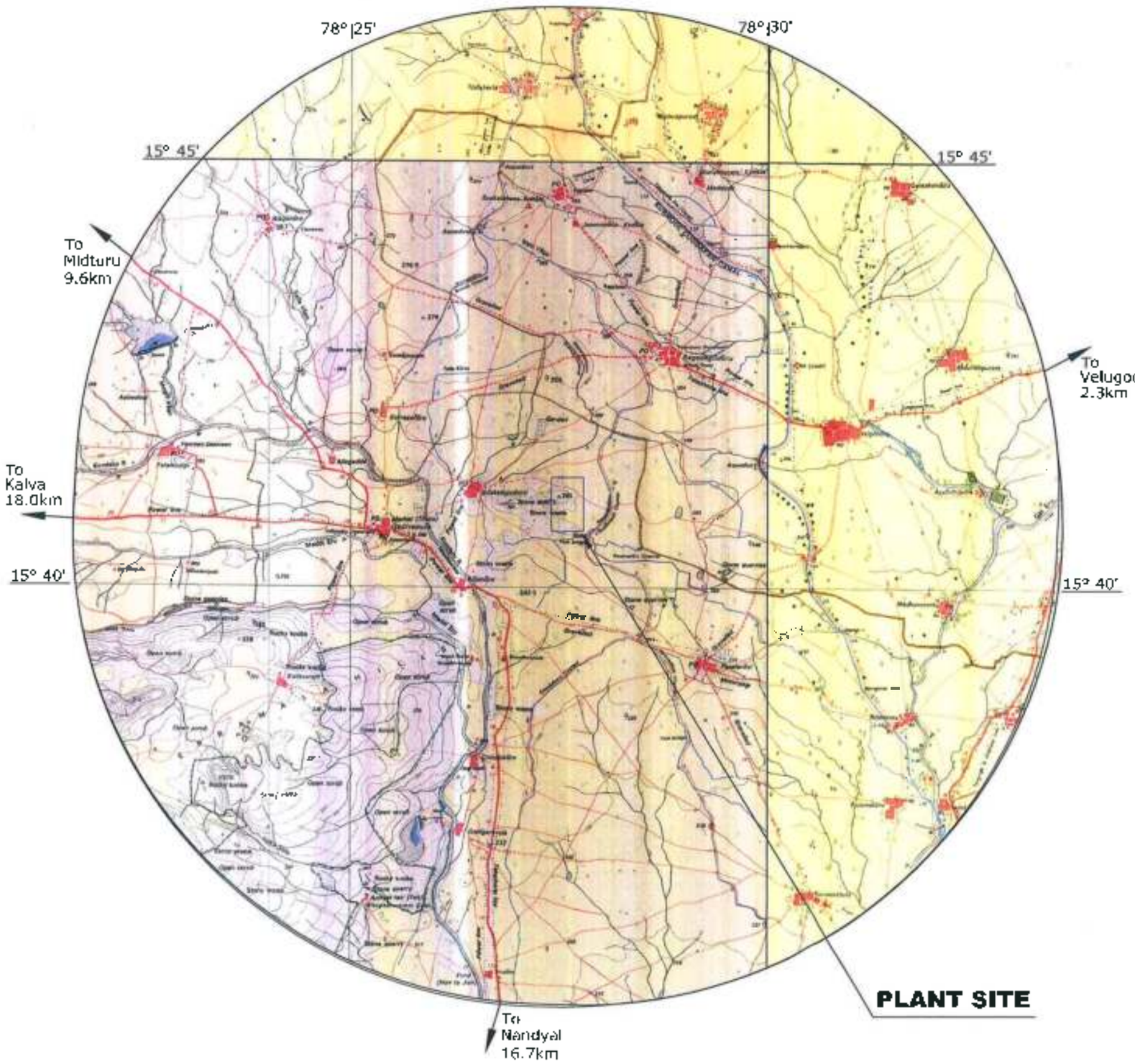
FIG - 1.4

CLIENT : **M/s. JSW CEMENT LIMITED**

PROJECT : **2.5 MTPA CLINKER PRODUCTION & 4.8 MTPA OPC/PSC/GGBS PRODUCTION**
Bilakaluguduru Village, Gadivemula Mandal, Kurnool District, Andhra Pradesh

TITLE : **TOPOGRAPHICAL MAP SHOWING 10 km RADIUS**

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



N

LEGEND

PLANT SITE

REFER TO THIS MAP AS:- 1:50,000
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SCALE

0 3 6 km

FIG - 1.5

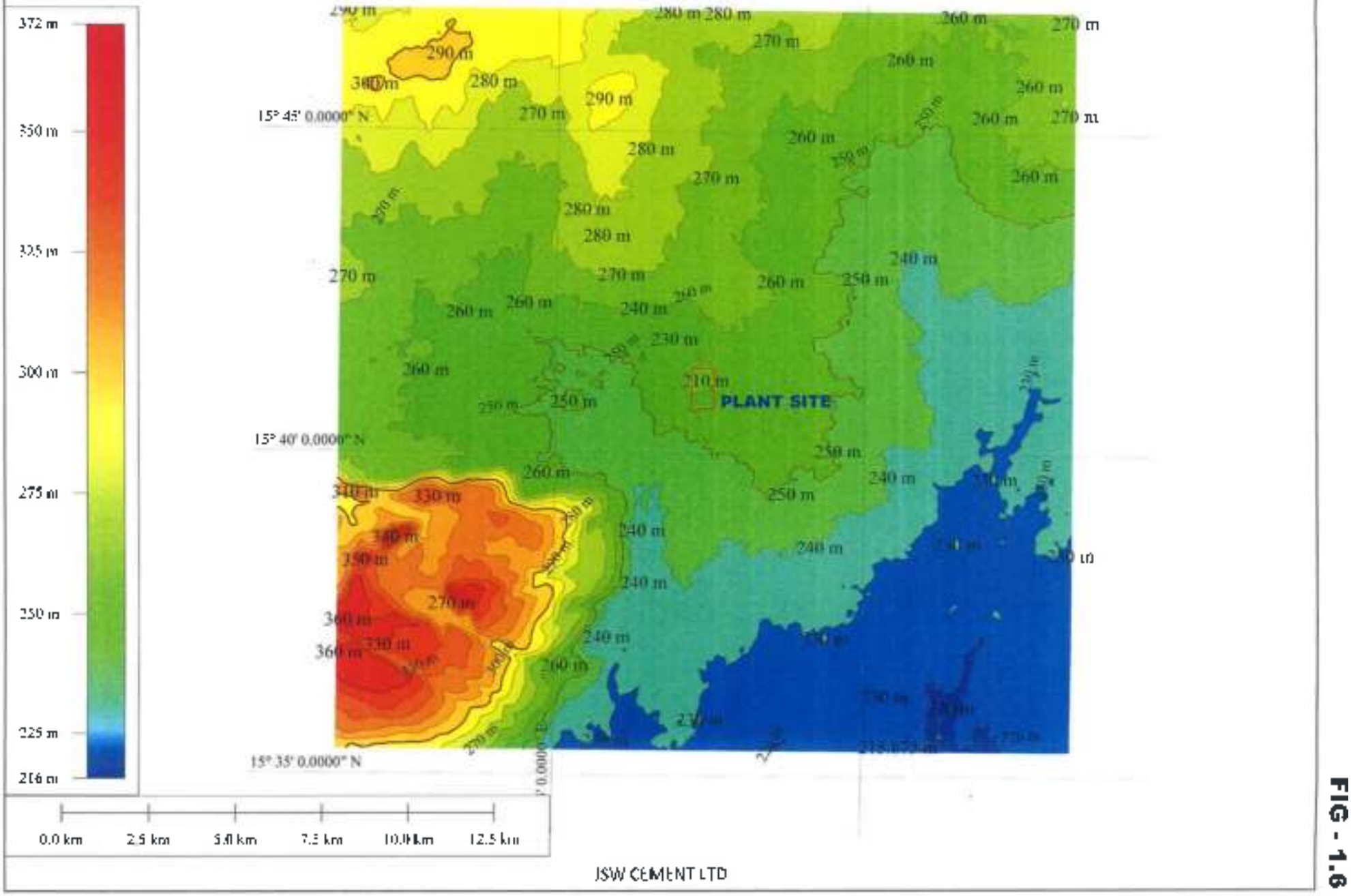
CLIENT : **M/s. JSW CEMENT LIMITED**

PROJECT : **2.5 MTPA CLINKER PRODUCTION**
&
4.8 MTPA OPC/PSC/GGBS PRODUCTION
Billakalagudur Village, Gadivemula Mandal, Kurnool District, Andhra Pradesh

TITLE : **TOPOGRAPHICAL MAP**
SHOWING 10 km RADIUS

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

DIGITAL ELEVATION MODEL



JSW CEMENT LTD

FIG - 1.6

FIG - 1.7

GOOGLE EARTH IMAGERY SHOWING THE PLANT SITE

Clinker is stored in the closed stock pile (CSP) and gypsum in covered sheds. Finished product (Cement) & Clinker is transported by road and railway from Panyam and Nandyal railway sidings. It is ensured that all the trucks employed will be "Environmentally Compliant".

All stockpiles are provided with paved floors to avoid leaching of materials to ground water.

Coal is imported to meet the requirement. Hence there is no coal linkage.

Characteristics of coal

Characteristics (average) of coal used in the cement plant are given below

CHARACTERISTICS OF COAL

Average	Unit	SA	Russian	Indonesian	petcoke
Calorific Value	Kcal/Kg	6148	5826	6286	8186
Sulphur as S	%	0.33	0.8	0.65	5.8
Ash		15.09	15.06	15.00	1.02

1.6.2 LAND

Cement Plant is located in an area of 263.05 Ha owned by JSWCL. No additional area will be required for expansion. No R&R is involved.

There are no Critically Polluted Area(s) or Eco-sensitive area(s) found within the study area. No Forest area is involved.

Photographs of the plant area are shown in **Fig – 1.8**.

1.6.3 WATER

The present water consumption of the plant is about 4500 m^3/day and is met from the ground. No additional ground water is required for the proposed expansion.

Ground water drawl permission obtained from Central Ground Water Authority vide letter No 21-4(15)/SR/CGWA/2008-860 dated 23.06.2008 is enclosed as **Annexure – 1G**. NOC since 30.12.2014 has

FIG – 1.8

PHOTOGRAPHS OF THE PLANT AREA

been granted by State Groundwater Department, AP. vide letter No. Lr.Rc. No. 226/D1/2014, dated 30.12.2014

JSWCL in consultation with the Central Ground Water Board, Southern Region, Hyderabad has implemented ground water recharge measures for augmenting the ground water resources of the area.

1.6.4 POWER

The peak power consumption in the JSWCL Cement plant complex including mine is 40 MW. Total power requirement for the JSWCL cement plant complex is met from APCPDCL with a dedicated 132 kV overhead grid line. No additional power requirement is envisaged for the expansion project.

However JSWCL already received Environmental Clearance for the proposed 2x18 MW coal based captive power plant. And the required power will be tapped from CPP, once it is commissioned.

1.6.5 INFRASTRUCTURE

No additional infrastructure is required for increase of the clinker production from 2.0 to 2.5 MTPA.

1.6.6 MANPOWER

The existing manpower working in plant is 800. No additional manpower is required.

1.7 IMPORTANCE OF THE PROJECT TO THE REGION

Many technological developments have taken place in cement production enabling cost reduction and large volume production. The wet kilns of the seventies were replaced by dry kilns, reducing fuel cost by 30 percent. Further improvement in thermal efficiency was obtained by installation of pre-heater and pre-calciner. Finally computerization and quality control of raw material resulted in optimum usage of fuel and power.

For decades Portland cement has been the widely used and best known cement type all over the world. However, as a result of urge for

saving energy and disposing of the waste materials from many industries, other cement types and binders have been developed. The most important raw material is flyash as a byproduct from electricity production in coal fired power plants. This by-product earlier was seen as waste. In the developed technical world, these products were renamed from waste to by-product and are used as raw material in producing the blended cements. 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 – No further land needs to be acquired
- Availability of existing infrastructure.

Cement industry is vital for the development of infrastructure all over the world as no other material is likely to be its substitute in the near future. Infrastructure and industrial activity, real estate business and investment in core sectors mainly drive the demand for cement. Some emerging markets for cement demand are concrete roads, concrete canal lining and rural construction (housing). Over 65% demand for cement arises from construction sector.

The Working Group on Cement Industry constituted by the Planning Commission for the 12th Five-Year Plan period has projected a demand growth at the rate of 10.75% per annum during the plan period at an expected 9% GDP growth rate. The Working Group expects that the additional installed capacity requirement would be 139.7 million tonnes by 2017 and 1035.3 million tonnes by 2027. Based on the demand growth projection the consumption of cement by the end of the 12th five year plan would be between 366.9 million tonnes and 397.4 million tonnes assuming growth rates of 9.75% to 10.75% during the Plan period.

Availability of cement grade limestone in adequate quantity has been one of the major factors for selecting the location of cement plant. In India, limestone of cement grade quality is not evenly distributed, but occurs in large clustered deposits mainly in few states viz. Andhra Pradesh, Madhya Pradesh, Rajasthan, Gujarat, Tamil Nadu, Karnataka and Maharashtra. The total limestone deposit in the country is estimated to be 90 billion tones, with Andhra Pradesh enjoying the largest share of 34%, followed by Karnataka, Gujarat,

Madhya Pradesh and Rajasthan, with respective shares of 13%, 13%, 8%, and 6.5%.

The result is that the majority of cement plants are located in the states despite markets not being in proximity or favorably placed in relation to the location of the plant. Total decontrol on price and distribution of cement was introduced by the Government in March 1989, and all subsidies relating to freight equalization were withdrawn. Consequently, the cost incurred on cement transportation has now become an important factor for deciding on the location of the cement plant.

In the Northern region, the major consumer is Uttar Pradesh with a highest growth rate of 31%. In the Eastern region, the major consumer is West Bengal, but the highest growth rate of 38% has been achieved by North Eastern States. In the Western region, although Madhya Pradesh is the highest producer of cement, the total consumption is highest in Maharashtra with the growth rate of 19%. In the Southern region, while the highest consumption takes place in Tamil Nadu followed by Andhra Pradesh, Karnataka and Kerala, the growth rate in consumption has increased by 21% in Andhra Pradesh, 17% in Kerala, 14% and 11% in Karnataka and Tamil Nadu respectively.

Location of cement plants is restricted to availability of limestone deposits. Southern India including adjoining states such as Maharashtra, Orissa etc. is fed through three main limestone-bearing states viz. Andhra Pradesh, Tamilnadu and Karnataka. Kerala and Maharashtra are deficit states in terms of availability of cement and shortfall in supply is met from neighbouring states viz. Andhra Pradesh and Tamilnadu.

CHAPTER - 2

PROJECT DESCRIPTION

CHAPTER – 2:PROJECT DESCRIPTION

2.1 CEMENT PLANT – PRODUCTION DETAILS

JSWCL proposes to increase the Clinker production from 2.0 to 2.5 MTPA through Optimization and de-bottlenecking of existing equipment & processes. In addition to increase of clinker production, change of product mix is also proposed keeping the production capacity of finished product at 4.8 MTPA. Change in Product Mix is mainly from 1.10 MTPA – Ordinary Portland Cement (OPC) and 3.70 MTPA Portland Slag Cement (PSC) to 1.10 MTPA OPC and 3.70 MTPA PSC/ Ground Granulated Blast Furnace Slag (GGBS).

2.2 LAYOUT OF CEMENT PLANT COMPLEX

The Cement Plant complex is located in an area of 263.05Ha. Layout of the existing cement plant along with colony is shown in **Fig - 2.1**. The land break up is given below:

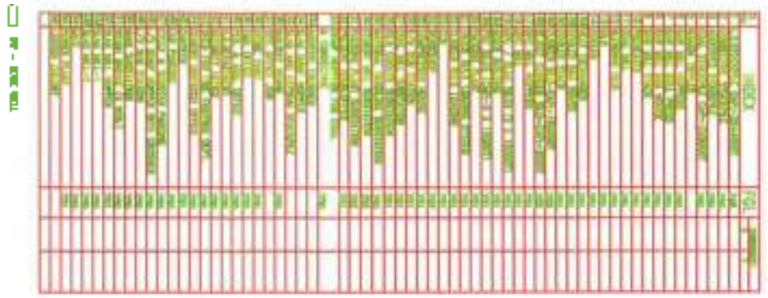
LAND BREAKUP

		Area (Ha)
CEMENT PLANT	Built up area	21.67
	Operated (for future expansion)	96.76
	Road area	3.43
	Proposed CPP	20.24
	Area of Plantation	95.95
	Proposed colony	25.0
	TOTAL AREA	**263.05**

2.3 RAW MATERIAL REQUIREMENT

The major raw material for manufacture of cement is Limestone. The captive limestone deposit is located in the vicinity of the Cement plant and Limestone is conveyed through closed belt Conveyor.

To meet the limestone requirement of Cement Plant after expansion project, the limestone will be additionally tapped from the existing mine.



LAND
SHRUBS / BUSHES
DECIDUOUS TREES
PALM

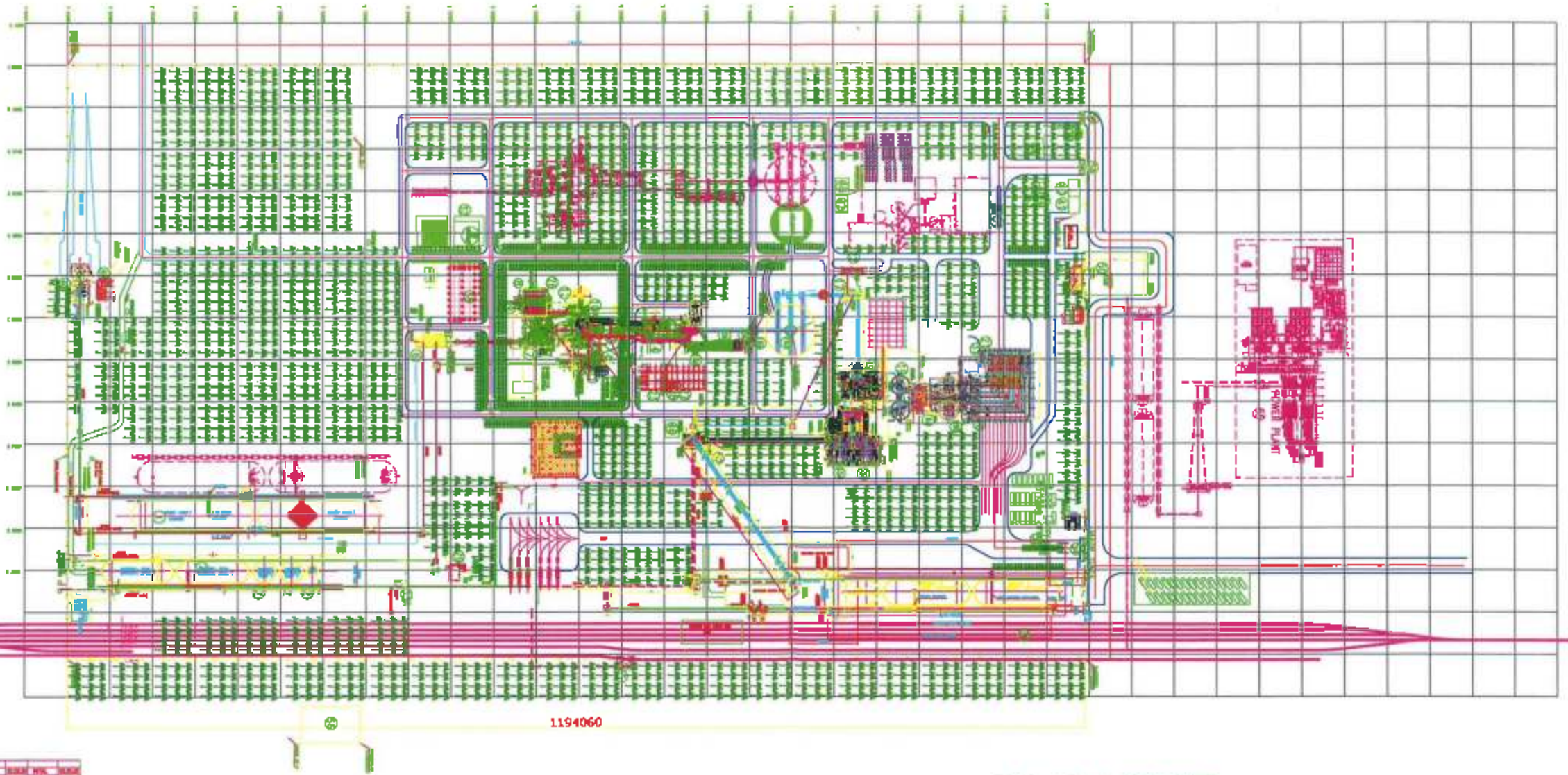


FIG - 2.1

M/s. JSW CEMENT LIMITED

2.5 MTPA CLINKER PRODUCTION
&
4.0 MTPA OPC/PSC/OGBS PRODUCTION

PLANT SITE

The other raw materials required for the cement manufacture are Bauxite, Iron ore, Slag and Gypsum. Coal is used as fuel for combustion in the kiln. Annual raw material requirement of the cement plant was given in Chapter – 1.

Fuel

Imported coal is used as fuel. The characteristics of imported coal are given in table below.

Proximate analysis	**Value %**
Ash (% mass)	15.06
Sulphur	0.3 to 0.6
Net calorific value	6280

Ash Analysis

Average Ash analysis (%)	
Components	**Value %**
SiO_2	45.10
Al_2O_3	29.20
Fe_2O_3	11.80
CaO	3.6

Fuel Consumption

Specific Heat Consumption: 695 kcal/kg clinker. The specific heat consumption is expected to be in the range of 680 – 700 kcal/kg clinker depending on the operational conditions like variations in the quality of kiln feed material and fuel, variations in feed rate, sudden dislodging of coating, etc.

Additives

Consumption of additives at present and also for the proposed capacity expansion is given below:

S. No.	Raw material	Existing requirement (Tonnes)	Additional requirement for the proposed expansion (Tonnes)	Total requirement after proposed expansion (Tonnes)	Source	Distance /Transportation
1.	Aluminous Laterite	155000	38750	193750	Kerala	850 km
2.	Flue Dust	62000	15500	77500	JSW Steel, Bellary	230 km

Product mix

The details of proposed product mix are given below;

PROPORTIONS OF PRODUCT MIX

S.No.	Component	Proportion % by weight		
		OPC	PSC	GGBS
1	Clinker	95	42	-
2	Gypsum	5	3	-
3	Slag	---	55	100

Norms for sizing main machinery and storages

- Kiln operating days : 330 days/Annum

Operating hours and safety factors for plant and machinery are given in following table.

S.No	Department	Operating (hrs/day)	Safety factor
1	Mines	10	1.10
2	Limestone Crusher	10	1.10
3	Raw Mill	21	1.10
4	Kiln	24	1.00
5	Coal Crusher	10	1.10
6	Coal Mill	21	1.10
7	Cement Mill	21	1.10
8	Packer	15	1.25

- Norms considered for storages for raw materials, intermediate products, additives and finalproducts are as given below in Table

S.No	Department	Storage days
1	Limestone Preblending Stockpile	5 (active)
2	Alu.Latrite	15
3	Flue Dust	15
4	Raw Meal	1.75 (active)
5	Clinker	15
6	Coal	10
7	Cement	3
8	Gypsum	12
9	Slag	4

STORAGE OF RAW MATERIAL

The storage capacities and type of storage are as follows:

S.No	Department	Unit	Recommended Capacity	Type
1	Limestone (Mix stockpile)	Tonne	2 x 44,000	Chevron type, longitudinal mixed stockpile
2	Raw meal silo	Tonne	20,000	RCC silo
3	Clinker	Tonne	1 x 100,000	RCC silo at Plant site
4	Coal stock pile	Tonne	2 x 8,000	Covered stockpile
5	Gypsum	Tonne	1 x 6,000	Covered gantry
6	Ground Slag	Tonne	1 x 9,500	RCC silo
7	Cement silo	Tonne	2 x 15,000 (PSC) 1 x 15,000 (OPC) 1 x 15,000 (GGBS)	RCC Silo

2.4 MANUFACTURING PROCESS

Being a modern Cement Plant, JSWCL has adopted State-of-art in line calciner (ILC) technology for manufacturing of the clinker. The main features of the process are given here under. It is proposed to install bag-filter system for cleaning of the kiln flue gas and hence no gas - conditioning tower is envisaged. Various stages of cement manufacture are given below.

- Lime Stone Crushing
- Raw material grinding
- Blending of raw material
- Coal grinding and fine coal handling
- Preheating of Raw Meal in the six-stage precalciner string
- Clinkerisation in Kiln
- Clinker cooler and storage
- Cement grinding & packing

In the production lines, five significant manufacturing stages, namely crushing, raw meal grinding, clinkerisation, cement grinding and packing are involved.

At crushing stage, run off mines (ROM) Limestone is crushed to desired size so as to achieve optimum grinding efficiency in the raw mills. Crushed limestone is stacked by stacker in a stockpile and reclaimed by means of a reclaimer. The stockpile serves as a buffer stock storage. Partial quantity of topsoil is also added during crushing.

In Raw Mill, crushed limestone with additives are fed through weigh feeders. The feed quantity and ratio of feeds are controlled based on the chemical analysis results from Laboratory.

The raw material is ground in closed circuit Roller Press and the fineness (residue) is controlled by separator. The ground meal is stored in raw meal storage silo. Hot gases from the kiln will be used for raw mill and coal Mill Operations.

Clinkerisation is the heart of cement manufacturing process, where the raw meal fed to the pre-heater at controlled rate through electronic weigh-feeder and or solid flow meters. The feed enters the kiln through cyclones and the fuel is fired at the kiln outlet end and pre-heater. The counter current of hot gases against the material flow right from pre-heater top stage to kiln outlet converts raw mix to clinker by pyro-processing stages like calcinations and clinkerisation. The clinker is cooled in Pyro-Floor cooler. Clinker is transported to covered clinker silo for storage.

Clinker and Gypsum in a definite proportion are ground for the production of Ordinary Portland Cement (OPC). Slag & Gypsum

received through trucks/railway wagons are unloaded by truck/tippler and transported through belt conveyor system for storage in Clinker silo, Slag & Gypsum covered sheds respectively. Clinker, Slag and Gypsum are subsequently extracted and transported in definite quantity as per the quality requirements to mill feed hoppers from where these materials are fed to cement mill for Grinding.

The Roller Press mill consists of Rollers and grind Clinker and Gypsum to produce OPC, whereas slag alone is ground to produce GGBS.

Both the OPC as well GGBS are stored in separate silos. For the production of Portland Slag Cement, GGBS and OPC are extracted from the respective silos and blended in definite proportion in paddle mixer and stored in PSC silo.

In Cement Silos, the cement is homogenised by fluidisation method (for blending) and then extracted through specific equipments installed and fed to Electronic Roto-Packing Machine for packing in bags. After packing in bags, the cement bags are transported by means of belt conveyor and loaded in Railway Wagons/Trucks by automatic Wagon/Truck Loading machines for onward dispatch to the customer.

2.4.1 SYSTEM DETAILS

Limestone crusher

Single stage impact crusher of 1200 tph has been installed at the mine site. A crusher feed hopper of mass flow design was installed before crusher. The ROM limestone is carried by dumpers/tippers from mine to plant site. The crushed material from the crusher is transported by a set of belt conveyors to the limestone stockpiles (2 x 44,000 tonnes) through a stacker of capacity 1500 tph. From stock pile, the material is reclaimed through a reclaimer of capacity 750 tph and is transported to the limestone hoppers. Material from the feed hopper discharge to Raw Mill is conveyed through weigh feeder and belt conveyor.

The size distribution of crushed material is controlled to achieve 90 % passing 50 mm sieve with the maximum product size as 70 mm.

Belt conveyor is installed from crusher to stacker belt at plant site.

Additive Crushing & Storage

Gypsum & Slag

Chemical Gypsum is sourced from fertilizers plant. A crusher feed hopper of mass flow is installed before the crusher. Gypsum received is unloaded by trucks and fed to the dump hopper of the gypsum crusher.

Slag is transported from the steel plant of JSW at Toranagallu through rail to panyam railway station and from railway station to carry through by lorry is unloaded at slag BRU of 500 tph capacity and further transported to the storage area through a set of belt conveyors.

Bauxite Storage/Alu.Latrite/Flue Dust

All the above materials are transported through trucks the plant site. Suitable unloading facilities such truck tippler installed for unloading the material. After crushing the material is stacked with the help of stacker. Reclamation is done as per the plant requirement through reclaimer.

Raw material drying and grinding

Material from the respective raw materials hoppers is fed into the mill through weigh feeders provided beneath each hopper. For mill feeding, 2nos. Concrete hoppers of mass flow design 2x500 tonnes for limestone, 1x250 tonnes for Latrite, 1x250 tonnes for flue dust were installed. The Roller Press is equipped with a new generation, high efficiency separator. Mill vent gas is dedusted in multiple cyclones. Exit gas from cyclones is transported to the bag filter through raw mill fan. Gas from the raw mill fan along with the gases from PH fan exit is dedusted in the bag House.
Material collected at the bottom of the cyclones in raw mill and bag filter hoppers is transported to the raw meal storage silo through a set of screw conveyors, bucket elevators and air slides. A separate system is provided to collect the material from the bag filter bottom for

transporting to a separate bin and from there to the kiln feed bin and to the silo. This is to avoid the ideal running of equipment when Raw Mill is not in operation.

Coal crushing and storage

Imported crushed coal is received by road to the plant site. The coal is unloaded utilizing truck tippler and is further transported to the crusher. The crushed coal is stacked in the linear stockpile (2 x 8,000 tonnes) through belt conveyors and stacker of capacity 550 tph having water spray system to prevent the dust emissions. From the storages coal is reclaimed through reclaimer of capacity 100tph to the raw coal hopper in coal mill section through a series of belt conveyors.

The fuel firing equipment comprises:

- One complete Pyro Jet fuel firing system for rotary kiln burner
- One complete fuel firing system for Preheater (ILC)

The firing system includes required oil pumps, filters, pipes, valves, safety instruments, primary air fans, etc.

Coal drying and grinding

Coal mill of 50 tph capacity i.e VCM for coal grinding has been installed. 2 nos. of Steel hopper of mass flow design were installed. Material from the raw coal hopper is fed in to the coal mill through weigh feeders beneath the hopper. Hot gases from the PH exit are used for drying of coal in the coal mill. Mill vent gas is transported to the coal mill bag filter. Fine coal product collected at the bottom of the bag filter is transported to the fine coal bins through screw conveyors.

Fine Coal is transported by the dedicated system for the kiln and Preheater firing. A common (stand by) fine coal handling system provided for both kiln and preheater firing respectively.

Pyro process section

Raw Meal Blending and Kiln Feed

Blending will be performed to minimize the variations in chemistry of raw meal. For homogenization of the raw meal, a continuous,

controlled flow type-blending silo with design blending ratio of minimum 7 has been provided. One raw meal silo of capacity 20,000 tonnes has been installed.

A kiln feed system, comprising of a steel bin is installed beneath the blending silo. The system use gravimetric feed control by solid flow meters. A mechanical conveying system i.e. bucket elevator has been considered for raw meal silo feeding as well as for preheater (PI) feeding.

Preheater, Precalciner& Kiln,

A dry-process kiln installation has been envisaged. The PH consisting 6 stage cyclones. With higher number of cyclone stages in the PH, the specific heat consumption and the PH exit gas temperature would be lower. On the other hand, the total pressures drop across the PH and hence, the specific power consumption of the PH fan increases with increasing the number of PH stages. In view of economy in specific heat consumption it is necessary to install a double string, 6 stages PH system having new generation, high efficiency cyclones with low-pressure drop. The overall separation efficiency of the PI is minimum 92%. An in line calciner (ILC) has been installed. About 40% fuel is fired in the kiln and the balance 60% fuel is fired in the PC.

The kiln feed material from storage silo is introduced into the PH by means of a system having bucket elevator and air slides. The material is preheated in the PI before entering the PC. Fuel firing in the PC is controlled to achieve about 90 – 95% calcinations of the material at its discharge. A separate tertiary air duct (TAD) has also been installed to transport the preheated air from the clinker cooler to PC.

Kiln Burner

A modern multi-channel, low NOx, multi fuel type burner with low primary air consumption is installed for fuel firing in the kiln. Kiln burner will be suitable for using multiple fuels.

Clinker Cooler

A new generation, Pyro-Floor, high heat recuperation efficiency (minimum 85%) clinker cooler is installed. For a situation when the cooler exit gas temperature exceeds a certain value of say 300°C, the

provision has been made for gas cooling by water spray in duct between cooler exit and cooler bag house.

Clinker transport & storage

Clinker from the clinker cooler discharge is transported by pan conveyor to the clinker silo of capacity 1,00,000 tonnes made of RCC structure at the plant site. Pan conveyor is sized with a capacity of 500 TPH.

An off spec silo, of about 2,000 t has also been considered for rejecting under burnt clinker at the plant site.

Cement and GGBS grinding

JSWCL has adopted the most modern Roller Press Combination Technology in finish mode with high efficiency separator with the state of art technology in the whole process of PSC / GGBS production line. Modern high technology features will ensure high quality product, high yield in energy savings, environmental protection, as well as large- scale automation.

Clinker and Gypsum in a definite proportion are ground for the production of Ordinary Portland Cement (OPC). Clinker, Slag & Gypsum received through trucks/railway wagons are unloaded by truck/wagon-tippler and transported through belt conveyor system for storage in Clinker silo, Slag & Gypsum covered sheds respectively. Clinker, Slag and Gypsum are subsequently extracted and transported in definite quantity as per the quality requirements to mill feed hoppers from where these materials are fed to cement mill for Grinding.

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In Cement Silos, the cement is homogenised by fluidisation method (for blending) and then extracted through specific equipments installed and fed to Electronic Roto-Packing Machine for packing in bags. After packing in bags, the cement bags are transported by means of belt conveyor and loaded in Railway Wagons/Trucks by automatic Wagon/Truck Loading machines for onward dispatch to the customer.

2.5 CAPACITY OF THE EQUIPMENT

LIST OF MAJOR EQUIPMENTS – EXISTING

S.No	Department	Unit	Capacity	Type
1	Limestone crusher	tph	1200	Impact Crusher (L&T)
2	Stacker	tph	1,500	Slewing, Takraf
3	Reclaimer	tph	750	Bridge type, Takraf
4	Raw mill	tph	2x250	Roller Press-KHD Hombold
5	Coal crusher	tph	500	Roll crusher
6	Coal mill	tph	50	VRM-FLS
7	Rotary kiln	tpd	7,500	Dry process
8	PH & PC	tpd	7500	Dry process, twin strings.6 stage ILC
9	Burner - Kiln	tph coal	19	Pyro Jet
10	Burner - PC	tph	29	Multichannel, multi fuel type with low primary air consumption
11	Clinker Cooler	tpd	7500	New generation high heat recuperation efficiency grate Cooler- Pyro Floor
12	Cement mill	tph	300 +90	Roller Press with Ball Mill
13	Slag mill	tph	2x170	Roller Press
14	Packing plant	tph	3x240	Sixteen spout electronic packer

2.6 OPTIMIZATION AND DE-BOTTLENECKING OF EXISTING EQUIPMENT & PROCESSES

The expansion of the cement plant is being achieved through Optimization and de-bottlenecking of existing equipment & processes for increase of Clinker production from 2.0 MTPA to 2.5 MTPA. In

addition, change of product mix is proposed from 1.10 MTPA – Ordinary Portland Cement (OPC) and 3.70 MTPA Portland Slag Cement (PSC) to 1.10 MTPA OPC and 3.70 MTPA PSC/ Ground Granulated Blast Furnace Slag (GGBS)

The proposed changes for optimization and debottlenecking of process units are:

Section	Activities proposed for process optimization / Modernization
Raw Mill	Increasing separator efficiency through optimization and minor modification Minor modification in material feeding system
Kiln & Cooler	Reduction in pressure drop in cyclones Process optimization to achieve maximum productivity (run factor & production factor) of Kiln and Cooler Clinker cooler optimization to achieve maximum heat recuperation efficiency
Coal Mill	Process optimization to achieve maximum productivity (run factor and production factor) of coal mill

Proposed changes in process parameters include the following

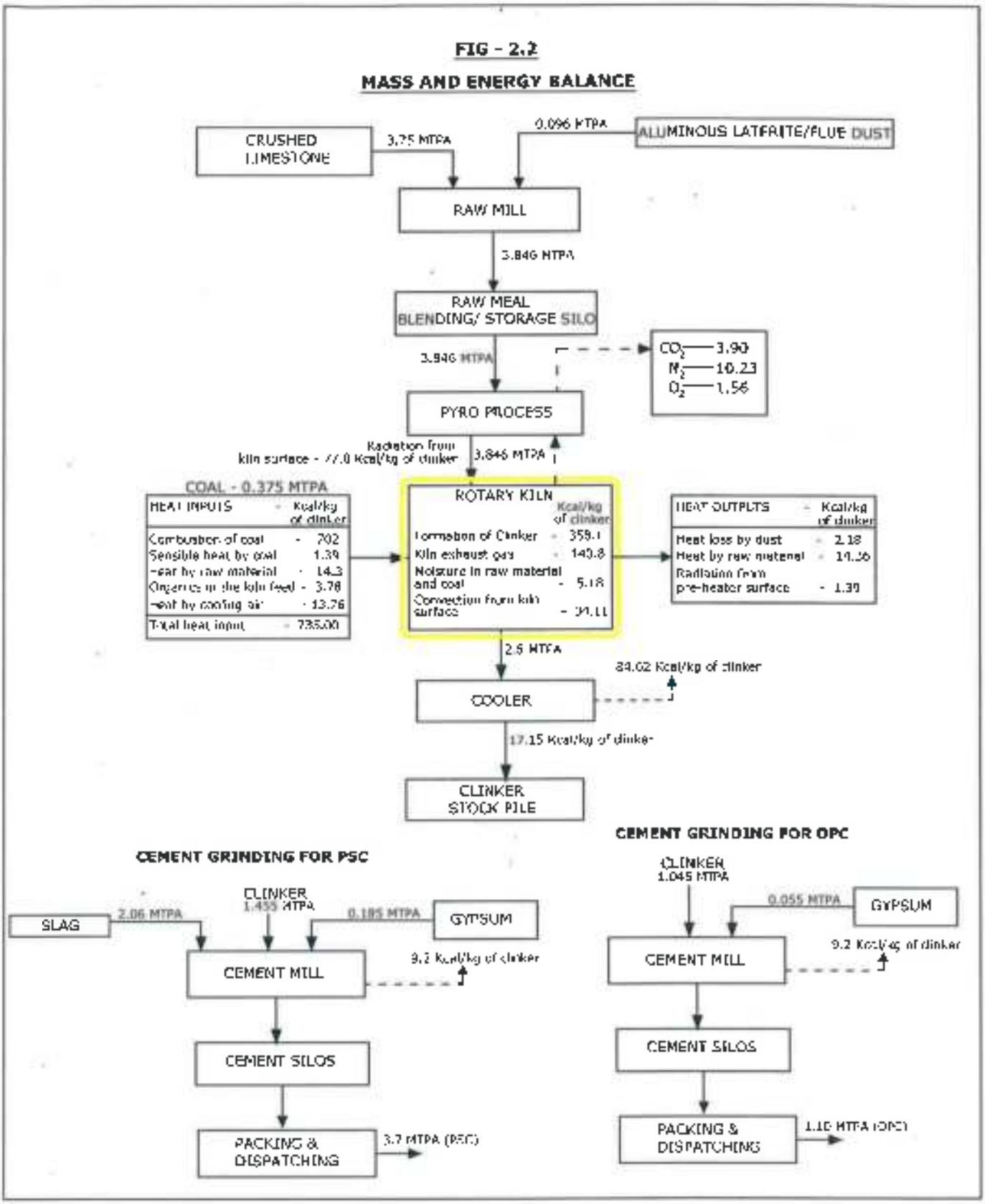
Parameters	UOM	Existing parameters (6000 TPD)	Post Expansion parameters (7500 TPD)
Kiln			
Kiln Size	m	5.0 X 70	5.0 X 70
Kiln Capacity	tpd	6000	7500
Kiln Rotation	rpm	4	4.5
Sp. Heat Consumption	Kcal/ kg Clinker	720	690
Kiln String Cyclone pressure drop	mmWG	535	700
Calciner String Cyclone pressure drop	mmWG	535	700
Clinker Cooler			
Cooler fans flow	Nm^3/min	7.17	8.92

No additional infrastructure is needed for the production the mass balance and enhancement.

Energy balance are shown in **Fig 2.2**

FIG - 2.2

MASS AND ENERGY BALANCE



2.7 PROPOSED 36 MW CAPTIVE POWER PLANT (EC OBTAINED)

The captive power plant of 36 MW capacity is envisaged in the existing cement plant. Fuel proposed for the CPP is imported coal. Hence, a conventional Rankine steam cycle plant has been considered for 36 MW CPP. The coal requirement is 800 TPD for the Captive Power Plant.

The power requirement will be met primarily through the CPP. However for initial/Black start and to meet the minimum power requirement to keep the kiln in operation & to take care of emergency loads during the outage/maintenance of CPP, sourcing of power from the grid substation of Andhra Pradesh State Electricity Board (APSEB) is also proposed. The grid substation (220 KV) is located at about 6.5km from the plant site.

Power generation process of power plant.

Power generation process is based on Rankine Steam cycle. The steam generated in the boiler when expanded through a turbine, turns the turbine shaft, which is tandem coupled to an electric power generator.

The schematic diagram of the power generation process is shown in **Fig- 2.3**

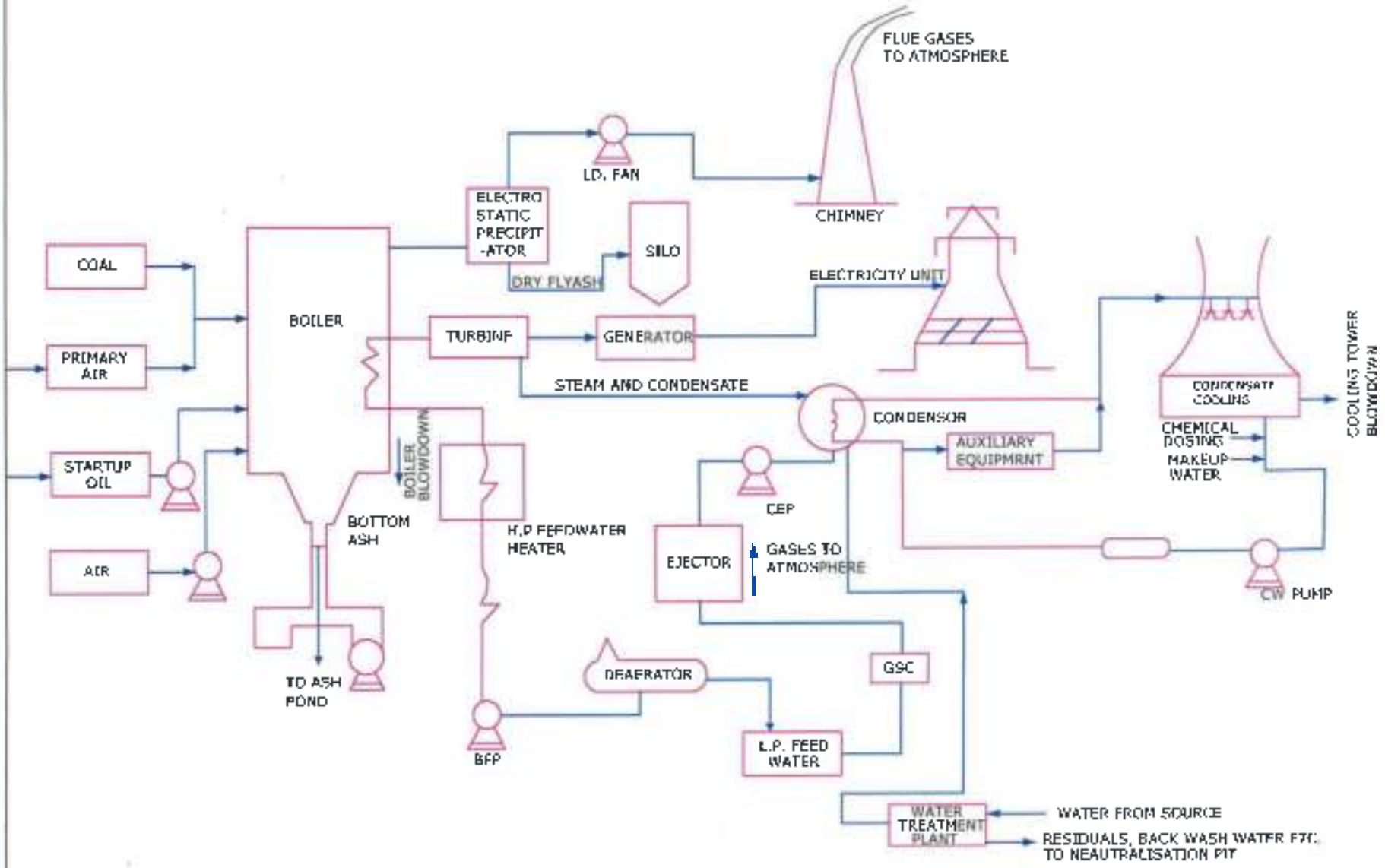
Proposed Power plant is aimed at generation of 2 X 18 MW of electric power. The power plant is designed based on Circulating Fluidized Bed Combustion (CFBC) Boilers design, which is an Environment Friendly Technology. This CFBC design allows burning of high ash content coals, multi-fuel operation, low stack gas temperatures. The boiler will be designed for a rated steam output of 110 TPH at a pressure of 105 kg/cm^2 and 510 ^{0}C.

The type of turbine & boiler are given below:-

Turbine

In order to optimize the cycle efficiency, the concept of regenerative feed heating is adopted. The 40 MW size turbine is having an axial length of approx. 3 meters. Hence, it shall be possible to provide 3 nos. of steam tap off nozzles in the turbine for feed heating making the

FIG - 2.3
TYPICAL FLOWSHEET FOR ELECTRIC POWER GENERATION



turbine a triple extraction cum condensing type. With this configuration, the power cycle efficiency can be improved.

CFBC Boiler option is being considered for the captive power plant.

Steam Generator	a.	No. and ratings	01no., Maximum continuous rating 110 tph & 515 oC, 89 ata.
	b.	Type of Boiler	AFBC
	c.	No. of fans for each Boiler	100 % duly ID and FD and 2 x 100 % for PA operation.
	d.	Type of atmospheric pollution control system	Electro Static Precipitators with outlet dust concentration less than 50 mg/ Nm^3.
Steam Turbine Generator	a.	No. and ratings of turbine	01 no. of inlet parameters, 86 ata & 510 °C
	b.	Capacity (STG)	40MW Maximum Continuous rating
	c.	No. of extractions	3 nos. 1 HP, 1MP and 1LP
	d.	Type of exhaust steam cooling	Through soft water circulation with water cooled condenser

Steam generators and auxiliaries.

General

The selection covers selection of mechanical equipment and system for efficient operation of the CPP.

The CPP consists of 36 MW MCR capacity steam turbine generators and CFBC boiler of 110 tph capacity.

Steam generator

The steam generating system for the power plant consists of a coal fired boiler of 110 capacity with all the auxiliaries.

The boiler is atmospheric fluidized bed type, natural circulation, balanced draft, and membrane wall radiant furnace design with two (2) stage super-heaters and inter-stage de-super heater.

The steam generator design parameters shall be as follows:

Steam Generator Design

Maximum continuous rating (MCR), tph	110
Peak capacity of the boiler as a percentage of MCR capacity, %	66
Super-heater outlet pressure, Kg/ cm^2 (g)	89
Super-heater outlet temperature, °C	515±5
Feed water inlet temperature, °C	147
Excess air, %	Not more than 25
Boiler outlet flue gas temperature, °C	150 (max.)
Dust concentration at chimney, mg/ Nm^3	50 (max.)

The steam generator is provided with fusion welded type steam drum. The steam drum is with necessary nozzle connections for the steam outlets, safety valves, feed water inlets, down-comers, continuous blow down, level indicators, chemical dosing, sampling connection, drains and vents to ensure the required steam purity.

Furnace

The furnace envelope is constructed of fully water-cooled membrane/ fin welded walls and the construction shall be gas pressure tight.
The furnace bottom is covered with an air nozzle tube plate, below which the fluidiser air plenum shall be located. The coal of properly graded size is brought to the fluidiser space by pneumatic transportation and the feed system shall be with under bed feeding system.

Super-heater

Super-heater system is of two (2) stage design with inter-stage de-superheating to achieve the rated steam temperature over 60 % to 100 % MCR load. The super-heater shall be combination of convection and radiation type.

The inter-stage attemperator or a de-super-heater of spray type shall be located between the two (2) super-heater stages, to control the final steam temperature at 515±5° C between 60% to 100 % MCR load.

Economizer

The economizer is located downstream of the super-heaters and evaporator sections. The economizer is of bare tube construction, in line arrangement, counter flow type and the economizer shall be designed for inlet temperature of 147° C.

Air heater

Air heater is arranged as the last heat recovery section downstream of economizer. Air heater is recuperative type with flue gas flowing inside the tubes and the combustion air flowing over the tubes.

Draft system

The draft system for the steam generator is suitable of producing a balanced draft with sub-atmospheric pressure condition in the furnace. For boiler, the system comprises of:

- 1 x 100 % FD fan (variable speed drive)
- 1 x 100 % ID fan (variable speed drive)
- 2 x 100 % PA fan

HP & LP dosing system

Steam generator is with High Pressure (HP) dosing and Low Pressure (LP) dosing system. The HP dosing system is based on 'tri-sodium phosphate' dosing and this is dosed in boiler water to take care of the ingress of the hardness salts and to increase the boiler water pH. The LP dosing system is based on 'hydrazine' dosing. This is dosed in the feed water to scavenge the last traces of oxygen and to increase the feed water pH.

Blow down tank

One Continuous Blow Down tank (CBD) and one Intermittent Blow Down tank (IBD) is provided for the boiler. The flash steam from the

CBD tank is piped to the de-aerator and outlet of the IBD tank shall be vented to the atmosphere.

De-aerator

One De-aerator of de-aerating capacity equal to twenty percent (20%) higher than the gross MCR steam generation capacity of boiler with a de-aerated water storage tank of minimum 20 minutes operation will be provided.

Boiler feed water pump

Two working and one standby boiler feed water pumps have been installed for complete power plant.

Steam turbine and auxiliaries

Steam turbine

This project required 36 MW triple extraction-cum-condensing turbo-generators, one for each phase.

- The turbine is designed for the operation with the inlet steam parameters at 89 ata and 510°C and with automatic controlled extraction steam.

- Turbines have water cooled Condenser and exhaust pressure shall be around 0.17 Kg/ cm2.
- The turbines are horizontal, single cylinder, triple extraction-cum-condensing type. All casings and stator blade carriers shall be horizontally split.

- The controlled extraction steam from the turbine is delivered to the heaters/ de-aerators in saturated condition.

- A de-superheater to bring the steam temperature from the extraction steam temperature down to the required level is envisaged.

Lubrication system

A pressure lubrication and control oil system are provided for the turbo-generator unit to supply oil at the required pressure to the steam turbine, gearbox, generator and governing system. The lubrication oil system supplies oil to the turbine generator under all the load conditions, including the turning gear operation.

The oil system with each Turbine has the following:

- One hundred percent (100 %) capacity centrifugal/ gear type, main oil pump.
- One (1) no. of one hundred percent (100 %) capacity auxiliary oil pump of centrifugal type, arranged to cut in automatically if the oil pressure falls to a preset value. This pump also meets the requirements during the startup and shut down.
- One (1) no., centrifugal type, DC emergency oil pump to provide adequate lubrication in the event of a failure of the main driven pump. This pump also shall cut in automatically at a preset value of the oil pressure.
- Emergency gravity lube oil system comprising of overhead tank with SS lining and complete interconnecting SS oil piping.
- Two nos. 100 % capacity (one working and one standby) water-cooled air coolers.
- Two 100 % duty oil filters.

Turbine governor

The turbine governing system is an electro-hydraulic type, designed for high accuracy, speed and sensitivity of response. The governor ensures controlled acceleration of the turbo generator and prevents over-speed without tripping the unit under any operating condition or in the even maximum load rejection. The governor is configurable in the field.

The governing system has the following important functions:

- Speed control
- Over speed control
- Load control
- Steam pressure control

The governing system has a digital governor with all parameter control from plant distributed control system (DCS) system.

Water-cooled condenser

The waste heat produced in the thermal process of the plant has to be transferred to the atmosphere by using adequate cooling system. Environmental concern and climatic conditions are the main factors in the selection of the most suitable power station process. Due easy availability of water, Turbine Condenser will be Water-cooled Surface condenser type. Exhaust pressure is around 0.17 Kg/ cm^2.

Turbine control

The turbine control is through the centrally located PC based PLC system. The control system is provided redundancy for key functions by use of separate sensors and monitors. The control system includes all the standard control monitoring and alarming.

In addition to centralized monitoring, some of the essential parameters mounted in local are:

- Inlet steam pressure temperature and flow
- Uncontrolled extraction steam pressure and temperature
- Exhaust steam pressure, temperature and flow
- Lube oil header pressure
- Control oil header pressure
- Steam turbine/ generator speed indicator
- Steam turbine/ generator stop push button
- Turbine back propose control
- Emergency shutdown push button

Coal crushing & storage in bunker

For boiler application, the coal has to be reduced to average 6 mm size, which necessitates crushing of the coal.

The vibrating screen is provided before crusher to screen out coal size below 6 mm and coarse particles are fed to the impact crusher. The output is fed to the vibrating screen. The oversize particle above 6mm is re-circulated. The screened material is conveyed to the coalbunker near the boiler. The bunker is sized for 24 hours storage capacity (400 m^3).

Sizing of conveyor, crusher and screen

The operation of coal reclaiming is in single shift with usage F-grade coal. Based on above, the sizing of the screen and crusher shall be finalized as follows:

- Screen : 115 tph (Primary & Secondary)
- Crusher : 100 tph

Utilities and service

Compressed air system

Compressed air is required for meeting the needs of various mechanical equipment and for instruments. A centralized compressor is envisaged to be installed for this economizing the overall cost. The compressors are fitted with all auxiliaries like receivers, dryers, moisture and oil separators and also necessary control panels. The compressor dew point is restricted to -30°C.

Outlet from service air compressor are routed to various areas like steam generator, TG Hall extension, coal handling, etc. In addition to this, a separate compressor for cleaning and other miscellaneous purposes are provided.

HP & LP piping

The piping for the CPP has been divided as follows :

- Power cycle piping
- Low pressure utility piping
- Cooling water piping
- Fire water piping
- Compressed air piping

Power cycle piping

The power cycle piping of each unit consists of mainly the following:

- Main stream piping from generator to turbine inlet
- Interconnection between main steam piping and auxiliary steam header through a Pressure Reducing and Desuperheating Station (PRDS)
- Boiler feed water pump suction piping
- Boiler feed water suction piping and common feed water header
- Boiler feed water pump recirculation piping
- Condensate extraction pump discharge piping
- Condensate extraction pump suction piping
- Heat exchanger piping
- Boiler blow down piping

Low pressure utility piping

- Raw water
- Reverse Osmosis (RO) Plant water

Cooling water piping

- Heat Exchanger for main plant area
- Heat Exchanger for compressed air system

Fire fight piping

- For fire Hydrants

Compressed air piping

- Instrument air
- Service air

Fire protection piping

Fire protection in the proposed power plant is required for the following purposes:

- Early Detection
- Alarm
- Suppression of Fire

The entire fire protection is designed to meet above requirement effectively and quickly as per the guidelines set out by the Tariff Advisory Committee.

For detection of fire, necessary smoke and heat detectors and manual call buttons with centralized zonal control room have been envisaged. Suitable alarm system is also provided along with detection system.

Fire protection system consists of:

- Fire Hydrants
- Portable Fire Extinguishers
- Heat sensing cable for cable trays
- Spray system for power transfer & lube oil system

The hydrant system consists of one electric driven water pump and one diesel engine driven standby pump along with necessary length of hose to be laid around vulnerable points. Various water pumping points are provided along the length of hose as per requirement.
Portable fire extinguishers consists of a combination of different type of extinguishers like foam type, CO_2 type, etc.

Air conditioning

Air conditioning has been considered for the following:

- Control room
- Group level controller and Electronic panel room
- UPS panel room
- SWAS room

Based on estimated heat load, the capacity of air-conditioning unit works out to:

- 15 TR for controller and electronic panel room
- 20 TR for Control room
- 50 TR for UPS room and SWAS room

Based on the heat load, operational ease, flexibility and reliability of the system, the water cooled package type is being considered.

Ventilation

The ventilation system for turbine building is provided to evacuate the heat liberated from the operating equipment and to prevent ingress of atmospheric dust.

For effective draft, induced draft ventilation system is provided for turbine building by installing sufficient roof exhausters. All the air entering the turbine building rises through various floor grills/ gratings and the hot air shall finally be exhausted through roof exhausters.

For switchgear/ MCC room, the clean air is required for protection of the equipment. Air filters are used in supply air and dampers are provided to maintain positive pressure of 3-4 mm WG inside the room. In order to have controlled atmosphere, the ventilation system consists of:

- Air intake louvers
- Viscous and fine filters
- Evaporative cooler
- Centrifugal blower

INSTRUMENTATION AND CONTROL SYSTEM

Station is provided with PLC based comprehensive integrated Instrumentation and Control system to operate, control and monitor Steam Generator and auxiliaries, steam turbine generator and auxiliaries, power evacuation and the plant common auxiliary system with a distributed structure. This has the following advantages:

- Increased reliability
- Better availability
- Higher system security
- Increased flexibility
- Modularity and expandability
- Higher maintainability
- Drift free control
- Lower power consumption
- Improved man-machine communication with colour graphic VDU based control stations
- Faster response time

The PLC system has complete control capabilities that include closed loop control, open loop control, computation and interfacing for data acquisition, graphic displays, logging, annunciation, data storage and retrieval.

- The PLC system will include following main sub-systems operating in a totally integrated fashion for the total plant operation.

The plant supervisory system performs control of process parameters like flow, temperature, pressure, level, power, current, voltage and analytical. In addition, it shall also perform functions like performance calculations, utility displays, operator guidance message displays, logs, historical storage and retrieval etc.

- The plant is divided into three sub-sections as given below:

  - Boiler
  - Turbine
  - Auxiliaries & Utilities

- Execution of sequence operation, interlocking, plant shut-down, PI/ PID control and plant start-up for the above sub-sections are achieved with respective group level PLCs. PLCs are interfaced with Supervisory Processor located in the control room.

- The safety and Burner management related digital inputs/ outputs are monitored and controlled.

- Engineer interface sub-system has an engineering console primarily for tuning, configuring, programming and maintaining the system.

- Redundant communication sub-system is considered for interconnecting all the PLCs & sub systems with plant supervisory control system.

CHAPTER - 3

DESCRIPTION OF ENVIRONMENT

CHAPTER – 3 : DESCRIPTION OF ENVIRONMENT

3.1 STUDY AREA

The study area includes 10 km radius around the project of cement plant of JSWCL at Bilakalagudur Village, Gadivemula Mandal, Kurnool District of Andhra Pradesh.

The study area of 10 km radius is covered in Survey of India toposheet No. 57 I/6. [1:50000 scale].

The baseline environmental quality represents the background environmental scenario of various environmental components. Pollution in the area is mainly due to surrounding Industries and unpaved road conditions and vehicular traffic.

STUDY PERIOD

The baseline environmental quality represents the background scenario of various environmental components in the study area.

As part of Environmental Impact Assessment study, baseline environmental monitoring was carried out for Summer Season covering the months of March –May 2015.

3.2 METHODOLOGY OF EIA STUDY

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

- Identification of significant environmental parameters to study the existing status within the impact zone with respect to air, water, noise, soil and socio-economic components of environment.
- Study of various activities of the proposed integrated project of plant & mine lease process to identify the area's leading to impact/change in environmental quality.
- Identification/Prediction of impacts for the identified activities and to study level of impact on various environmental components.

- Evaluation of impacts after superimposing the predicted/quantified scenario over the baseline scenario.
- Formulation of Environmental Management Plan for implementation in the proposed integrated project.

3.2.1 COLLECTION OF BASELINE STATUS

A) Micro Meteorology

A temporary auto weather monitoring station was installed to record meteorological parameters like Wind speed, Wind direction, temperature, and relative humidity on hourly basis continuously for the Summer Season 2015.

Wind speed, wind direction data recorded during the study period was 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 project.

B) Ambient Air Quality

The scenario of the existing Ambient air quality in the study region has been assessed through a network of Nine ambient air quality stations during the study period is summer Season 2015 within an area of 10 km radius and around the project.

The Ambient air quality monitoring network has been designed 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 station:

- Topography / Terrain of the study area
- Populated areas within the study area
- Residential and sensitive areas within the study area.

The existing Ambient Air Quality (AAQ) status has been monitored for PM_{10}, $PM_{2.5}$, SO_2, NO_X and CO. PM_{10}, $PM_{2.5}$, at each station has been monitored on 24 hourly basis, CO was monitored on 8 hourly basis.

Pre-calibrated Respirable dust & Fine 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.

C) Noise Environment

Noise monitoring has been carried out at various locations to identify the impact due to the existing sources on the surroundings in the study area during summer Season 2015. Noise levels were recorded at an interval of 30 minutes during the day and night times to compute the day equivalent and night equivalent levels.

D)Water Environment

Water samples from various locations within 10 km radius were collected for assessment of the existing physico-chemical and bacteriological quality during summer Season 2015.

Methodologies adopted for sampling and analysis were according to the IS methods. The parameters thus analyzed were compared with IS 10500. The activities surrounding the source during sampling were taken into consideration in the interpretation of the water quality of that particular source.

E) Land Environment

Field surveys were conducted to identify the land use in and around 10 km radius of the site. Representative soil samples were collected from eight locations within 10 km radius of project of plant for analysis of the physico chemical characteristics. Standard procedures were followed for sampling and analysis. The samples collected were also analysed to check the suitability for growth of native species in and around the proposed project. Information on flora and fauna in

the study area has been collected as part of the Ecological survey conducted during the study period.

F)Socio – Economic Environment

A socio economic assessment of the positive and negative impacts on the people likely to be directly and indirectly affected by the project was conducted along with other studies during the EIA study. The assessment facilitated an understanding of the needs, demands, preferences, capacities and constraints of the people in the vicinity of the project operation. It enhanced livelihood patterns, social infrastructure etc.

3.2.2 STUDY OF VARIOUS ACTIVITIES

Various operations involved in this project have been studied in detail to identify areas having impact on various environmental components. The study is based on the various other secondary sources of information.

3.2.3 QUANTIFICATION/PREDICTION OF IMPACTS

The identified impacts based on the above study are quantified using various mathematical models.

3.2.4 EVALUATION OF IMPACTS

The quantified incremental impacts are superimposed on the baseline status of various environmental components to have an overall scenario. The overall scenario estimated has been checked for compliance with various statutory requirements/standards.

3.2.5 FORMULATION OF AN ENVIRONMENTAL MANAGEMENT PLAN.

Based on the environmental status & quantified impacts, a detailed Environmental Management Plan has been formulated for implementation during the operational phase of cement plant. A detailed environmental monitoring programme has been drawn for further strengthening.

3.3 BASELINE ENVIRONMENT

3.3.1 MICRO METEOROLOGY OF THE STUDY AREA

Regional Meteorology

The tropical climate of the region is manifested in hot and humid summer, moderately monsoon and mild winter seasons. May is the hottest month in the year. The maximum temperature during the day time was recorded as 45.6°C and December the coldest with the temperature during the day time falling down to about 15°C. The months of December, January & February are considered to have pleasant climate.

Site Meteorology

An auto weather monitoring station was installed during the months of March to May '15 to record various meteorological parameters on hourly basis to understand the wind pattern, Temperature variation, solar insolation and relative humidity variation etc.,

Percentage frequencies of wind in 16 directions have been computed from the recorded data of Summer Season – 2015 during the study period for 8 hourly (01-08hrs, 09-16 hrs and 17-24 hrs) and 24 (01-24hrs) intervals to plot wind roses. **Fig – 3.1 and 3.2** represents the wind pattern of the study period.

Wind Pattern during 01:00 - 08:00 hours

The predominant wind directions during these hours were from NNW-N sector accounting to 41.27% of the time winds of less than 1.65kmph were recorded. Calm winds accounted for 2.05%.Wind speed during this period was above 15 kmph.

Wind pattern during 09:00 - 16:00 hours

The predominant wind directions during these hours were from NNW-NW-N-NNE sector accounting to 35.45%. Calm winds accounted for 8.05%. Wind speed during this period was varying above 15 kmph.

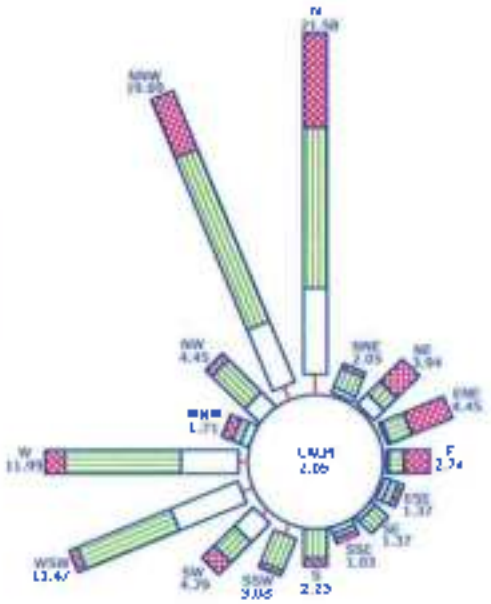
FIG - 3.1
WINDROSE DIAGRAM

CLIENT : M/s. JSW CEMENT LIMITED

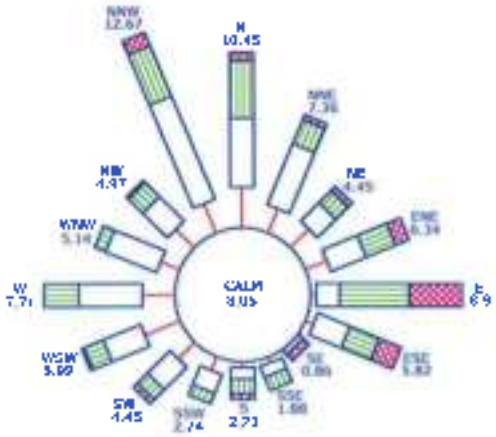
PROJECT : CLINKER PRODUCTION CAPACITY
(1.1 MTPA OPC TO 3.7 MTPA OPC/PSC) TO 4.8 MTPA (OPC/PSC/GGBS) PERIOD : SUMMER - 2015

LOCATION : Bilakalagudur Village, Gadivemula Mandal, Kurnool District, Andhra Pradesh.

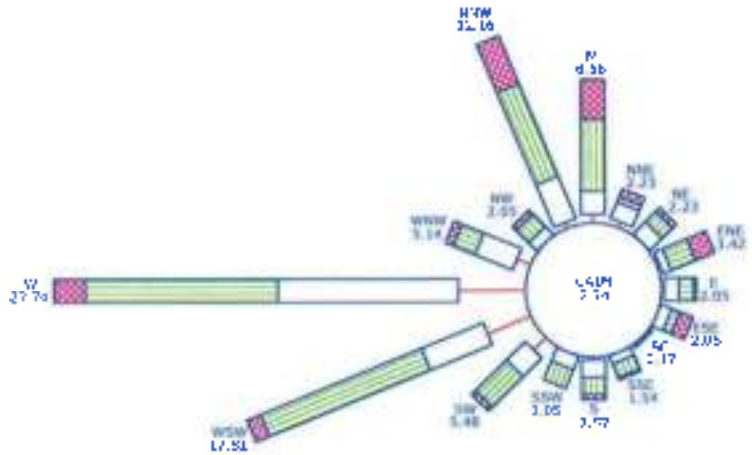
N



DURATION : 01 - 08 HRS.



DURATION : 09- 16 HRS.



DURATION : 17- 24 HRS.

NOTE : All readings are in percentage occurance of wind

LEGEND

0.0-1.0

C

1.01-5

5.01-10

10.01-15

>15 KMPH

C = Calm Conditions in Percentage

SCALE

5 % 10 %

FIG - 3.2

WINDROSE DIAGRAM

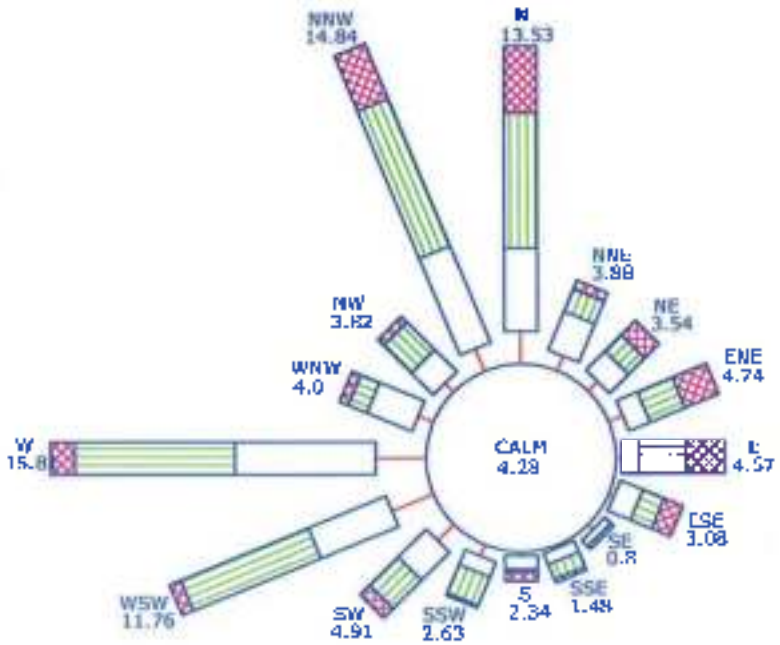
CLEENT : M/s. JSW CEMENT LIMITED

PROJECT : CLINKER PRODUCTION CAPACITY
(1.1 MTPA CPC TO 3.7 MTPA OF PSC) TO 4.8 MTPA (OHQ/SC/0686S)

PERIOD : SUMMER - 2015

LOCATION : Bilakalaguduru Village, Gadivemula Mandal, Kurnool District, Andhra Pradesh

N



DURATION : 01- 24 HRS.

NOTE : All readings are in percentage occurance of wind

LEGEND

0.0-1.0

C

1.01-5

5.01-10

10.01-15

>15 KMPH

C = Calm Conditions in Percentage

SCALE

5 %

10 %

Wind pattern during 17:00 – 24:00 hours

The predominant wind directions during these hours were from WSW-W sector accounting to 45.55%. Calm winds of less than 1 kmph prevailed for 2.74% of the time. Wind speed during this period was varying above 15 kmph.

Wind pattern during the season (Summer Season 2015)

The predominant wind directions during these hours were from NNW-N sector accounting to about 28.37% of the time. Calm winds of less than 1.65 kmph prevailed for 4.28% of the time. Wind speed during this period was mostly above 15 kmph. The summary of the wind pattern is given below:

SUMMARY OF WIND PATTERN

Duration (Hrs)	Predominant Wind Direction	Wind Rose Enclosed as
00:00 – 08:00	NNW-N	**Fig-3.1 & 3.2**
08:00 – 16:00	NNW-NW-N-NNE	
16:00 – 24:00	WSW-W	
00:00 – 24:00	NNW- N	

3.3.2 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 areas. The following points have been considered for the selection of air quality monitoring stations.

- Predominant wind directions
- Topography of the study area
- Terrain and sensitive areas
- Populated areas near to the plant area
- Magnitude of the surrounding industries

3.3.2.1 IDENTIFICATION OF VARIOUS INDUSTRIAL OPERATIONS IN THE STUDY AREA:

The area experiences dry climate and most of the roads in the area are unmetalled. There are no industries present in the 10 km radius of the plant site contributing to background air quality.

TOPOGRAPHY / TERRAIN AND SENSITIVE AREAS OF THE STUDY AREA

The site is located at an elevation of 260 m above Mean sea level (MSL). There are no sensitive areas with the study area.

Based on the above, the AAQ stations have been identified and location of ambient air quality stations is presented in **Table-3.1**.

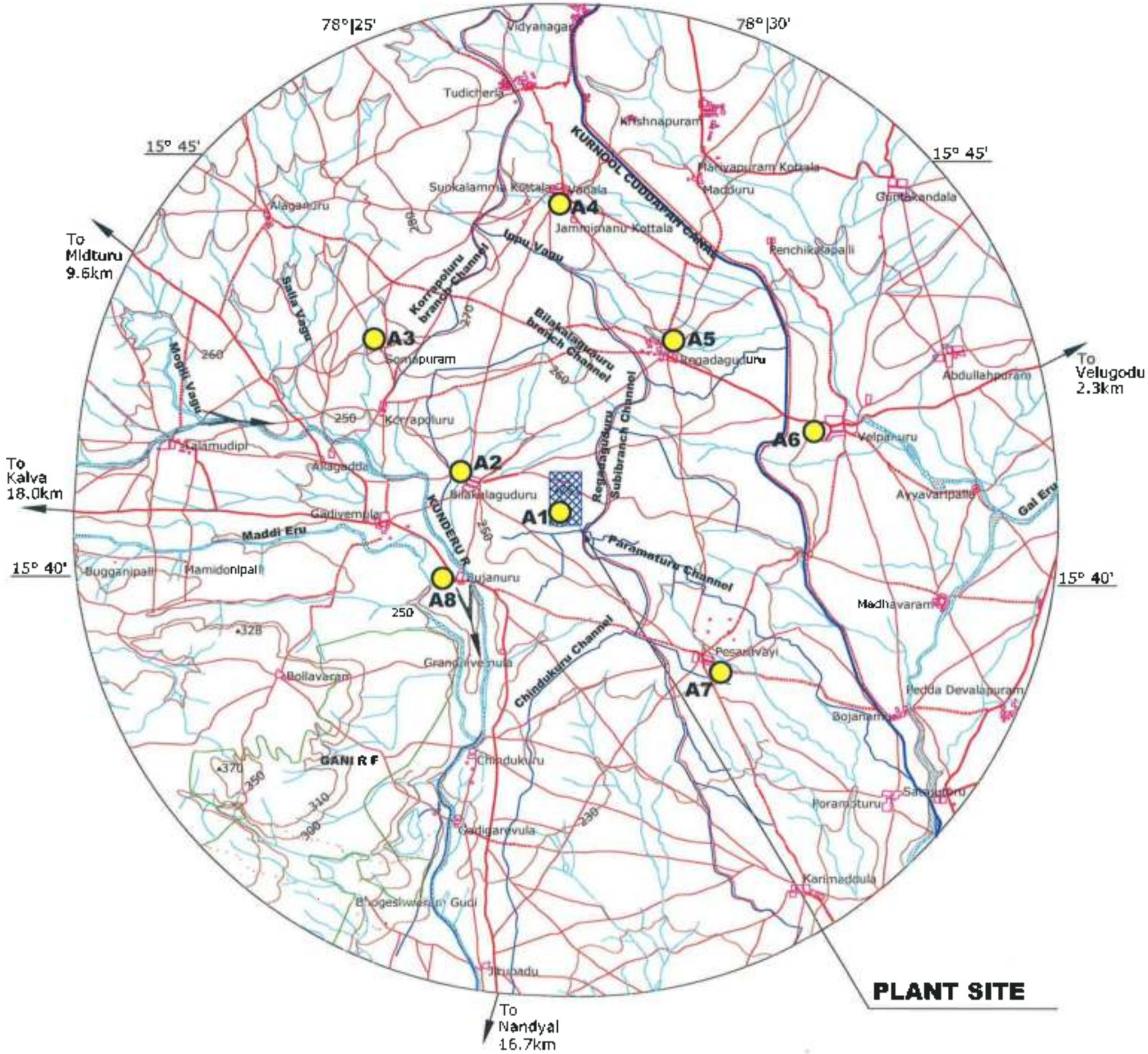
3.3.2.2 IDENTIFICATION OF AMBIENT AIR QUALITY MONITORING STATIONS:

Ambient air quality of the study area has been assessed through a network of 8 ambient air quality locations. These stations are designed keeping in view of the climatological conditions of the study region.

TABLE –3.1
AMBIENT AIR QUALITY MONITORING STATIONS

Station Code	Locations	Distance [km]	Direction w.r.t Plant	Representation
A-1.	Plant Site	--	--	--
A-2.	Bilakaluguduru	1.5	W	Up Wind
A-3.	Somapuram	4.3	NW	Up Wind
A-4.	Vanala	5.9	N	Up Wind
A-5	Regadaguduru	3.0	NE	Cross wind
A-6.	Velpanuru	5.1	ENE	Cross wind
A-7.	Pesaravayi	3.6	SE	Down Wind
A-8.	Bujanuru	2.0	SW	Down Wind

The above monitoring stations are located such that a representative background ambient air quality levels are obtained. **Fig – 3.3** shows the location of ambient air quality monitoring stations in the study area.



LEGEND

- ROADS
- STREAMS/ TANKS
- CONTOURS
- FOREST
- CANALS
- RIVER
- SETTLEMENTS
- SPOT HEIGHT
- PLANT SITE
- AMBIENT AIR QUALITY MONITORING STATIONS

REFER TO THIS MAP AS:- 1:50,000
SHEET 57/I/6 FIRST EDITION
Published under the direction of
the Surveyor General of India - 1982

Index to
Survey of India Toposheets

57 I/1	57 I/5	57 I/9
57 I/2	57 I/6	57 I/10
57 I/3	57 I/7	57 I/11

SCALE

0 3 6 km

FIG - 3.3

CLIENT : **M/s. JSW CEMENT LIMITED**

PROJECT : **2.8 MTPA CLINKER PRODUCTION & 4.8 MTPA OPC/PSC/GGBS PRODUCTION**
Bilakaluguduru Village, Gadivemula Mandal, Kurnool District, Andhra Pradesh.

TITLE : **AMBIENT AIR QUALITY MONITORING STATIONS**

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

Pre calibrated Respirable & Fine dust samplers were used for monitoring of the existing AAQ status. Methodologies adopted for sampling and analysis are as per the approved methods of Central Pollution Control Board (CPCB).

Data on the activities surrounding the ambient air quality monitoring stations were collected for interpretation of the ambient air quality status.

3.3.2.3 ANALYSIS OF BASELINE CONCENTRATIONS

Respirable Particulate Matter – PM_{10}

Respirable particulate matter monitored in the study area showed 98th percentile values in the range of 50.8 – 64.5µg/m^3. The highest value of PM_{10} level (64.5µg/m^3) was observed at Plant Site. The PM_{10} concentration in the study area was found to be well within the norms prescribed by NAAQ.

Particulate Matter – $PM_{2.5}$

$PM_{2.5}$ values monitored at 8 locations showed 98th percentile values in the range of 20.5 – 29.6µg/m^3. Highest value of 29.6µg/m^3 was recorded at Plant Site.

Sulphurdioxide - SO_2

98th percentile value of Sulphur dioxide in the study area from the monitored data was in the range of 8.3–15.1µg/m^3. Maximum value of sulphurdioxide of 15.1µg/m^3 obtained at Plant Site. 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 9.7 - 15.5µg/m^3. A maximum value of 15.5µg/m^3 was prevailing at the time of sampling at Plant Site.

Carbon Monoxide - CO

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

HYDRO CARBON (METHANE AND NON METHANE)

Grab samples collected from each location showed absence of methane and non-methane hydro carbons.

SUMMARY OF AAQ MONITORING

Summary of AAQ monitoring at each location is given in **Table – 3.2** and Percentile values of ambient air quality is enclosed in **Annexure – 3A.**

TABLE – 3.2
Summary of AAQ monitoring

Locations	98TH PERCENTILE VALUES (ug/M3)			
	PM_{10}	$PM_{2.5}$	SO_2	NO_x
Plant Site	64.5	29.6	15.1	15.5
Bilakalaguduru	55.1	24.7	12.5	14.0
Somapuram	54.3	25.4	13.5	14.3
Vanala	55.2	24.9	13.7	14.1
Regadaguduru	54.3	25.3	12.7	12.9
Velpanuru	58.3	25.5	11.3	12.1
Pesaravayi	53.2	24.3	12.3	12.9
Bujanuru	50.8	20.5	8.3	9.7

Note: CO at all locations was found < 1.0 ppm

3.3.2.4 STACK EMISSION MONITORING

The following emissions sources (mg/Nm^3) were monitored as part of the baseline monitoring.

TABLE – 3.3
STACK EMISSION MONITORING

Stack	Permissible limits	Achieved values mg/Nm^3
Crusher	30 mg/Nm^3	9.45
Kiln/ Raw Mill		9.6
Cooler		10.7
Coal Mill		11.2
Cement mill		10.41
Slag Mill-1		9.8
Slag Mill-2		10.6

3.3.3 NOISE ENVIRONMENT

In order to assess the noise levels in the study area, monitoring was carried out at 8 different locations within 10 km radius of the study area. Noise levels were recorded at each station with a time interval of one minute for about 30 minutes in each hour and were computed for equivalent noise levels for day-equivalent, night-equivalent.

Details of noise monitoring stations are given in **Table – 3.4.**

TABLE - 3.4
NOISE MONITORING STATIONS

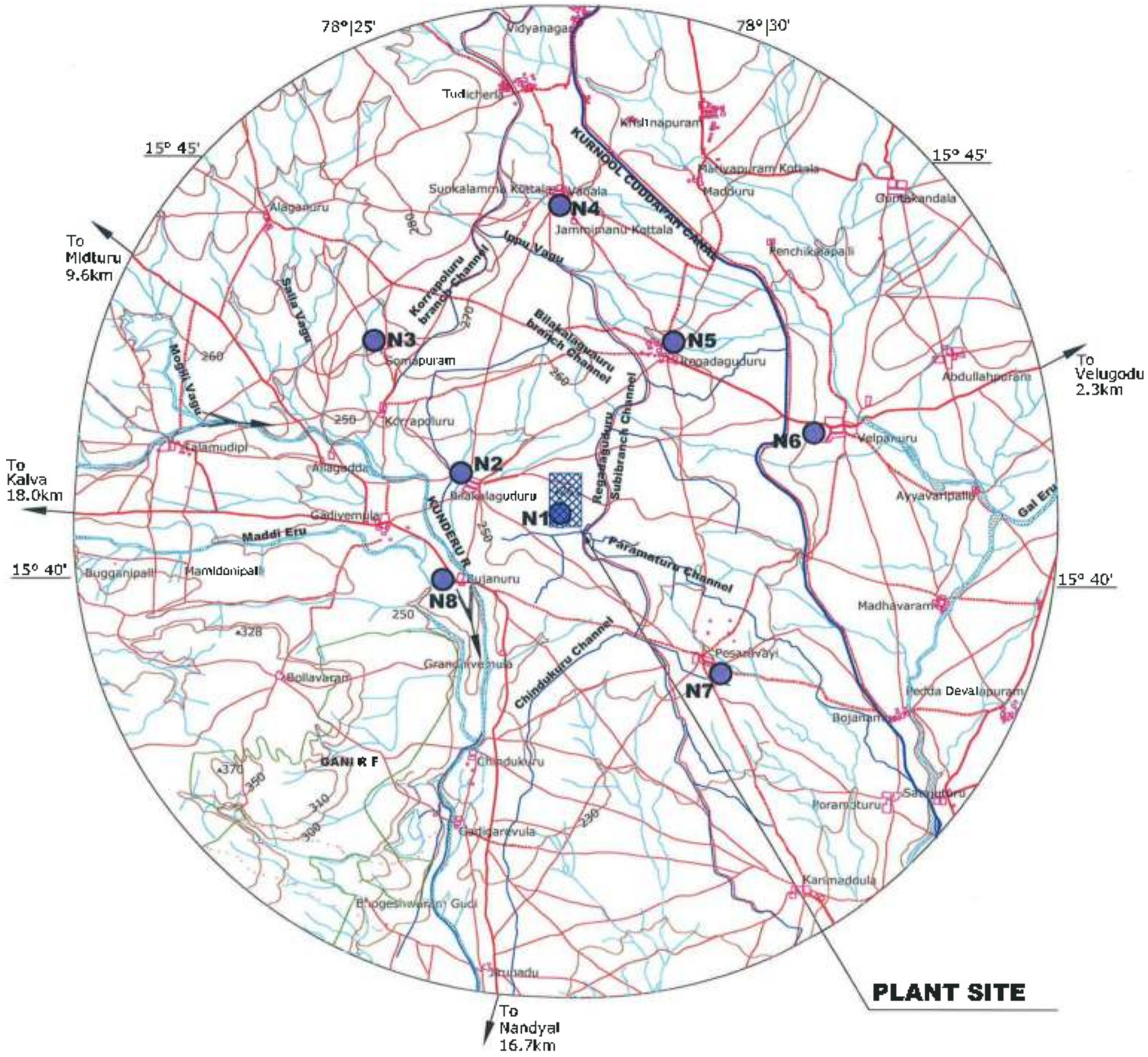
Code	Locations	Distance [km]	Direction w.r.t plant
N1	Plant Site	--	--
N2	Bilakalaguduru	1.5	W
N3	Bujanuru	2.0	SW
N4	Gadivemula	3.3	W
N5	Grandhivemula	2.8	SSW
N6	Allagada	4.6	W
N7	Korrapoluru	3.7	WNW
N8	Somapuram	4.3	NW

The noise recording stations are shown in **Fig-3.4** and the summary of the day – equivalent and night - equivalent values computed for various locations in the study area is given in **Table – 3.6.**

3.3.3.1 NOISE LEVELS IN CORE ZONE – PLANT AREA

Noise levels in the cement plant have been measured at various places within the plant to know the background noise levels. The major noise generating sources in the cement plant are cooler fans, compressor house, cement mill and ball mill section.

The spot noise levels measured during the study period at 1m from various noise generating sources are given below



LEGEND

N

- ROADS
- STREAMS/ TANKS
- CONTOURS
- FOREST
- CANALS
- RIVER
- SETTLEMENTS
- SPOT HEIGHT
- PLANT SITE
- NOISE QUALITY MONITORING STATIONS

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$57\frac{I}{2}$	$57\frac{I}{6}$	$57\frac{I}{10}$
$57\frac{I}{3}$	$57\frac{I}{7}$	$57\frac{I}{11}$

SCALE

0 3 6 km

FIG - 3.4

CLIENT : **M/s. JSW CEMENT LIMITED**

PROJECT : **2.5 MTPA CLINKER PRODUCTION**
&
4.8 MTPA OPC/PSC/GGBS PRODUCTION
Bilakalaguduru Village, Gadivemula Mandal, Kurnool District, Andhra Pradesh.

TITLE : **NOISE QUALITY MONITORING STATIONS**

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

TABLE – 3.5
SPOT NOISE LEVELS IN THE CEMENT PLANT COMPLEX

Location	Noise Level in dB (A)
Near Crusher	68.7
Raw Mill floor	70.2
Kiln Inlet	66.5
Cement Mill 1st floor	66.9
Slag Mill top floor	67.2
Packer Plant	64.8
Coal Mill 1st floor	65.2
Near WTP	57.4
Coal BRW	64.2
Slag BRW	66.7

TABLE-3.6
EQUIVALENT NOISE LEVELS IN THE STUDY AREA (10 KM RADIUS)

CODE	LOCATION	dB (A)	
		Day Equivalent	Night Equivalent
N1	Plant Site	68	61
N2	Bilakalaguduru	55	45
N3	Bujanuru	54	44
N4	Gadivemula	52	42
N5	Grandhivemula	51	40
N6	Allagada	54	43
N7	Korrapoluru	52	41
N8	Somapuram	51	40

3.3.4 WATER ENVIRONMENT

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) Analysing water samples collected for physico-chemical and biological parameters

Assessment of water quality in the study area includes the quality assessment of parameters as per the Indian standard IS 10500 (drinking water standard). The locations of water sampling are shown in **Fig – 3.5.**

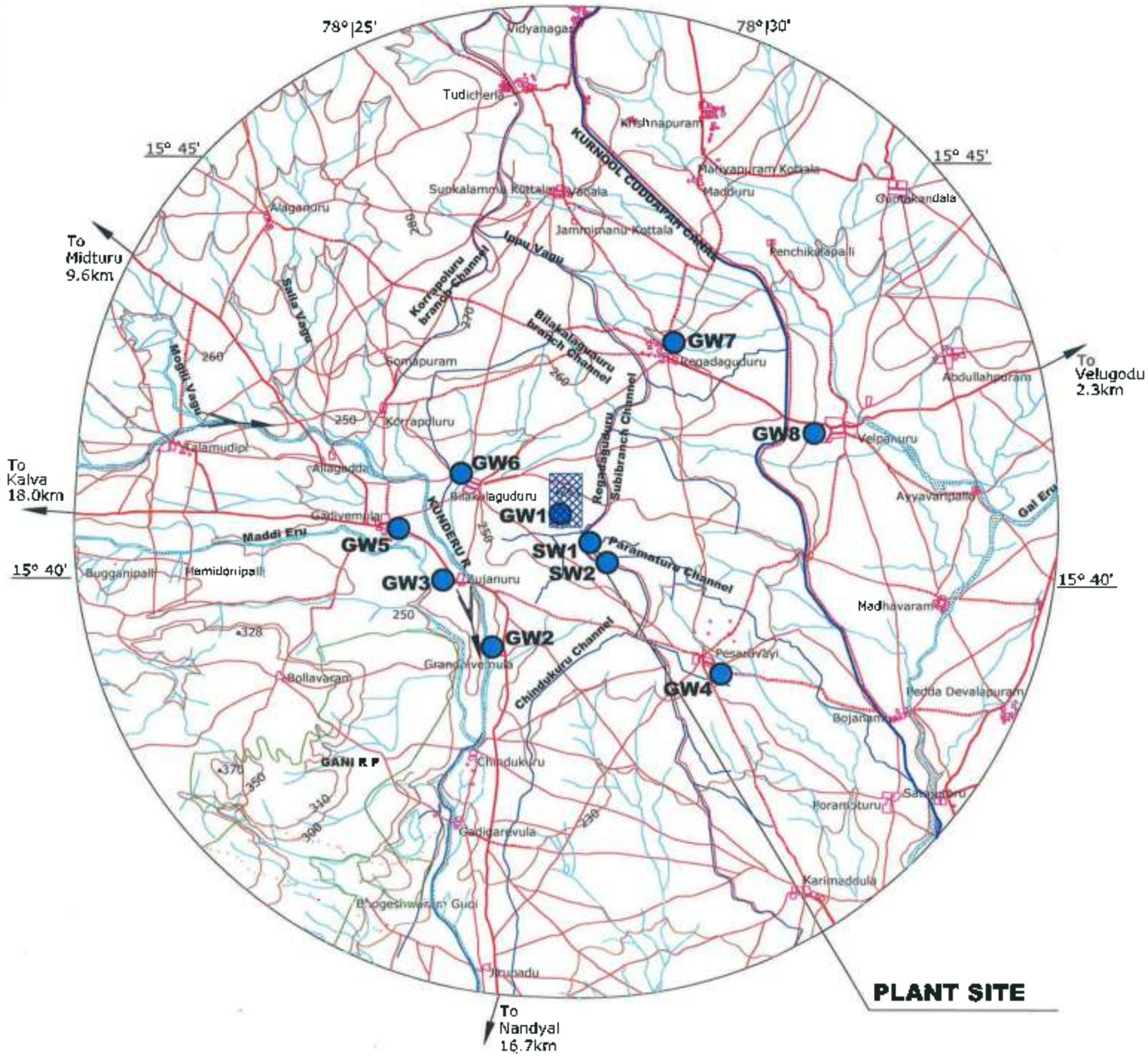
Eightground water samples and two Surface water samples from various locations in and around the plant site within 10 km radius were collected for assessment of the physico-chemical and bacteriological quality. Methodologies adopted for sampling and analysis were according to the IS methods. Field parameters such as pH, Temperature, Taste and odour were monitored on site. The parameters thus analysed were compared with IS 10500. Details of water sampling locations are given in **Table - 3.7.**

TABLE-3.7
WATER SAMPLING LOCATIONS

CODE	LOCATIONS	DISTANCE [KM]	DIRECTION W.R.T PLANT
GROUND WATER			
GW-1	Plant Site	-	-
GW-2	Grandhivemula Village	2.8	SSW
GW-3	Bujanuru Village	2.0	SW
GW-4	Pesaravai	3.6	SE
GW-5	Gadivemula Village	3.3	W
GW-6	Bilakalaguduru Village	1.5	W
GW-7	Ragadiguduru Village	3.0	NE
GW-8	Velpanuru Village	5.1	ENE
SURFACE WATER			
SW-1	Paramaturu channel upstream	0.4	SE
SW-2	Paramaturu channel downstream	0.8	SE

Annexure– 3B represents the water quality data at the above locations.

Ground water samples collected from 8 locations within 10 km radius of the plant site showed all parameters well within the drinking water standards specified in IS 10500.



LEGEND

N

- ROADS
- STREAMS/ TANKS
- CONTOURS
- FOREST
- CANALS
- RIVER
- SETTLEMENTS
- SPOT HEIGHT
- PLANT SITE
- WATER QUALITY MONITORING STATIONS

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SCALE

0 3 6 km

FIG - 3.5

CLIENT : **M/s. JSW CEMENT LIMITED**

PROJECT : **2.5 MTPA CLINKER PRODUCTION & 4.8 MTPA OPC/PSC/GGBS PRODUCTION**
Bilakalaguduru Village, Gadivemula Mandal, Kurnool District, Andhra Pradesh.

TITLE : **WATER QUALITY MONITORING STATIONS**

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

Surface water samples were collected from Paramaturu channel at two locations. Due to non-availability of water and dry conditions in the area, samples from drains (six samples) could not be collected as per the TOR point no - 25.

3.4 LAND ENVIRONMENT

3.4.1 GEOLOGY

General geology of the area comprises of Cuddapah super group and underlined by the Archean group of metamorphosed granitic gneiss and schists. They are unconformably overlained by the lower and older sediments of Papaghni above which Chitravathi group, Nallamalai group and Kurnool group of rocks lie in the ascending order. The stratigraphic succession of Kurnool group, which covers the major portion of the study area is explained in detail below.

KUNDERU SERIES

Nandyal shale: It rests upon the koilkuntla Lime stone. In the study area this rock type occupied most of the southern and southeastern part. They are purple in colour with thin layers of calcareous material, which are measuring about 1-2 meter thickness and are fragile in nature. Generally they are horizontal beds, at places gently dipped with the dip amount of 5 northeast.

Koilkuntla limestone:

Koilkuntlalimestones overlie the Panyam quartzite and occur in the central east and western corner of the study area. At kalva spring, to the western portion of kalva wall, it is present with a few folds. It is grayish in colour, soft, flagging nature and is used as building stone for flooring and construction work.

Panyam series:

It rests unconformably over the Auk shales and is exposed in the form of hill ranges. These quartzite's are of two different types viz., Plateau and Pinnacled. The Plateau quartzites are thin, gritty and appear as sand stones. These are medium grained with light brownish and pinkish colors. Joints are well developed both along and across the

bedding Planes. This is used as the raw material for the glass industry. The pinnacled quartzite's are with characteristic sedimentary features such as bedding planes, ripple marks. The fracture in these are clearly observed striking in the northwest / southeast directions.

Auk stage:

This is the upper most horizons of the Jammalamadugu series and is conformably overlined on the Narji stage. It is generally thin with an average thickness of 0.5-2 meters. They are generally loose, fragile and ocherous. The overlying quartzite's have protected them from weathering and erosion. In general they follow the dip and strike of underlying Narji limestone.

Jammalamadugu series:

This series rests conformably over the Banaganapalli series. These are calcareous with display of a variety of colours and compositions with an average thickness of 100 meters. This series is sub divided in to lower Narji and upper Auk stages.

The Narji stage, which is dominantly of calcareous one, comprises a variety of lime stone beds that can be distinguished on the basis of their colour texture and composition. The purple siliceous limestones are the lower most beds of the Narji stage, which are overlying the Banaganapalli sandstone. They are hard and compact: occasionally they form siliceous material in the form of veins.

The greenish massive type of beds is recognized overlying the purple siliceous beds. Their thickness varies from 3-10 meters at different places. White massive limestones are present overlying the greenish massive type of limestone. These beds have a thickness from 5-10 meters. Numerous ramification of the recrystalline calcite veins are observed within these beds.

Intra-formational conglomerate is observed with rounded to sub rounded fragments of lower beds of limestone embedded in a calcareous ground mass. The gray massive types of beds are the thickest beds out of all the types in the Narji stage. They are as thick as 70 meters and are exposed overlined by the younger formations

of the paryamquartzite's. They have a gentle dip of 5-8 degree towards east. The dark flaggy varieties of limestone with their thickness of more than 25 meters are present on the gray massive limestone.

Karstification in the limestone of Kurnool super group is very prominent character, with the longest caves (Belum caves) were formed. Apart from this, these Narjillimestone contain at least 7-8 well-known caves (Krishna Rao et.al.1994).

3.4.2 PHYSIOGRAPHY AND DRAINAGE

Nallamalas and Erramalas are the two important mountain ranges in the district running in parallel from North to South. The Erramalas divide the district into two well defined tracts from East to West. Between Erramalas and Nallamalas lies the Eastern part of the district comprisingNandikotkur, Pagidyala, Kothapalli, Pamulapadu, Atmakur, Velgodu, J.Bunglow, Midthur, BandiAtmakur, Gadivemula, Nandyal, Mahanandi, Panyam, Banaganapalli, Owk, Koilakuntla, Rudravaram and ChagalamarriMandals. This tract is crossed by the crest of Krishna and Pennar, watershed at the North part of the Pagidyalamandal at about 1000 above the sea level. From this height the ground slopes to the South along the river Kundu till it traverses into Pennar valley. Major part of its tract is predominantly black cotton soils.

The western tract comprises Pathikonda, Tuggali, Maddikera, Devanakonda, Gonegandla, Dhone, Peapully, Veldurthy, Bethamcherla, Krishnagiri, Kurnool, Orvakal, Kallur, Kodumur, C.Belagal, Gudur, Yemmiganur, Nandavaram, Mantralayam, Adoni, Peddakadubur, Kosigi, Kowthalam, Alur, Aspari, Holagunda, Halaharvi, ChippagiriMandals. The terrain here slopes from South to North and it is drained by the river Hundri which joins the river Tungabhadra at Kurnool. The soils in the North Western traversed parts by the river Hundri are black cotton while the South Eastern parts are predominantly pure red soils.

The study area comes under the Agro-Climate Zone VI with its scarce rainfall and high ranges of temperature conditions in Rayalaseema area. The wind velocity in the area varies between 12 to 20 km /h.

Morphologically the area is a rugged plateau terrain comprising structural hill ranges, plateau, pediplanes, and Residual hills, Inselbergs, Mesas, Buttes and pediments as well as pediplanes.

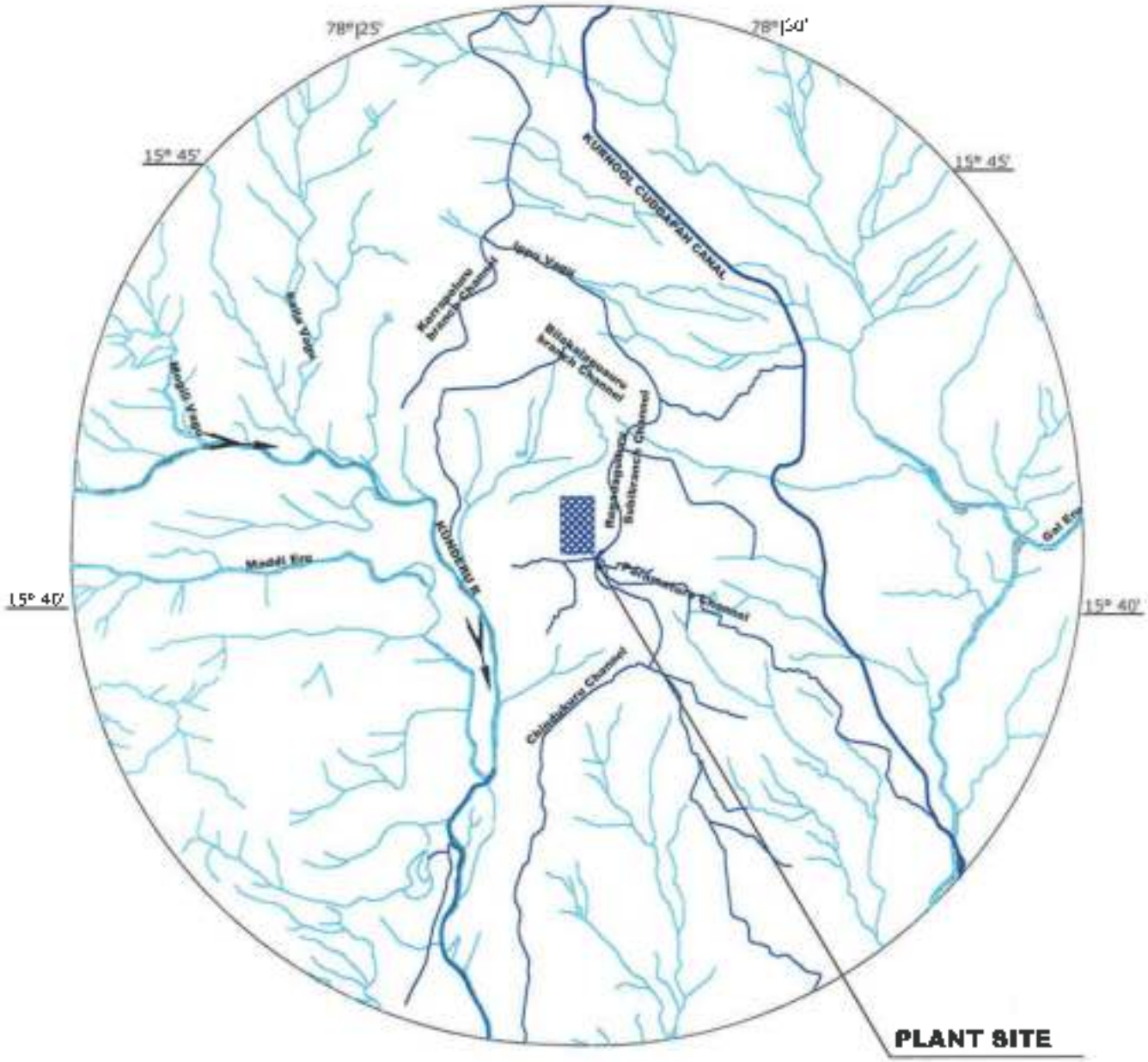
The major morphological units under the denudation landforms near KalvaBugga, Kollamagula and Ramathirtham springs are shallow weathered burriedpediplanes of Auk shale with fractures and below which moderately weathered burriedpediplains of Narji Lime stone with good yields along fractures, joints and bedding planes and cavernous zones. In the up streams of KalvaBugga shallow weathered pediplains of Tadipatrishales are found with fractures and lineaments. At Kollamagula and Ramathirtham the cuesta hills of panyam quartzite with good number of fracture which infiltrates more water through them in to Narji Limestone.

At Konidedu under structural land forms, butte of panyam quartzite and cuesta hills of Panyam quartzite are leading to infiltrate the water into the major fracture with total network of fracture that leads to the flow of precipitated water through them.

At Rangapuram, the shallow weathered burriedpediplains of stills, Vempalle Dolomites and cuesta of vempalli dolomites, where expectations of water along the fracture/limestone above which the structural hills of Bairankonda quartzite with fractures which leads the origin of springs.

At JSWCL site the elevation is approximately at 252 m above mean sea level. The lower elevations of 235m are observed in the southwestern part of the mine area and the highest elevation of 252 m is observed where the present plant is located. The study area is an elevated terrain exhibiting a dome like structure with slopes in all directions. It is also located on the surface water divide. Parallel drainage pattern is observed in the quartzite and dendritic drainage is observed in limestone. Regadaguduru canal running north to south and borders the eastern part of the study area. A few first order streams were found to emanate from the site flowing towards north west and west. Kunderuriver flowing from northwest to south is at a distance of about 1.5 km from the site boundary.

Fig-3.6 Shows the drainage pattern of the Study area.



N

LEGEND

- STREAMS/ TANKS
- CANALS
- RIVER
- PLANT SITE

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SCALE

0 3 6 km

FIG - 3.6

CLIENT : **M/s. JSW CEMENT LIMITED**

PROJECT : CLINKER PRODUCTION CAPACITY
(3.1 MTPA OPC TO 3.7 MTPA OF PSC) TO 4.8 MTPA (OPC/PSC/GGBS)
Bukkapatnam Village, Gadivemula Mandal, Kurnool District, Andhra Pradesh

TITLE : **DRAINAGE MAP**

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

68/1

3.4.3 HYDROGEOLOGY

A review of the regional report conducted for DST covering Upper Kunderu Sub Basin in which the study area forms part, about 350 wells have been inventoried. These wells are reported to be tapping the ground water in four litho units namely NandyalShales. Quartzites. KoilkuntlaLimestones, TadpatriShales. Out of the 350 wells inventoried, 33 are dug cum borewells.125 are borewells and 187 are dugwells. The dugwells vary in depth from1.5 m to 15m and all of them are used for agriculture. About 90% of the dugwells in the area are tapping groundwater from Nandyal shale and Tadpatri Shale. The borewells drilled in eastern part of the Kanderu basin (wherein the mine plant area falls) are reported to be tapping ground water from Koilkuntla limestone.

In JSWCL area the rock types encountered are shales, sandstones, quartzites, limestones, grits which vary in compaction and cementation. The primary porosity is almost lost subsequent to deposition. The occurrence of groundwater is limited to bedding planes,joints, fractures and its movement is along these planes. The limestones are cavernous at someplaces and constitute huge reservoirs of groundwater. The type of groundwater extracting structures in the area is Borewells, dugcumborewells with their shallow water levels under water table conditions. Koilkuntla limestone at places shows subsurface solution cavities which yields copious amounts of yield. The depth of the borewell is in the range of 40 to 60m.

A review of geotechnical investigation data within JSW plant site indicates presence of whitish grey fissured and fractured limestone to a depth of 20m.

In order to understand the hydrogeological set up in and around the study area, the hydrogeologists of EGSS conducted a hydrogeological detailed groundwater survey.

There are six borewells and out of that about three borewells meet the present water demandduring the construction phase. The depth of the borewells ranges from 60 to 70m below ground level. The borewells are pumped for about 3 - 4 hours in a day. A short duration yield test was conducted in these borewells. Based on the test, it is inferred that the

yield of the borewells ranges from 10 cu.m to 18 cu.m per hour. The borewells are installed with submersible pumps of capacity ranging from 15HP to 20 HP.

In the nearby Bilakalagudurn village, which is at a distance of about 1.7 km from the study area, there are about 900 households with a population of around 5000. The daily water requirement is met from groundwater sources through borewells. There are about 10 borewells drilled in the village catering to the daily water requirement. The depth of borewells ranges from 80 – 100m below ground level and the yield from 5cu.m to 10 cu..m per hour. The yielding zones tapped through bore wells are at 40m and 60m below ground level tapping mainly the limestone formation.

In Korapaleru village which is at a distance of about 6.0Km from the study area there are about 200 households with a population just exceeding 1000. The daily water requirement is met from groundwater sources ie., through open wells and borewells. There are about 5 borewells and 3 open wells drilled in the village catering to the daily water requirement. The depth of borewells ranges from 50 – 60m below ground level and the yield from 3cu.m to 10 cu.m per hour. The yielding zones tapped through borewells are at 20m and 40m below ground level tapping the limestone formation. The pre monsoon water level is at around 4m bgl and that of post monsoon is reported to be around 2m bgl.

In Alaganuru village which is at a distance of about 7.5.Km from the study area, there are about 300 houscholds with a population of about 2500. The daily water requirement is met from borewells. There are about 10 borewells drilled in the village of which 4 borewells are in operation at present and are catering to the daily water requirement. The depth of borewells ranges from 50 – 60m below ground level and the yield from 2cu.m to 5 cu..m per hour. Shallow open wells of 10m depth normally go dry during summer. This village is located very near to the KC canal.

In Rchadagudur village which is at a distance of about 3.5.Km from the study area, there are about 1300 houscholds. The piped water supply is minimal and not able to meet the daily water requirement of all the households. Hence borewells have been drilled individually at the household level to meet the daily water requirement. The depth of

borewells ranges from 40 – 50m below ground level and the yield from 2cu.m to 10 cu,.m per hour. The first water strike in the borewellsis reported to be at 20m below ground level.

In Pesaravayi village which is at a distance of about 5.5 Km from the study area, there are about 700 households. The piped water supply is minimal and not able to meet the daily water requirement of all the households. Hence borewells have been drilled individually at the household level to meet the daily water requirement. The depth of borewells ranges from 60 – 70m below ground level and the yield from 2cu.m to 5 cu..m per hour. The first water strike in the borewell is reported to be at 10m below ground level. The borewell water is not used for drinking purposes. The household depend on bottled water supplied at a subsidised rate by the local elected representative.

In velpanur village which is at a distance of about 6.0.Km from the study area, there are about 2000 households. The daily domestic water requirement is met from both piped water supply and also through borewells drilled at household level. The depth of borewells ranges from 60 – 70m below ground level and the yield from 5cu.m to 10 cu,.m per hour. The quality of borewell water is reported to be good and used for drinking purposes.

In Bollevaram village, which is at a distance of about 9.0.Km from the study areaand at an elevation of 330 m above msl, there are about 1300 households. The daily domestic water requirement is met from borewells and they're also using canal water for non-drinking domestic purpose. The depth of borewells ranges from 130 to 160m below ground level and the yield varies from 2cu.m to 4 cu,.m per hour. The quality of borewell water is reported to be good and used for drinking purposes.

In Bujanuru village which is at a distance of about 2.5 Km from the study area, there are about 3500 households. The daily domestic water requirement is met from borewells, and some People have water pipeline in household to meet the daily water requirement. The depth of borewells ranges from 80– 90m below ground level and the yield from 2cu.m to 4 cu,.m per hour. The quality of borewell ,water is reported to be good and used for drinking purposes.

In Somapuram village which is at a distance of about 4.3 Km from the site area, there are about 500 households. The daily domestic water requirement is met from borewells, to meet the daily water requirement. The depth of borewells ranges from 45 to 80m below ground level and the yield from 2.5 cu.m to 3 cu..m per hour. The quality of borewell water is reported to be good and used for drinking purposes.

In Bhojanam village, which is at a distance of about 8..Km from the study area, there are about 2000 households. The daily domestic water requirement is met from hand borewells and they are using the canal water for general purpose. The depth of borewells ranges from 35 -45m below ground level and the yield from 2.5cu.m to 3 cu.m per hour and water observed 40 ft. The quality of borewell water is reported to be good and used for drinking purposes.

In Madhavaram village, which is at a distance of about 9.5Km from the study area, there are about 1500 households. The daily domestic water requirement is met from hand borewells and they are using the canal water for general purpose. The depth of borewells ranges from 35 to45m below ground level and the yield from 2.5cu.m to 3 cu..m per hour and water observed 50 ft. The quality of borewell water is reported to be good and used for drinking purposes.

In Grandlvemula village, which is at a distance of about 4.5Km from the study area, there are about 600 households. The daily domestic water requirement is met from borewells and many people have water pipeline supply in household. The depth of borewells ranges from 60to65m below ground level and the yield from 3 cu.m to 5 cu..m per hour and water observed 28m. The quality of borewell water is reported to be good and used for drinking purposes.

In Chindkur village, which is at a distance of about 6.0.Km from the study area, there are about 2500 households. The daily domestic water requirement is met from borewells and 95 % people have water pipeline supply in household. The depth of borewells ranges from 30to35m ft below ground level and the yield from 3 cu.m to 5 cu..m per hour and water observed 40 ft. The quality of borewell water is reported to be good and used for drinking purposes.

In Gadigavemula village, which is at a distance of about 8.0.Km from the study area, there are about 2800 households. The daily domestic water requirement is met from borewells. The depth of borewells ranges from 45-65m below ground level and the yield from 3.5 cu.m to 5 cu.m per hour.The depth to water level at the time of study is at around 14 m bgl. The quality of borewell water is reported to be good and used for drinking purposes.

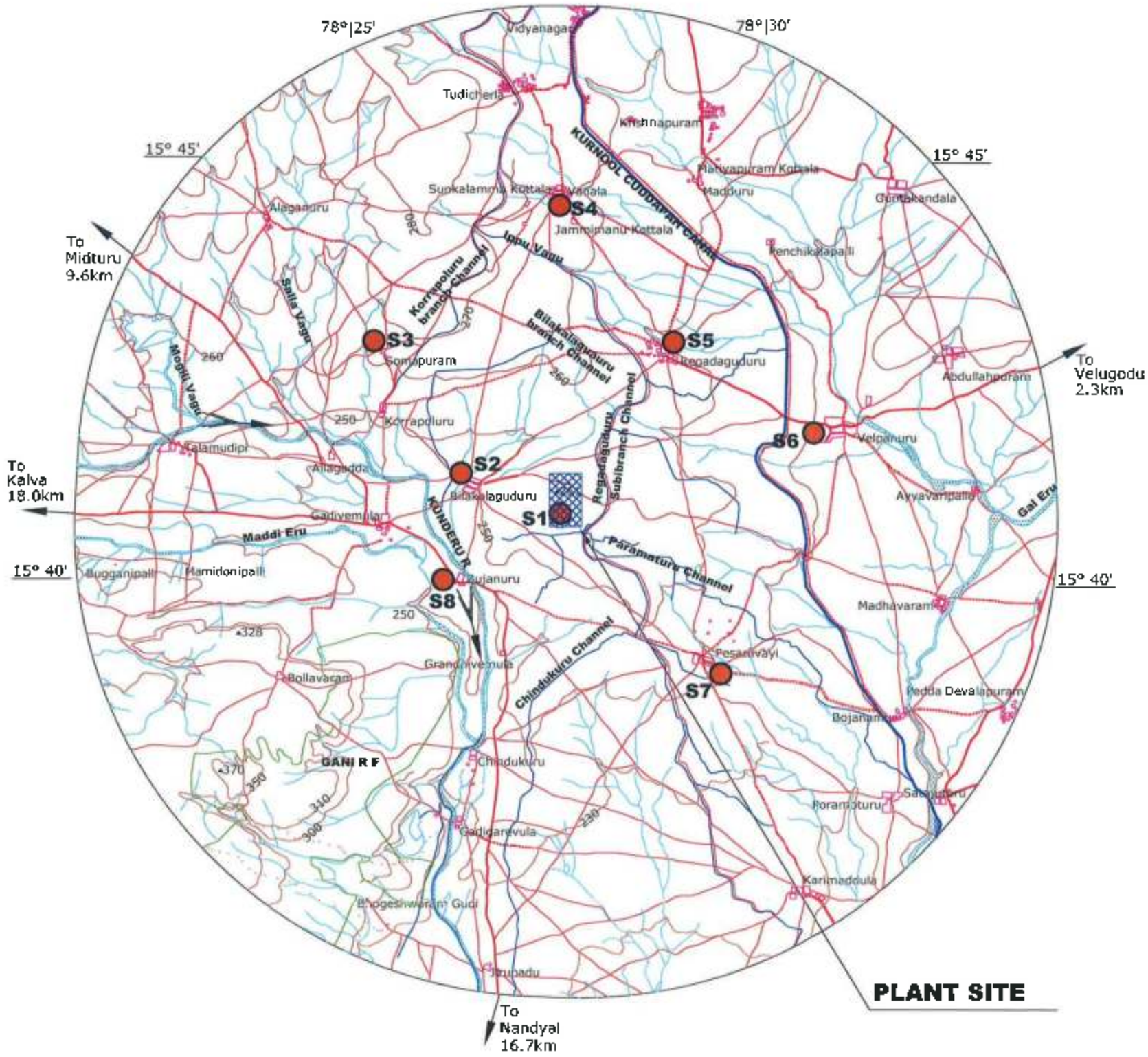
The study area is bounded by the Kurnool Cuddapah Canal and it supply channels on all directions. The KC canal is reported to have water flowing for about 8 -9 months in a year excepting the summer months of Apr – Jun. The main canal and the supply channels do contribute to the groundwater system in the area.

D)SOILS

The most dominant type of soil in the area is the black-cotton soil which is present in thickness ranging from less than a meter to as much as 1.5m in the cultivated and agriculture lands. Thinner patches of soil are present in the open scrub covered wastelands where either sheet rock or stony outcrops is absent. Smaller patches of reddish lateritic soil occur amidst the all-pervasive black-cotton soil especially in the northern part of the study area. Sandy soil is also present at places in the northern part where the basal quartzite forms the main litho-unit. In general, the area underlain by limestone, siliceous limestone, calcareous shale and shale is characterized by black to grey soil.

3.4.4 SOIL QUALITY

Representative soil samples were collected from nine sampling locations within an area of 10 km radius around the plant site for analysis of the physico-chemical characteristics of the soil quality. **Fig-3.7** and **Table- 3.8** shows the location of soil sampling stations.



LEGEND

N

- ROADS
- STREAMS/ TANKS
- CONTOURS
- FOREST
- CANALS
- RIVER
- SETTLEMENTS
- SPOT HEIGHT
- PLANT SITE
- SOIL QUALITY MONITORING STATIONS

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$57\frac{1}{1}$	$57\frac{I}{5}$	$57\frac{I}{9}$
$57\frac{I}{2}$	57 6	$57\frac{I}{10}$
$57\frac{I}{3}$	$57\frac{I}{7}$	$57\frac{I}{11}$

SCALE

0 3 6 km

FIG - 3.6

CLIENT : **M/s. JSW CEMENT LIMITED**

PROJECT : **2.5 MTPA CLINKER PRODUCTION**
&
4.8 MTPA OPC/PSC/GGBS PRODUCTION
Bilakalaguduru Village, Gadivemula Mandal, Kurnool District, Andhra Pradesh.

TITLE : **SOIL QUALITY MONITORING STATIONS**

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

TABLE-3.8
SOIL SAMPLING STATION

Code	Location Name	Distance in (km)	Direction w.r.t plant
S-1	Plant Site	--	--
S-2	Bilakalaguduru	1.5	W
S-3	Bujanuru	2.0	SW
S-4	Gadivemula	3.3	W
S-5	Grandhivemula	2.8	SSW
S-6	Allagada	4.6	W
S-7	Korrapoluru	3.7	WNW
S-8	Somapuram	4.3	NW

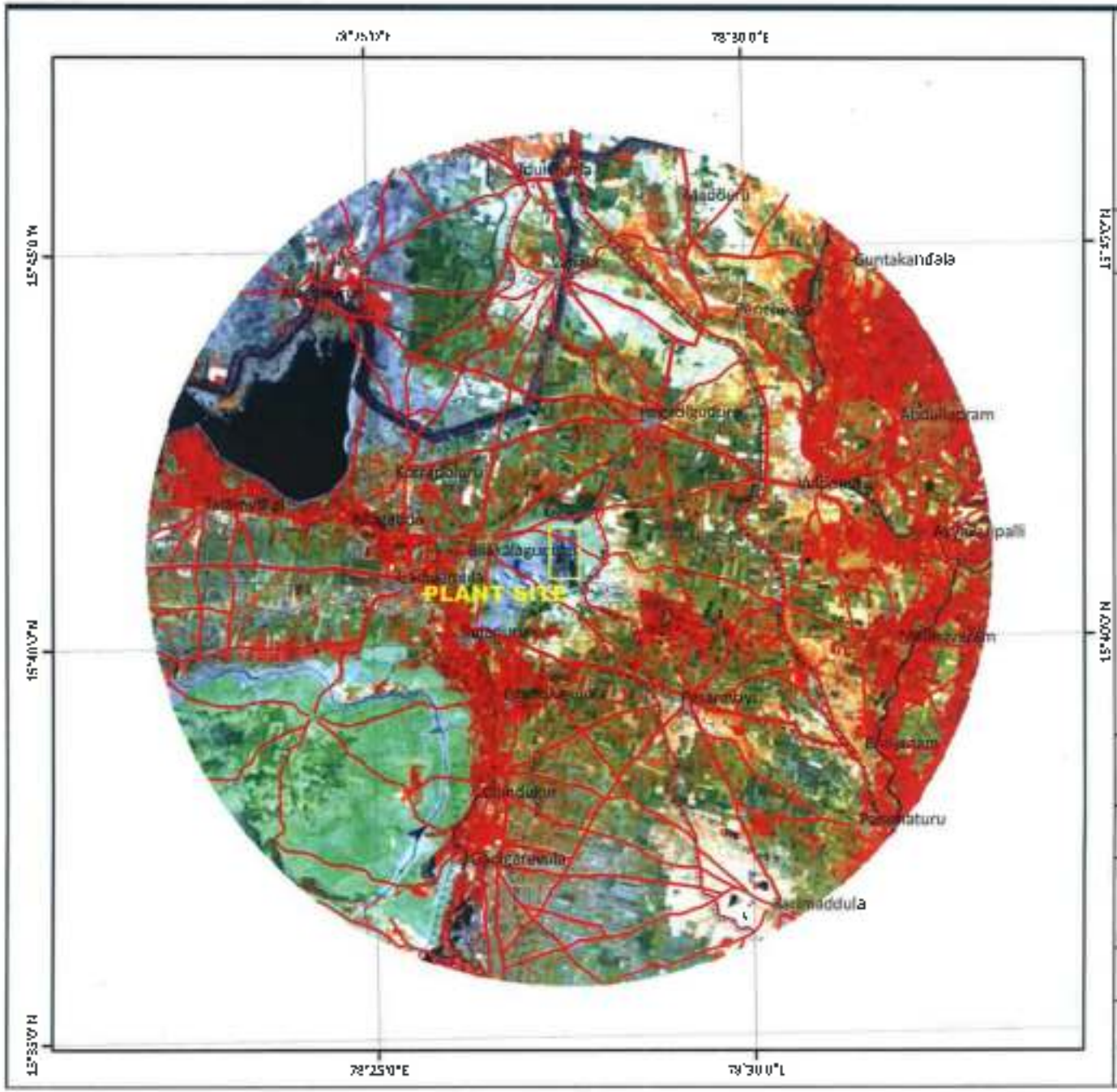
Results of soil sampling analysis are given in **Annexure– 3C.**

3.4.5 LAND USE PATTERN

Landuse pattern of the study area has been assessed through Remote Sensing methodology using IRS-P6, LISS-III geocoded images. **Fig – 3.8** shows the satellite imagery of 10 km radius around the plant. Level – I landuse/ landcover categories identified in the area are built-up, agricultural land, wasteland, forest, water bodies and others. The land use pattern of the study area is given in table below:

TABLE - 3.9
SPATIAL DISTRIBUTION OF LEVEL-II LAND USE / LAND COVER CLASSES WITH IN 10KM RADIUS AREA

S.NO.	LU\LC	AREA	
		km^2	PERCENTAGE
1	Built up land	6.98	2.91
2	Water body	10.31	3.28
3	**Wastelands**		
	1. Land with/without scrub	25.16	8.01
	2.Fallow Land	52.14	16.60
4	Agricultural land		
	a. Double crop	63.82	20.31
	b. Single crop	139.04	44.26
5	Forest	16.68	5.31
TOTAL		**314.13**	**100.00**



N
W
E
S

SATELLITE IMAGERY

CANAL

ROAD

SATELLITE IMAGERY SOURCE DETAILS

SATELLITE	:	IRS P6 LIS III
PATH/ROW	:	100/062
DATE OF PASS	:	24 APR 2015

0 0.5 1 2 3 4 5 Kilometers

CLIENT:
M/s. JSW CEMENT LIMITED

PROJECT:
2.8 MTPA CLINKER PRODUCTION
&
4.8 MTPA OPC/PSC/GGBS PRODUCTION
Bhetalagudur Village, Dachepalle Mandal, Guntur District, Andhra Pradesh

TITLE:
SATELLITE IMAGERY

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

FIG - 3.7

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, vacant land, etc. In the study area the built-up land consists of settlements like Regadigudur, Korrapolur, Allagadda, Gadivemula, Pesaravayi, Madduru, Vanala, Bollavaram.

The total area estimated in this category is 6.98 sq.km or 2.91% of the total study area.

2. AGRICULTURAL LAND

The common crops are Oryza sativa, Triticumvulgare, Triticumdiococcum, Pennisitumglaucam, Sorghum vulgare, Zea mays, and commercial crops like ground nut, sunflower and several vegetable crops like Brinjal, Bhendi and leafy vegetable.

The main source of water for this activity is through canals/River/groundwater.

SINGLE CROP

This category occupies an area of 139.04 km^2 or 44.26 % of the total area.

DOUBLE CROP

This category occupies an area of 63.82 km^2 or 20.31 % of the total area.

3. WASTELAND

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 consist of shrubs and Stoney waste. This category is observed in patches in the entire study area. It occupies an area of 77.3 sq. km or 24.61% of the total area.

4. FOREST LAND

The Forest land in the study area accounts 16.68 sq. km or 5.31% of the total study area.

5. WATER BODIES: RIVER/STREAM

These classes comprise areas of surface water either impounded in the form of ponds, rivers and flowing streams etc. The water bodies account for 10.31 km² or 3.28 % of the total study area.

Fig – 3.9 shows the Landuse and Landcover map of 10 km radius.

3.5 BIOLOGICAL ENVIRONMENT

Secondary data on ecology of the study area were obtained from available literature including that from the Forest department. The primary data relating to flora and fauna of the area was generated on site through a detailed ecological survey.

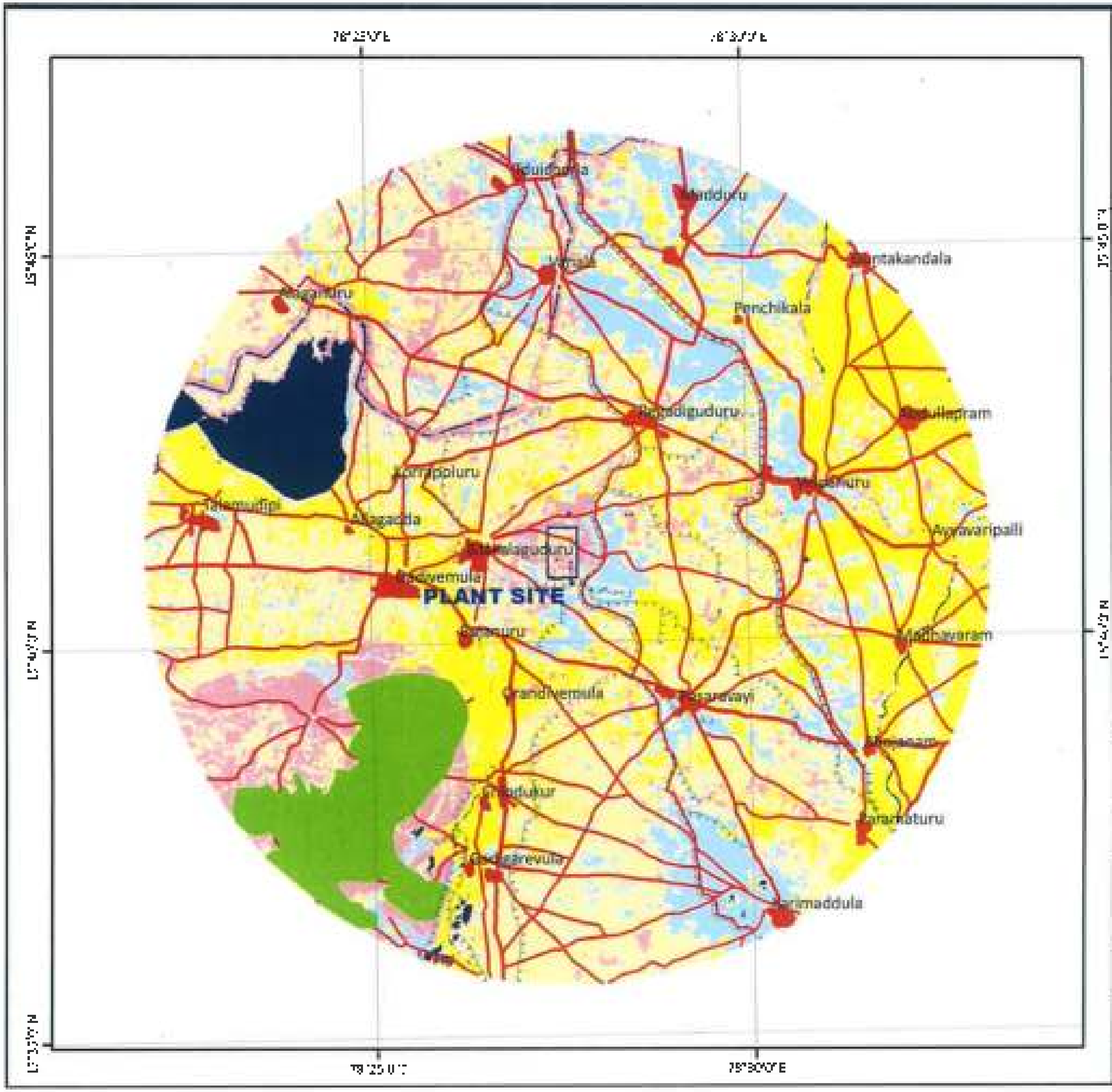
3.5.1 METHODOLOGY FOR FLORAL AND FAUNAL STUDY

Forest types were closely observed and identified, as also vegetation types were sampled for assessing ecological status. The forest types were based on the composition of the forests and dominant species found in them. The identified forest types have been confirmed from published and authenticated sources.

The vegetation was sampled by employing the standardized field ecological sampling methods (transect and quadrant method). Both Terrestrial Ecosystem and Aquatic Ecosystem were studied. The study of terrestrial ecosystem covers the forest type analysis, floral analysis, faunal analysis and assessment of agriculture and livestock, etc.

PHYTO- SOCIOLOGICAL ANALYSIS

Phytosociological studies were carried out by using least count quadrate method. Trees and shrubs were sampled by taking quadrates of 100m² and in case of herbaceous vegetation of 1 m² distributed randomly. Their girths (GBH at 132 cm from the ground) were recorded. The data obtained was further used to estimate



LANDUSE LANDCOVER

CANAL
ROAD

Classification	Area in Ha	%
Agriculture Double Crop	6382.03	20.31
Agriculture Single Crop	13904.26	44.28
Agriculture Fallow Land	5214.57	16.60
Forest	1668.56	5.31
Land with/without Scrub	2516.35	8.01
Builtup Land	658.41	[illegible].91
Water Body	1031.67	3.75

0 0.5 1 2 3 4 5 Kilometers

CLIENT: M/s. JSW CEMENT LIMITED

PROJECT: 2.5 MTPA CLINKER PRODUCTION & 4.8 MTPA OPC/PSC/GGBS PRODUCTION

TITLE: LANDUSE LANDCOVER

PREPARED BY
J.S. ENVIRO-TECH (P) LTD
Secunderabad

FIG - 3.8

Relative Frequency, Relative Density, Relative Basal area and calculated Importance Value Index (IVI). Five locations were identified in study area and details are presented in the following table

SAMPLING LOCATIONS IN THE STUDY AREA

At each sampling location the protocol adopted to collect primary data were 5 quadrates of 20X20 m for trees and 5 x 5m for shrubs and 1m x 1m for herbs.

Fig – 3.10 shows the Phyto- Sociological Analysis locations map of 10 km radius.

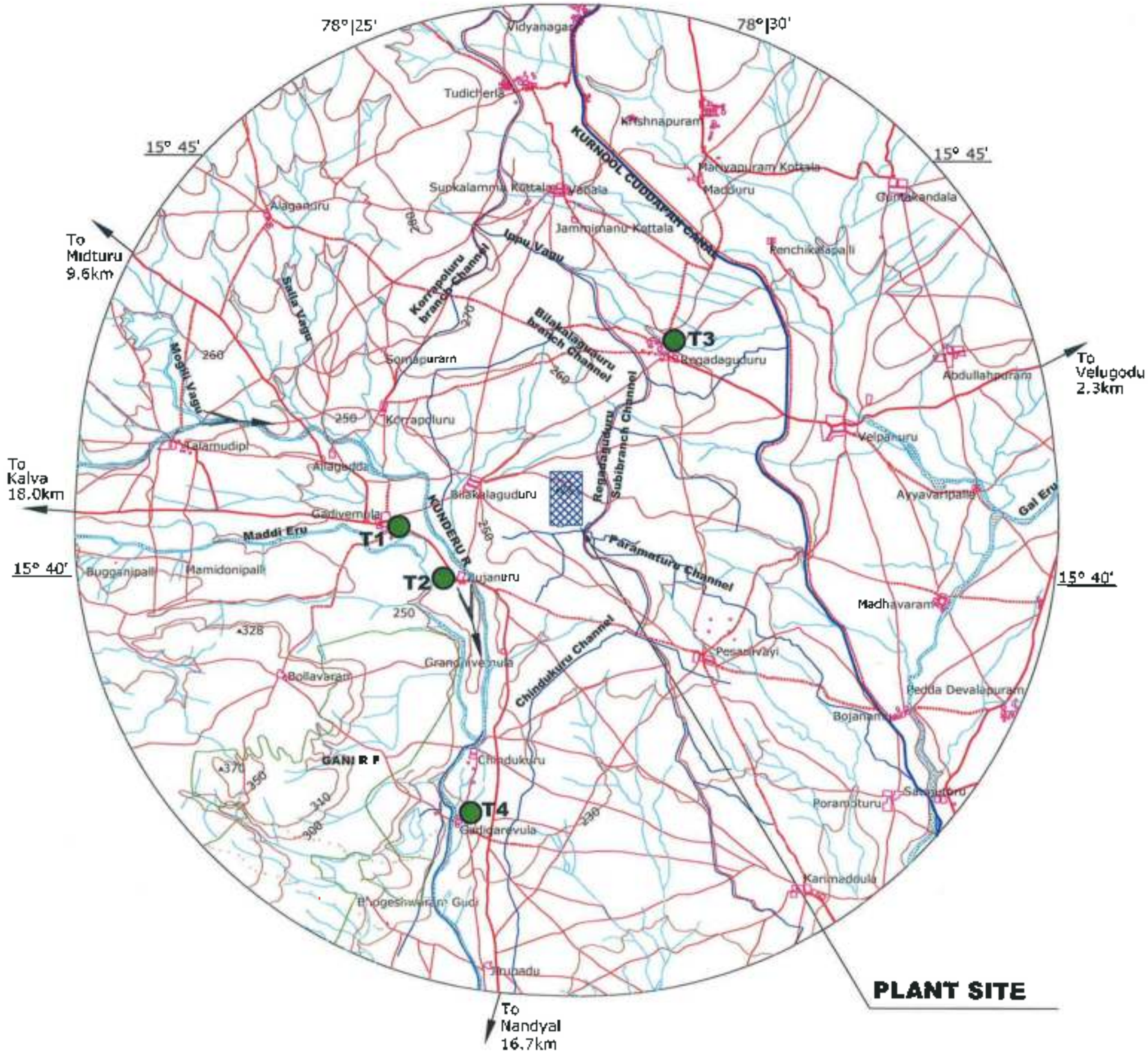
TABLE - 3.10

Sr. No.	Location Code	Name of the location	Distance from plant site(in km)	Direction from plant site
1	T-1	Gadivemula Village	3.4	W
2	T-2	Bujanuru	2.0	WSW
3	T-3	Regadagudduru	3.0	NE
4	T-4	Gadigarevula	6.4	SSW

In case of faunal assessment primary data was collected on site by direct citing or by recording the occurrence of pug marks, foot prints, scat, nesting site etc. in the study area. Secondary data were obtained from the Forest Department, Surveyors, local people etc.

IMPORTANCE VALUE INDEX AND SPECIES DIVERSITY INDEX

The Importance Value Index (IVI) is a statistical quantity which gives an overall picture of the importance of the species in the vegetative community. It considers the relative values of density, frequency and basal area of every species in given area. It thus incorporates three important parameters which are measures of diversity and productivity of every species. In any community structure, the quantitative value of each of the frequency, density and basal area and basal cover has its own importance. But the total picture of ecological importance cannot be obtained by one of these vegetation structure in respect to varying environmental factors can also be studied through such study of basal area, density and frequency of the community. The Importance value index as such, gives the total



LEGEND

- ROADS
- STREAMS/ TANKS
- CONTOURS
- FOREST
- CANALS
- RIVER
- SETTLEMENTS
- SPOT HEIGHT
- PLANT SITE
- PHYTOSOCIOLOGICAL MONITORING STATIONS

N

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57 I/2	57 I/6	57 I/10
57 I/3	57 I/7	57 I/11

SCALE

0 3 6 km

FIG - 3.9

CLIENT : **M/s. JSW CEMENT LIMITED**

PROJECT : **2.5 MTPA CLINKER PRODUCTION & 4.8 MTPA OPC/PSC/GGBS PRODUCTION**
Bilakaluguduru Village, Gadivemula Mandal, Kurnool District, Andhra Pradesh.

TITLE : **PHYTOSOCIOLOGICAL MONITORING STATIONS**

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

picture of sociological structure of species in a community but it does not give the dimension or share of relative values of frequency, density and dominance. The dominant plant species observed in all sampling locations are *Dalbergiatssoo, Euphorbia antiquorrum, Tephrosiapurpuiajatrophasp, Cassia occidentalis, Cassia tora and Parthemiumhystreophorus.*

Diversity means variety or variability. Species diversity therefore refers to the variation that exists among the different living forms. It is estimated that there are more than 50 million different species of living organisms on the earth. With the growing concern of species going extinct at a very rapid pace, identification of the different species of plants and animals and conserving them is of primary importance. Species indicates the extent of biodiversity in the ecosystem. Species diversity is a statistical abstraction with two components. These are the number of species or richness and evenness or equitability. For better understanding of plant diversity, the Shannon-Weaver index of diversity was used. The index considers two important characters of vegetation. *i.e.* floristic richness and proportional abundance of the species. Diversity index is increases with the floral spectra (more species means that more wide species diversity) that show that undisturbed scenario of ecosystem. The index is given as:

$$H' = - \text{sum} (Pi \ln Pi)$$

Where
Pi = Proportional abundance of the I^{th} (individual) species
H' = Shannon-Weaver diversity index

The highest Importance value index of studied locations varies between 7.30 and 66.38 study area and the details of IVI are presented in the table below.

The species diversity varies between 2.25 and 2.42 in studied population and highest was recorded in T-3 (Regadaguduru) and lowest in T-1 (Gadivemula) for perennial vegetation. The species diversity indices for live sampling locations are presented in the following table.

DETALS OF IMPORTANCE VALUE INDEX IN STUDY AREA

Code	Location	Range of IVI	Diversity index of herbal vegetation	Diversity index for perennial vegetation
T-1	Gadivemula Village	7.11-58.20	2.19	2.36
T-2	Bujanuru	7.30-66.38	2.76	2.42
T-3	Regadaguduru	6.12-58.45	2.86	2.25
T-4	Gadigarevula	4.50-42.53	2.31	2.40

METHODOLOGY FOR AQUATIC ECOLOGY STUDY

In order to study aquatic life (flora and fauna), one time survey was undertaken during the winter season. Major components of aquatic life under study area are listed below:

PLANKTONS

50 liters of water samples were collected and filtered through plankton net (40 µ mesh size) for plankton collection. Samples were then preserved in formalin (1% concentration) for laboratory analysis of species diversity and load (Number/ liter).

MACRO FAUNA

Macro fauna was studied by field collection and observation with the help of field binocular. Fish fauna was studied with the help of drag net and secondary data was collected from the leaseholder of the lake. Aquatic bird, amphibia and reptiles were studied by field observation and secondary data was collected from the local residents.

3.5.2 IDENTIFICATION OF FLORA

The species of flora found during the species identification survey within and in the forest tracts adjacent to the mining lease area are given as **Annexure-3D.**

PHYTO SOCIOLOGY OF FLORA

SPECIES FREQUENCY

The forests in study area are falls scrub forest type. Gani Reserve forestis major component occupied in study mainly comprised of rocky outcrops covered with Acacia leucophloe, Acacia horrida, Acacia Senegal sp, Euphorbia antiquorum, Disopyroschiroxylon, in gorge areas and top of hill range mainly composed of Azadirachtaindica, Dalbergiasisoo, Boswellaserrata, Maytenusemerginatus, Soymidafabrifuga and Grewia sp.

ENDEMIC, THREATENED AND ENDANGERED PLANT SPECIES

In the floristic checklist, the study area shows rich floristic diversity. Number of floral species in the study area are 228. A good number of species are commercially cultivated in orchards. Number of plant species have medicinal value and also important for other non-timber produces. From the present survey it appears that none of the endangered plant species exist in the study area.

AGRICULTURE

The common crops are *Oryza sativa, Triticumvulgare, Triticumdiococcum, Pennesitumglaucum, Sorghum vulgare, Zea mays,* which are mainly dependent on rainwater during monsoon season and also through ground water source, tubewells, open wells during non-monsoon season. Apart from the commercial crops like ground nut, sunflower and several vegetables likeBrinjal, Bhendi and leafy vegetable crops could also grow in this region. The detail of staple crops and commercial crops in study area is enclosed as **ANNEXURE-3 D.**

3.5.3 FAUNA AND WILDLIFE

The present study reveals that 7 mammalian species, 26 avian species and 2 reptilian species were recorded from this area.

MAMMALIAN SPECIES

The current survey recorded 7 species from the study area. Out of these, Common Mongoose (*Herpestreseduardstnjula*), Jackal (*Canisaurius*) are found to be under Part-II of Schedule-II as per wildlife protection act,1972 but Least Concern under IUCN category. These are very common in all forested areas throughout country and need not to take conservation steps except to protect their natural habitats.

WILDLIFE CORRIDORS, SEASONAL MOVEMENTS AND MIGRATION

No such zones are present in the study area.

AVIAN SPECIES

The survey results show that 26 species of birds are recorded and none of them are rare or endangered or migratory.

REPTILIAN SPECIES

The survey recorded 2 species of reptiles in the study area. Out of these, *Najanaja* (Common Cobra) under Schedule-IV as per wildlife protection act. 1972 but Least Concern under IUCN category. These are very common in all forested areas throughout country and need not to take conservation steps except to protect their natural habitats.

THREATENED AND ENDANGERED ANIMAL SPECIES

None of the species are under endangered and threatened species, and not listed in the Schedule I of the Indian Wildlife (Protection) Act, 1972 as amended in 1991.

A detailed list of all the mammalian, avian and reptilian species including the endangered and threatened species recorded in the study area is given in **Annexure –3D.**

3.5.4 AQUATIC ECOSYSTEM

On the basis of field observations and interactions with elderly people of the area, literature survey reveals that no aquatic animals have spawning, breeding, nesting or nursery of Turtles and other aquatic animals in study area.

3.6 SOCIO ECONOMIC ENVIRONMENT

The description of the demographic and socio-economic environment within the study area is based on Census Data (CD based data) of Kurnool Districts.

The census data has been analyzed with respect to various demographic and socio-economic parameters for the study area and the results are represented in the following sections.

Population

The population profile shows that total population of the study area villages is 187006. The villages falling in this Study area are BilakalaGudur, Bujanur, Regadigudur, Korrapolur, Allagadda, Gadivemula, Pesaravayi, Madduru, Vanala, Bollavaram, Chindukuru, Gadigarevula, Velpanur, Krishnapuram, Alaganur, Talamudipi, Bugganipalle, Karimaddala, PeddaDevalapuram, Madhavaram, Abdullapuram, Allagaddathe highest population (79126) and Abdullapuramvillage has the lowest population (1284).The total population density of the study area is about 595 persons/sq. km. The population profile of the study area is given in **Annexure- 3E.**

POPULATION, HOUSEHOLD SIZE & SEX RATIO IN THE STUDY AREA

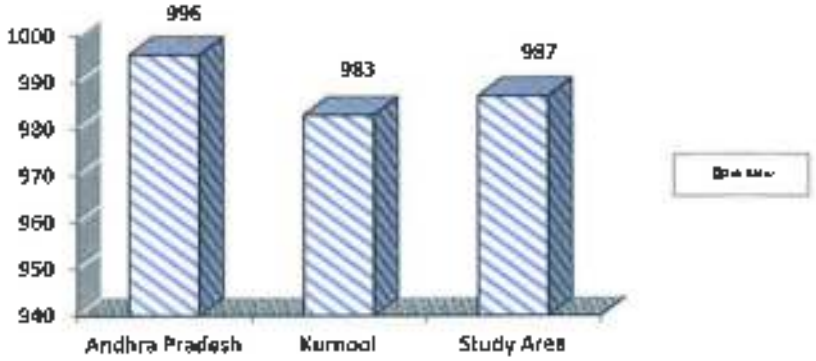
	Total (0 - 10 km)
Household	44812
Population	187006
Male Population	94126
Female Population	92880
Household Size	4-5
Sex Ratio	987

Source: - Census: 2011

Sex Ratio

The sex ratio for the state (Andhra Pradesh) and district (Kurnool) is 996 and 983 respectively. The average sex ratio in the whole study area is 987. The details are given in **Annexure- 3E.** Comparative Sex Ratio is given in below **Figure.**

Sex Ratio in the Study Area

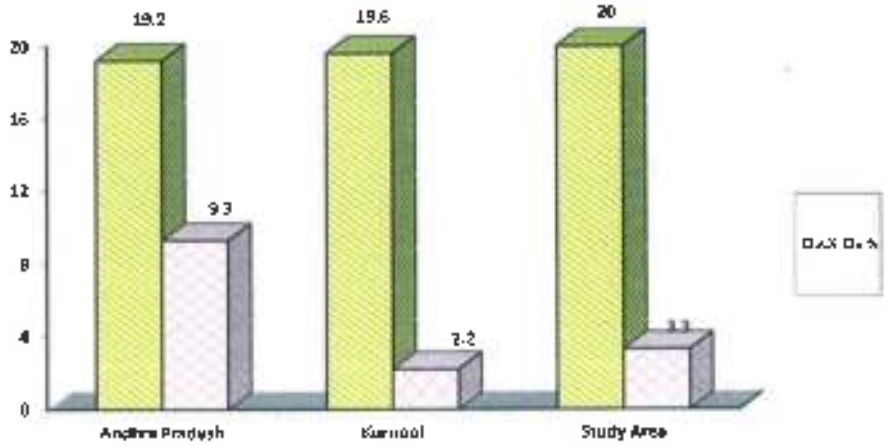


The Percentage of SC population for state (Andhra Pradesh) and district (Kurnool) is 19.2% and 19.6% respectively. The percentage of SC population for the whole study area is 20.0%, which is higher than state and district SC population percentage.

The percentage of ST population for state (Andhra Pradesh) and district (Krishna) is 9.3% and 2.2% respectively. There is 3.3% of ST population in the whole study area.

Comparative analysis of SC & ST population is given in below **Figure.** The details of SC & ST population are given in **Annexure- 3E.**

Comparative Analysis of SC & ST Percentage in the Study Area



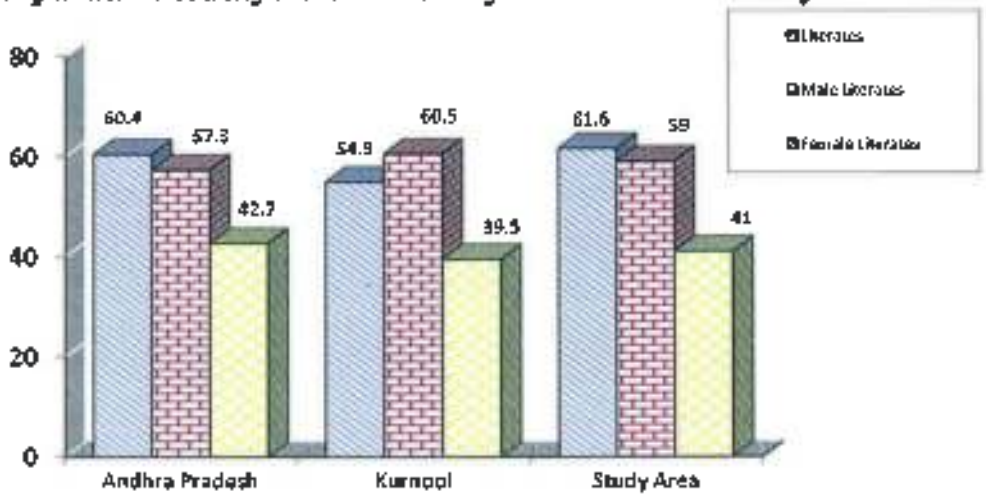
Literacy

The literacy level for state (Andhra Pradesh) and district (Kurnool) is 60.4% and 54.9% respectively. The literacy percentage of the study area is 61.6 %, which is higher than state and district levels.
The literacy level of the male population for state (Andhra Pradesh) and district (Kurnool) is 57.3% and 60.5% respectively. The literacy level of male population for the study area is 59.0%, which is higher than state and lower than district.

The literacy level of the female population for the state (Andhra Pradesh) and district (Kurnool) are 42.7% and 39.5% respectively. The literacy level of female population for the study area is 41.0% which is lower than statcandhigher than district.

The Literacy status of the study area is given in **Annexure-3E.** Comparative analysis of literacy level is given in below **Figure.**

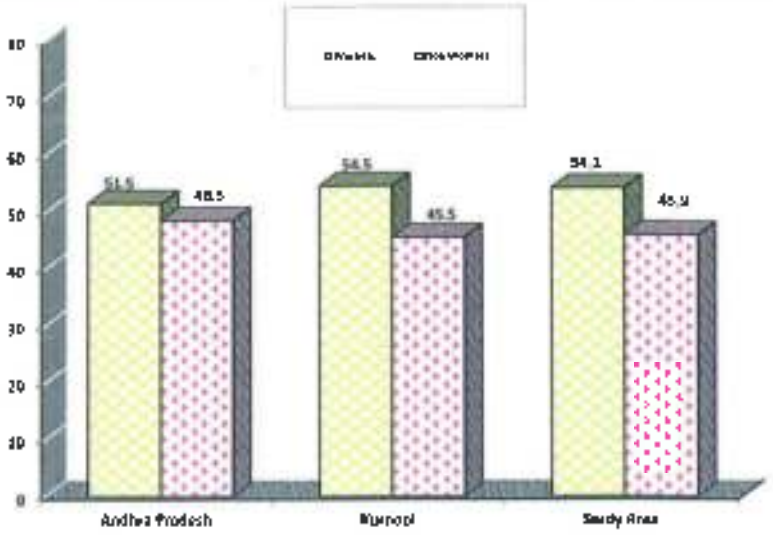
Comparative Analysis of Literacy Level in the Study Area



Economic Pattern and Livelihood

Total work participation rate in whole study area is 54.1% of the total population, which is higher than the state and lower than district worker participation rate (51.5% & 54.5% respectively). The main workers in the whole study area are 46.6% and marginal workers are 7.5% of the total labor force.

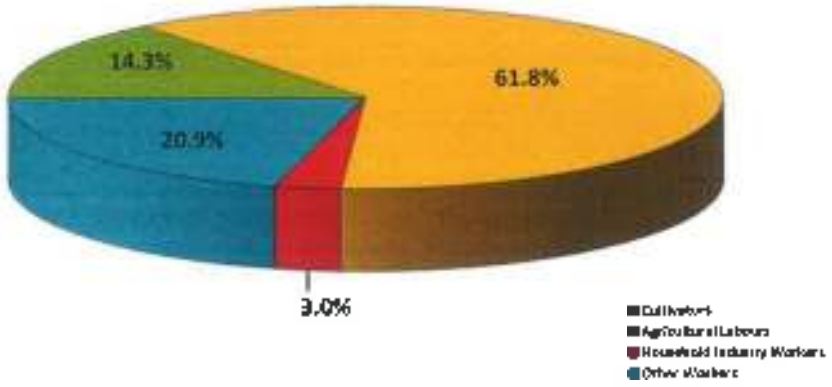
Comparative Analysis of the workforce in the Study Area



The employment pattern in the villages suggest that only 14.3% work as cultivators, 61.8% as agricultural labors, 20.9% as other workers and 3.0% as household industry workers. Most of the villagers are agriculturists. The occupation status in the study area is given in **Annexure-3E.**

Comparative analysis of zone wise work force is given in below **Figure**

Comparative Analysis of Economic Activity in the Study Area



The male workers in the study area account to 70.3% of the total working population. The female workers in the study area account to 29.7% of the total working population.

It has been observed that household activities such as pre-cooking, cooking, post-cooking, washing clothes, cleaning house, collection of

fuel wood, care of children are left to women with negligible involvement of men. The details are given in below table.

WORK PARTICIPATION: MALE & FEMALE

Category	Study Area			
	Male		Female	
	No.	%	No.	%
Total Workers	55837	55.2	45289	44.8
Main Workers	50490	57.9	36639	42.1
Marginal Workers	5347	38.2	8650	61.8
Cultivators	10177	70.3	4292	29.7
Agricultural Laborers	28670	45.9	33820	54.1
Household Industry Workers	1668	55.3	1349	44.7
Other Workers	15322	72.4	5858	27.6

INFRASTRUCTURAL FACILITIES AND AMINITIES:

The infrastructure and amenities available in the area denote the economic wellbeing of the region. A review of infrastructural facilities available in the study area has been done based on the information given in the amenities census data (village level). Summary of the same is given below:

Amenities Available

Infrastructure Facilities*			
Water facilities*			
Tap	12	River	22
Well	20	Canal	21
Tank	21	Lake	22
Tube Well	20	Spring	21
Hand Pump	12	Others	22
P & T Facilities			
Post Office	11	Post & Telegraph Office	1
Telegraph Office	1	Telephone Connection	1260
Power Supply	Available for all purpose in all villages		

Infrastructure Facilities*			
Medical Facilities*			
Maternity & Child Welfare Center	4	Family Welfare Center	9
Public Health Sub Center	16		
Education Facilities			
Primary School	47	Sr. Secondary School	7
Middle School	18	College	1
Secondary School	9		

* Facilities available in no. of village

CHAPTER - 4

ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

CHAPTER – 4: ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.0 ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

JSWCL has incorporated all necessary steps to mitigate the environmental pollution in the design stage itself. Environmental Management Plan of the plant details the environmental quality control measures by JSWCL during operations phase of the project in order to maintain environmental quality within the stipulated standard limits specified by State Pollution Control Board, CPCB and Ministry of Environment and Forests.

JSWCL has designed Environmental Management plan as per CPCB's Charter on Corporate Responsibility for Environmental Protection (CREP). The Compliance of the Charter on Corporate Responsibility for Environmental Protection is given in **Table – 4.1**

JSWCL has implemented Eco friendly operations as detailed below in the plant and the same will be continued after expansion:

JSWCL is designed to produce 100% eco-friendly cement (Portland Slag Cement or PSC).

❖ **Lowest Dust emission from the chimneys:** JSWCL has installed Bag Houses/ Pulse Air Bag House at every production unit. In addition, Pulse Bag Filters are installed at every material transfer point.

All the Bag Houses as well as the Pulse Bag Filters are designed to control the dust emission below **30** mg/Nm^3 or 20 gm/tonne clinker (for kiln stack only).

Lowest GHG emission intensity (approx. 0.50 t CO2/ t PSC as against 0.90 & 0.631 CO_2/t cement for OPC & PPC respectively)

This is possible because of two reasons - first, utilization of 50 - 55% slag reduces the Specific Energy consumption and secondly by way of installing Energy efficient grinding mills (Roller Press) having lesser absolute energy consumption.

TABLE – 4.1
COMPLIANCE TO THE CREP

S. No	CONDITION	COMPLIANCE STATUS
1	Cement Plants, which are not complying with notified standards, shall do the following to meet the standards; Augmentation of existing Air Pollution Control Devices - by July 2003. Replacement of existing Air Pollution Control Devices - by July 2004.	Complying with notified standards of PM of 30 mg/Nm^3
2	Cement Plants located in critically polluted or urban areas (including 5 km distance outside urban boundary) will meet 100 mg/ Nm^3 limit or particulate matter by December 2004 and continue working to reduce the emission of particulate matter to 50 mg/Nm3.	Not applicable – located in rural area
3	The new cement kilns to be accorded NOC/Environmental Clearance w.e.f 01.04.2003 will meet the limit of 50 mg/Nm^3 for particulate matter emissions.	Complied. Kiln emission is controlled through Pulse Jet Bag House system to meet the standard of PM 30 mg/Nm^3
4	CPCB will evolve load based standards by December 2003.	--
5	CPCB and NCBM will evolve SO2 and NOx emission standards by June 2004.	Standards of CPCB/MoEFCC are followed
6	The Cement industries will control fugitive emissions from all the raw material and products storage and transfer points by December 2003. However, the feasibility for the control of fugitive emissions from limestone and coal storage areas will be decided by the National Task Force (NTF). The NTF shall submit its recommendations within three months.	CPCB Environmental Guidelines for Prevention and Control of Fugitive Emissions from Cement Plants are being followed • All transfer points and storage silos are provided with dust collection and extraction systems for effective control of fugitive emissions. All the installed pollution control equipment are designed for ≤ 30 mg/Nm^3.

		▪ The dust collected from the pollution control equipment is being recycled back into the process. • Clinker is being stored in clinker storage Silo to control fugitive emissions. • Gypsum and additives are being stored in covered storage sheds. • Slag is stored in stockpile • Cement is being stored in silos. • All raw material transfer conveyors are covered with GI sheet. • Truck mounted vacuum cleaner and road sweeper are deployed and good housekeeping is being maintained for controlling secondary fugitive dust emissions.
7	CPCB, NCBM, BIS and Oil refineries will jointly prepare the policy on use of petroleum cokes as fuel in cement kiln by July 2003.	---
8	After performance evaluation of various types of continuous monitoring equipment and feedback from the industries and equipment manufacturers, NTF will decide feasible unit operations/ sections for installation of continuous monitoring equipment. The industry will install the continuous monitoring systems (CMS) by December 2003.	Continuous online stack monitoring equipment installed for 6 major stacks
9	Tripping in kiln ESP to be minimized by July 2003 as per the recommendations of NTF.	JSWCL has installed Pulse Jet bag Houses in all the sections.

10	Industries will submit the target date to enhance the utilization of waste material by April, 2003.	Gypsum from chemical unit, slag, Flue Dust from steel industries, Pet Coke from Petro-Chem industries are being utilised in cement manufacturing process since inception.
11	NCBM will carry out a study on hazardous waste utilization in cement kiln by December 2003.	-------
12	Cement industries will carry out feasibility study and submit target dates to CPCB for co-generation of power by July 2003.	JSWCL is in the process of installing 9 MW WHRB at Preheater and Clinker Cooler. The Company has also obtained Consent for Establishment from APPCB.

❖ **Lowest Specific Energy consumption** (approx. 65 kWh/t PSC as against 80 & 70 kWh/t cement for OPC & PPC respectively) Lowest.

❖ **Specific Water Consumption** (approx. 0.048 M^3/t cement as against 0.11 & 0.08 M^3/t cement for OPC and PPC respectively). This is possible because of two reasons - first, utililization of 50 - 55% slag reduces the Specific Water consumption and secondly by way of installing Water efficient grinding mills (Roller Press) which, unlike traditional ball mills or VRMs, consumes less amount of water for cooling.

❖ **Lowest* consumption of mined out raw materials** viz. Limestone, Aluminous Laterite, Flue dust, Gypsum, Slag etc. (approx. 0.68 ton raw material extraction per ton cement as against 1.42 and 1.05 tons of raw material extraction per ton cement for OPC and PPC respectively)

Compared to any other type of Portland cement

OPC Substitution rate	Slag Cement (50%)	Fly Ash (20%)
CO_2 emission savings	**53%**	**30%**
Energy Savings	**30%**	**14%**
Reduction in the consumption of extracted raw material	**53%**	**25%**

*Percentage listed for savings in CO_2. Energy and raw material are based on 100% OPC systems compared with systems containing slag cement or Fly Ash substitution.

❖ **Generation of lesser hazardous waste:** Unlike ball mills, Roller Press mills don't have **Girth Gears** that require continuous injection of grease for lubrication which is continuously discharged out from the gearbox as hazardous waste (category 5.2 of HW Rules, 2008)

❖ **Generation of lesser amount of NOx & SOx from the kiln stack:** JSWCL has installed Low NOx Calciner & Low NOx Burner in the kiln system to control the NOx emissions and with the use of low sulphur coal and raw mix with optimum CaO content, the SOx emission from the kiln stack is very low.

❖ **Low Noise generating equipment:** JSWCL has installed the following major equipmentto prevent generation of high noise:

- Wobbler at Limestone crusher
- Grinding of raw material and finished products is performed by Roller Press that generates less noise compared to traditional ball mills.
- Single chamber ball mill for cement grinding; i.e. no crushing chamber to create high noise during cement grinding.
- All major industrial fans are fitted with silencers.
- DG sets are provided with acoustic enclosures & installed in enclosed rooms.
- Sound barriers/ walls provided at certain locations in coal mill area
- Wobbler (in place of grizzly) has been installed in Limestone crusher
- Compressors are installed within enclosed rooms
- Thick greenbelt around the plant acts as a natural sound barrier and prevents propagation of noise waves from spreading into external environment.
- Regular preventive maintenance of plant and machinery by competent staff.
- Regular noise level monitoring to determine where actions are needed.

❖ **Waste minimization/reuse**

- Use of LD slag, Flue Dust, Corex Sludge etc. (waste from steel plant) as partial substitute of raw material
- Closed pneumatic systems are in place
- All the venting points are provided with pulse bag filters and the dust collected by the bag filters is recycled into the process stream
- 100% of the top soil generated from mines is utilized for greenbelt development.
- Utilization of industrial by products such as Blast Furnace Slag, Corex Sludge, Flue Dust, Chemical Gypsum, Pet Coke etc. to conserve natural resources
- Reuse of rawmill reject i.e. magnetic separator reject is utilized for road paving resulting in reduction in fugitive emission due to vehicular movement.
- Canteen food waste is converted into manure and used for horticulture.

EFFORTS OF JSW TOWARDS SUSTAINABILITY

The manufacture of Slag cement not only lessens the burden on landfills, but also reduces air emissions at steel plants through the granulation process. Use of Slag cement in concrete reduces the environmental impact of concrete by:

- Reducing greenhouse gas emissions by eliminating about 0.85 ton of CO_2 for each ton of clinker replaced with GBS.
- Reducing energy consumption, since a ton of Slag cement requires nearly 30 % less energy than a ton of Ordinary Portland cement.
- Curtailing the "urban heat island" effect by making concrete lighter in colour, enabling it to reflect more light and cooling structures and pavements with exposed concrete.

Every ton of additional cementitious material used in concrete mixes saves about 1.4 ton of raw materials. The use of upto 50% Slag can reduce embodied CO_2 by over 40%, compared with a traditional 100% Ordinary Portland Cement concrete mix. Durability, economy, energy efficiency, fire resistance, low maintenance costs, recycling, and thermal mass all add to the sustainability of concrete in our built environment and at the end of the usage phase, concrete can easily be recycled.

JSWCL is continuously making efforts to look for ways to reduce the dependency on the natural raw material. In order to do so, it enhances the mix optimisation with the introduction of alternative, recycled materials to replace the use of natural resources.

ENVIRONMENTAL IMPACTS DUE TO INCREASE OF CLINKER PRODUCTION

The proposed expansion is for increase of clinker production from 2.0 to 2.5 MTPA by through Optimization and de-bottlenecking of existing equipment & processes without affecting land, air and water environment.

The expansion results in marginal emission of particulate matter, So_2 and NOx resulting in marginal increase of ground level concentrations. The air pollution control equipment existing are capable of handling additional emissions and hence no additional

measures are proposed. Except for these marginal air emissions, no effect on other environmental components is anticipated. The impact of expansion of cement plant on air environment has been estimated using AERMOD model.

No change in cement production is proposed. Additionally, slag will be ground as GGBS and will be dispatched for use by other industries such as RMC and cement plants.

No additional land will be acquired.

No additional water consumption, No wastewater generation and No solid waste generation due to the expansion.

Details of the environmental impacts and management plan due to increase of clinker production is detailed below:

4.1 AIR ENVIRONMENT

The baseline concentrations monitored in the EIA study includes the emissions of the existing unit of Cement Plant. Therefore, additional emissions are mainly due to enhancement of clinker production from 2.0 to 2.5 MTPA and change of product mix.

Major pollutant emitted is Particulate matter from stacks attached to the following equipments:

a. Raw Mill/Kiln.
b. Cooler
c. Coal Mill
d. Cement Mills
e. Slag Mills

Other sources of particulate system include ventilation systems from limestone weigh feeder, raw material storage silo, raw meal blending silo, raw coal hopper, clinker, clinker transport to cement mill and packing machines.

The additional emission from the proposed capacity expansion through optimization and de-bottlenecking are mainly due to:

a. Increase in flows resulting in increase in particulate emission load

b. Increase in coal consumption in the kiln resulting in increase of particulate, SO_2 and NOx emissions (about 90% of Sulphur will be absorbed by clinker)
c. Increase in coal and furnace oil consumption at Hot air generator of slag grinding unit

In order to estimate the additional increase of emission due to expansion of cement plant, the present levels of emissions have been studied. In addition to increase of clinker production, the proposed change in raw mix design will increase emissions from Hot air generator which is mainly used for drying of slag. Therefore considering change in product mix, worst case emissions have been worked considering the following

a. Additional increase of clinker production of 0.5 MTPA
b. Additional increase in GGBS production

The emission rate of Particulate Matter (PM), SO_2 and NO_x concentrations for increased production of 0.5 MTPA of clinker from the cement plant, along with emissions of 2 X 18MW(yet to be commissioned) are presented below in **Table – 4.2**

4.1.1 METEOROLOGICAL DATA

The meteorological data recorded continuously during the month of May, 2015 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 AERMOD model. Stability classes are computed for the mean hours are 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 are enclosed as **Annexure – 4 A.**

4.1.2 MODEL EMPLOYED

AERMOD Model with the following options has been employed to predict the ground level concentrations due to emissions from the expansion of cement plant.

TABLE - 4.2
INPUTS TO AIR POLLUTION MODEL (EMISSION DATA)

2.5 MTPA CLINKER PRODUCTION AND WITH CHANGE IN PRODUCT MIX CONSIDERING WORST CASE OF 3.7 MTPA GGBS PRODUCTION AND 36 MW POWER GENERATION

Location	Height	Temp-erature	Dia-meter	Velocity of flue gas	Flow rate m^3/hr	with APC			without APC
						emissions from stacks (gm/sec)			g/sec
	M	°C	M	M/sec		PM	SO_2	NOx	PM
CEMENT PLANT									
Raw Mill/Kiln	140	146	5.6	15.3	771500	4.57	15.2	19.98	4574
Cooler	50	122	4.0	11.0	542600	3.41	-	-	3413
Coal Mill	69	70	1.80	11.6	99986	0.72	-	-	720
Cement Mill	64	98	1.36	12	61155	0.40	-	-	400
SLAG GRINDING UNIT									
Slag Mill 1	62.4	110	2.80	12	257672	1.67	-	-	1670
Slag Mill 2	62.4	110	2.80	12	266039	1.70	-	-	1700
Hot air generator	55	140	1.50	13.5	85926	0.861	21.9	8.61	861
CAPTIVE POWER PLANT									
CPP Boiler stack	95	3.2	20	413	579133	5.2	166	90.0	5200

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. Polar receptor network has been considered.
4. Emission rates from the point sources and area sources were considered as constant during the entire period.
5. The ground level concentrations computed were as is basis without any consideration of decay coefficient.
6. Calm winds recorded during the study period were also taken into consideration.
7. 24 hourly meteorological data as per guidelines of IMD and MoEF mean ground level concentrations were estimated for the Summer Season- 2015.
8. An option for creation of data file giving average ground level concentrations for the mean meteorological data of summer season has been used for post processing in **SURFER – 8** graphics package.

4.1.3 PREDICTED GROUND LEVEL CONCENTRATIONS

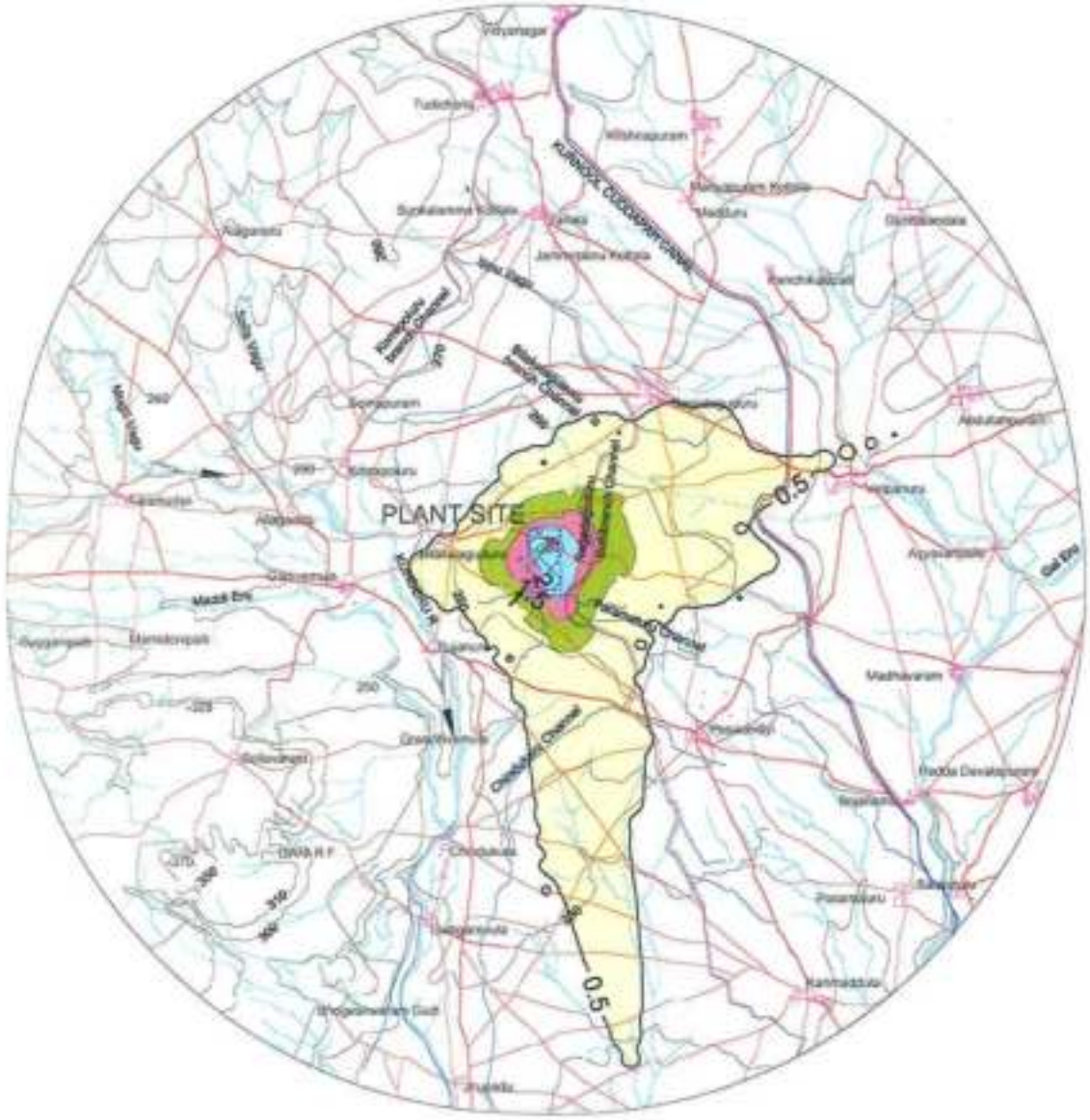
The ground level concentrations worked out considering proposed emission at 2.5 MTPA clinker production and with change in product mix considering worst case of 3.7 MTPA GGBS production to work out the incremental ground level concentration due to increase of clinker production and change of product mix. Since the power plant is yet to be commissioned, the 2 X 18 MW power plant emissions were also considered.

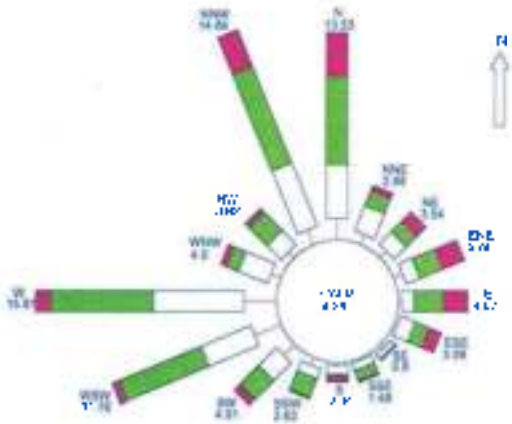
4.1.3.1 INCREMENTAL GROUND LEVEL CONCENTRATIONS

The baseline concentrations monitored in 10 km radius of the study area reflect the emissions from all the existing sources of cement plant. The additional emissions are mainly from the JSWCL cement plant due to additional clinker production of 0.5 MTPA.

PARTICULATE MATTER - (PM_{10})

24-hourly average ground level concentrations computed summer season - 2015 have shown the maximum value of 3.28 $\mu g/m^3$ of PM_{10} at a distance of 0.50 km in the NE direction of the source. **Fig – 4.1** shows the distribution and dispersion suspended particulate matter as a result of emissions from the cement plant.





WINDROSE : SUMMER. 2015

ISOPLETH INTERVAL (ug/m3)

SCALE (M)

0 2000 4000

FIG - 4.1

PREDICTED INCREMENTAL GROUND LEVEL CONCENTRATION OF PARTICULATE MATTER DUE TO EMISSION FROM CEMENT PLANT CLINKER : 2.5 MTPA ; CHANGE OF PRODUCT MIX : 4.8 MTPA (OPC/PSC/GGBS)

PROJECT : JSW CEMENT LTD, KURNOOL, AP

PREPARED BY

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

SULPHUR DIOXIDE

24-hourly average ground level concentrations computed for summer season– 2015 have shown the maximum value 24.9 µg/m³ of SO_2 at a distance of about 1.5 km in the NE direction of the source. **Fig – 4.2** shows the distribution and dispersion of Sulphur dioxide ground level concentrations.

OXIDES OF NITROGEN

24-hourly average ground level concentrations computed for summer season – 2015 have shown the maximum value of 13.16 µg/m³ of NOx at a distance of about 1.5 km in the NE direction of the source. **Fig – 4.3** shows the distribution and dispersion of Oxides of nitrogen ground level concentrations.

Annexure - 4B gives the 50 high 24-hourly average ground level concentration of PM_{10}, SO_2 and NOx during (summer season- 2015)

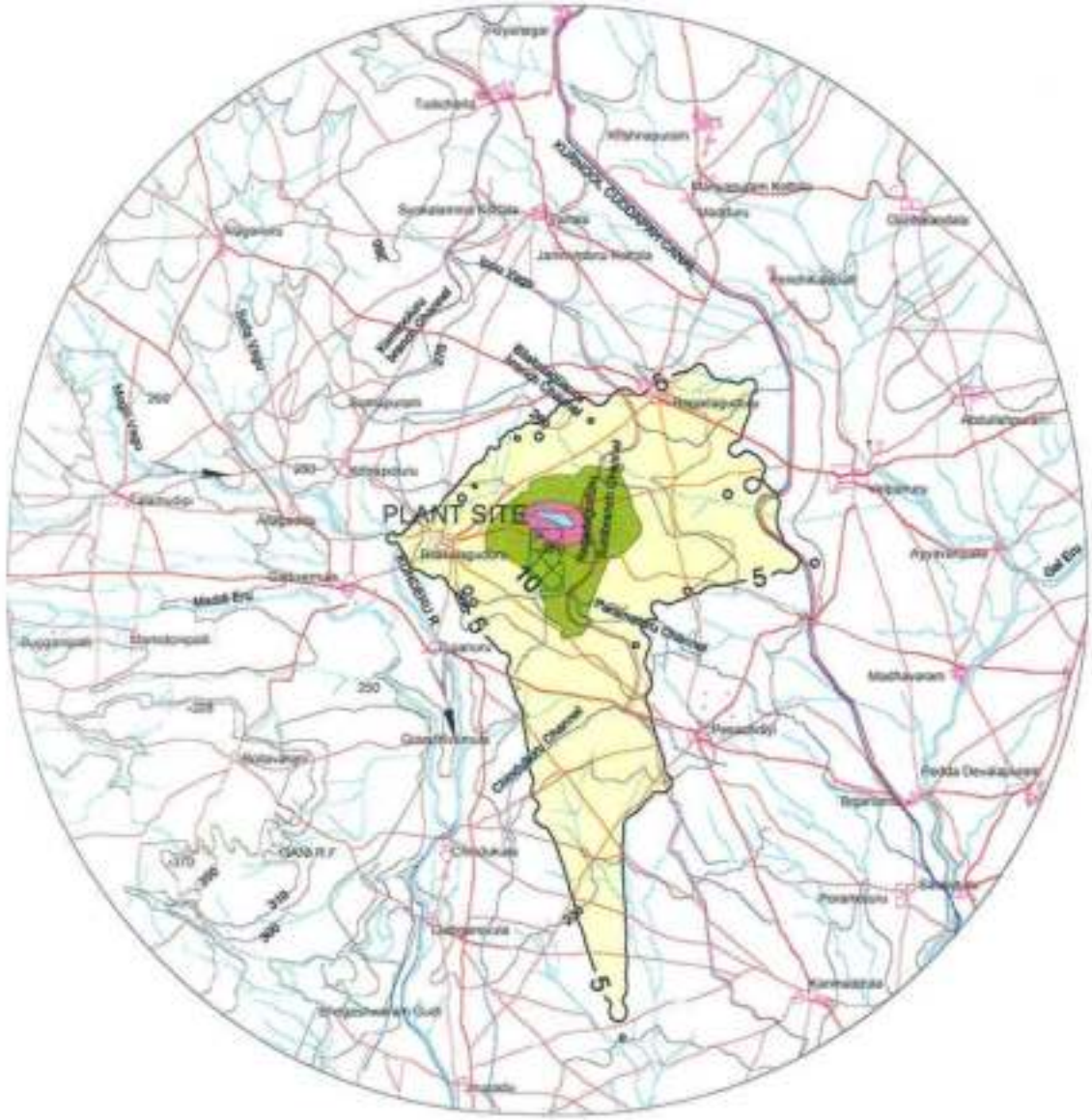
OVERALL SCENARIO

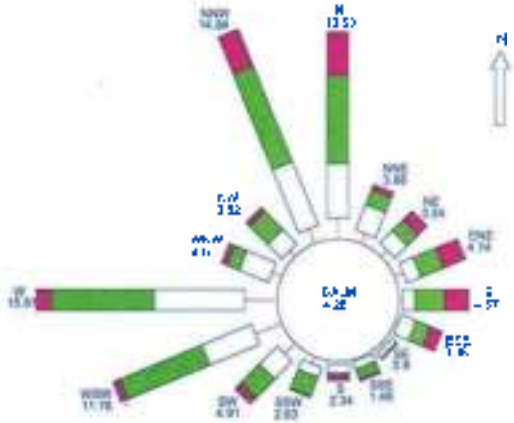
Predicted maximum ground level concentrations obtained for 24-hour meteorological data of summer season – 2015 are superimposed on the following existing baseline concentrations to project the overall post expansion scenario in the study area. The Overall Scenario with predicted concentrations over the baseline is shown below.

TABLE – 4.3
PREDICTED GROUND LEVEL CONCENTRATIONS AND OVERALL SCENARIO, (µg/m³)

24-Hourly Concentrations	Particulate Matter - 10 (PM_{10})	Sulphur Dioxide (SO_2)	Oxides Of Nitrogen (NOx)
Baseline concentration, max	64.5	15.1	15.5
Predicted Ground level Concentration (Max)	3.28	24.95	13.16
Overall Scenario	67.78 **{100}**	40.05 **{80}**	28.66 **{80}**

NOTE: Values in parenthesis are National Ambient Air Quality (NAAQ) standard limits specified for industrial, Residential, Rural and other areas.





WINDROSE : SUMMER, 2015

ISOPLETH INTERVAL (ug/m3)

25 20 15 10 5

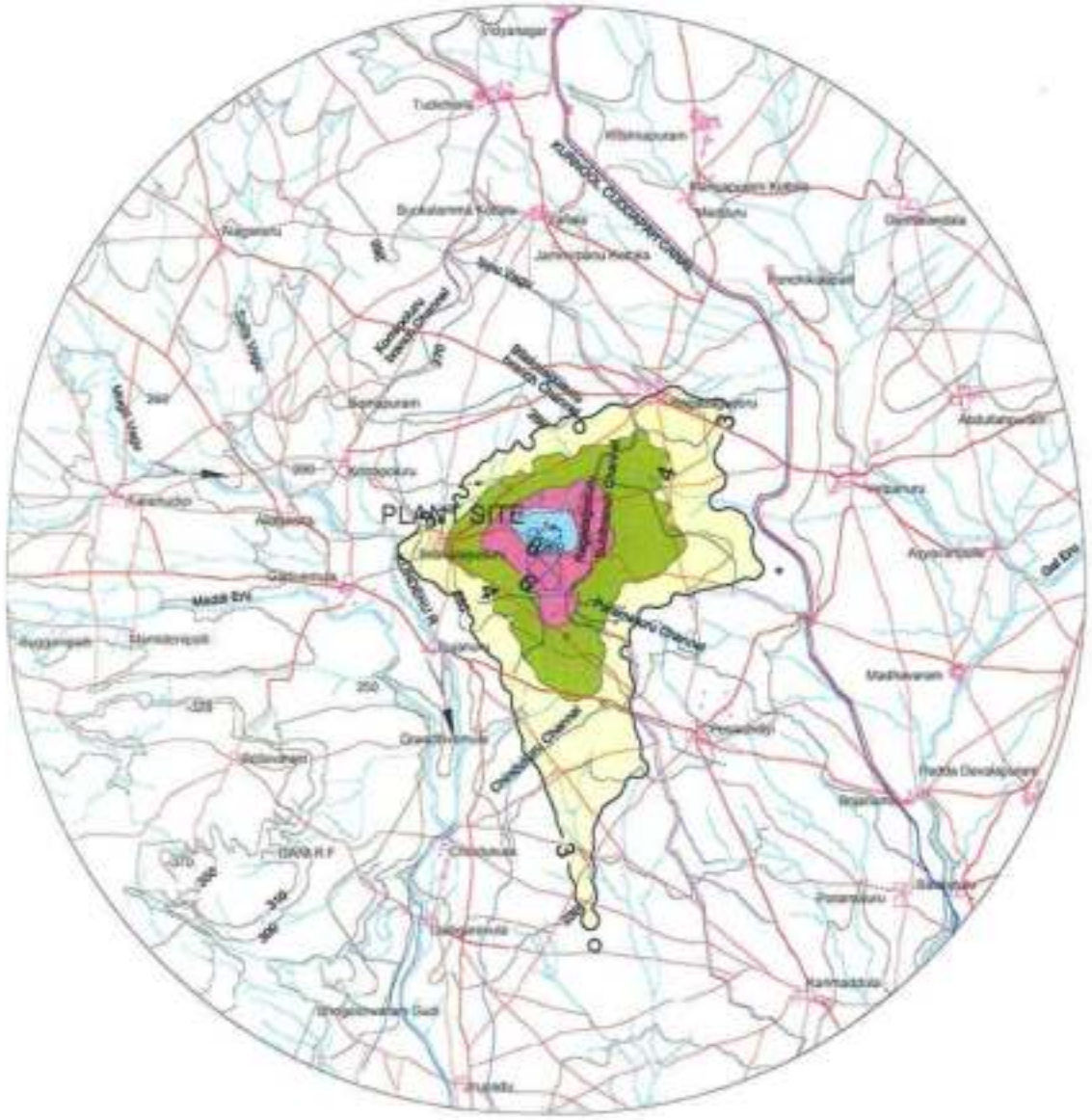
SCALE (M)

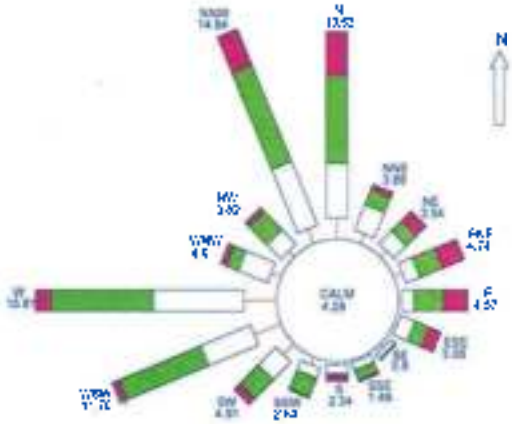
0 2000 4000

FIG - 4.2
PREDICTED INCREMENTAL GROUND LEVEL CONCENTRATION OF SULPHUR DIOXIDE DUE TO EMISSION FROM CEMENT PLANT CLINKER : 2.5 MTPA ; CHANGE OF PRODUCT MIX : 4.8 MTPA (OPC/PSC/GGBS)

PROJECT : JSW CEMENT LTD, KURNOOL, AP

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





WINDROSE : SUMMER, 2015

ISOPLETH INTERVAL (ug/m3)

12	8	6	4	3

SCALE (M)

0 2000 4000

FIG - 4.3
PREDICTED INCREMENTAL GROUND LEVEL CONCENTRATION OF OXIDES OF NITROGEN DUE TO EMISSION FROM CEMENT PLANT CLINKER : 2.5 MTPA ; CHANGE OF PRODUCT MIX : 4.8 MTPA (OPC/PSC/GGBS)

PROJECT : JSW CEMENT LTD, KURNOOL, AP

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

4.1.4 IMPACT DUE TO TRANSPORTATION

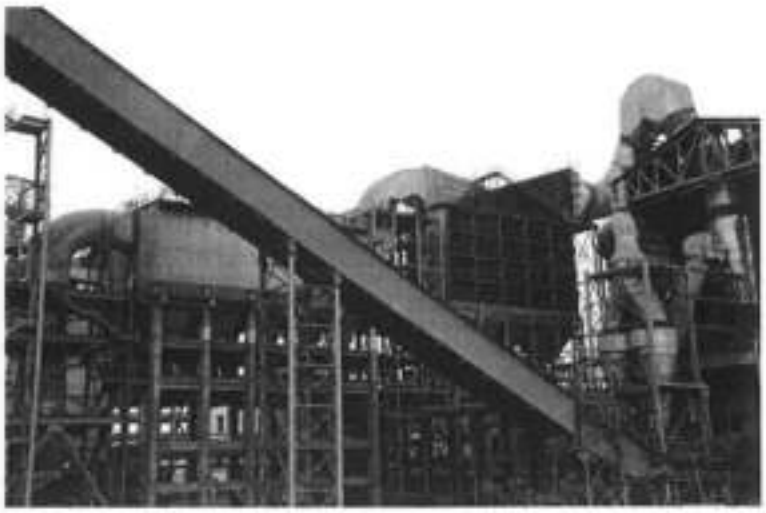
No further adverse impact is anticipated due to increase in production due to transportation as the railway siding being laid will be commissioned shortly for transportation of cement and slag.

4.1.5 AIR POLLUTION CONTROL MEASURES

The main pollutant emitted from the cement plant is particulate matter.

JSWCL has integrated the Environmental management with the manufacturing process. Cement manufacturing at JSWCL cement plant is a compound process with Combi-Roller Press for Raw mill which helps in energy conservation. Additionally kiln operation is being controlled through fully automated, which takes action for coal firing based on various advanced information and also can take action by seeing the parameters in less than a minute time.

JSWCL has invested about Rs. 34.12 Crores for the installation of various pollution control systems and other environment protection measures in the existing cement plant. The emissions from all the chimneys are maintained well within the prescribed norms of APPCB.



COOLER BAG HOUSE

High efficiency pulse jet type bag filters are installed in the crushing plant, raw mill hoppers, coal mill hoppers, blending silo, cement mill hoppers, cement silo and in all belt conveyor transfer towers to control the particulate emission less than 30 mg/Nm^3.

COAL MILL BAG HOUSE

Details of the pollution control systems provided are given in following table:

LIST OF POLLUTION CONTROL SYSTEMS IN THE PLANT

Process Unit	Pollution Control Equipment
Cement plant	
Kiln/Rawmill	Bag house
Coal mill	Bag house
Cooler	Bag house
Cement Mill	Bag house
Slag Mill -1	Bag house
Slag Mill -2	Bag house

(A) MAJOR POLLUTION CONTROL EQUIPMENT DESCRIPTION

RAW MILL & KILN Bag house

Flow, design	:	780000 m^3/Hr
Temperature	:	220 deg.C
Inlet Dust load in gas	:	700 g/m^3
Max. outlet dust emission	:	10 mg/Nm^3

Bag material Glass fabric with PTFE treatment	:	740 gm/m^2
A/C Ratio	:	1.00 m3/min/m^2

CLINKER COOLER 491BH1 Cooler Bag house

Vol. flow rate, max.	:	500000 m^3/Hr.
Density	:	0.56 kg/m^3
Moisture	:	3%
Design temperature	:	130 deg.C
Operating temperature	:	120 deg.C
Gas dew point	:	20 deg.C
Dust load in gas	:	30 g/m^3
Max. dust emission	:	50 mg/Nm^3
Diff. press., max.	:	250 mmWG
Total collect. area	:	9409 m^2
Current density	:	0.25 mA/m^2
No. of fields	:	3

VERTICAL COAL MILL BAG HOUSE

Vol. flow rate, max.	:	1,20,000 m^3/min
Design temperature	:	85 deg.C
Gas dew point	:	56 deg.C
Dust load in gas	:	35 g/m^3, dry
No. of fields	:	3
No. of chambers	:	1
Effective cross-section	:	40.5 m^2
Max. dust emission	:	75 mg/Nm^3
Diff. press., max.	:	2000 mmWG
Total collect. area	:	2835 m^2
Comp. air consp.	:	0.013 m^3/min
Pressure, pe	:	5-7 bar

CEMENT MILL BAG HOUSE (CEMENT MILL)

Vol. flow rate, max.	:	43,800 m^3/Hr.
Current density	:	0.3 mA/m^2
Gas dew point	:	57 deg.C
Dust load in gas	:	450 g/m^3
No. of fields	:	4
Max. dust emission	:	75 mg/Nm^3
Diff. Pressure, max.	:	450 mm WG
Total collect. area	:	1680 m^2
Dust Emission	:	50 mg/Nm^3

SLAG MILL-I 591 BH1 BAG HOUSE

Vol. flow rate, max.	:	4.15,000 m^3/Hr.
Current density	:	0.3 mA/m^2

Gas dew point	:	57 deg.C
Dust load in gas	:	450 g/m^3
No. of fields	:	4
Max. dust emission	:	75 mg/Nm^3
Diff. Pressure. max.	:	450 mmWG
Total collect. area	:	1680 m^2
Dust Emission	:	10 mg/Nm^3

SLAG MILL-2 592 BH1 BAG HOUSE

Vol. flow rate, max.	:	4,15,000 m^3/Hr.
Current density	:	0.3 mA/m^2
Gas dew point	:	57 deg.C
Dust load in gas	:	450 g/m^3
No. of fields	:	4
Max. dust emission	:	75 mg/m^3
Diff. Pressure. max.	:	450 mmWG
Total collect. area	:	1680 m^2
Dust Emission	:	10 mg/Nm^3

CRUSHER BAG HOUSE

Application	:	Crusher Dust vent
Flow rate	:	99550 Nm^3/hr.
Op. Temperature: Max. Temp.	:	45°C
Inlet Dust load in gas	:	30 g/Nm^3
Dust emisston	:	50 mg/Nm^3

(B) OTHER POLLUTION CONTROL EQUIPMENT

S.No	EQPT. NO.	QTY.	DESCRIPTION
1	K11BF1	1	DUST COLLECTOR
	Location		Slag BRU
	Volume flow		25000 m^3/hr
	Temperature		40°C
	Static pressure		-200 mmWG
	Dust emission		30 mg/Nm^3
2	K11.BF2 Slag BRU	1	DUST COLLECTOR
	Volume flow	:	25000 m3/hr
	Temperature	:	40 °C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm^3
3	K11.BF3 Slag BRU	1	DUST COLLECTOR
	Volume flow	:	25000 m3/hr
	Temperature	:	40°C

	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm3
4	K11.BF5Slag stacker TT9	1	DUST COLLECTOR
	Volume flow	:	7500 m³/hr
	Temperature	:	35°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm³
5	K31.BF1 SLAG TT-10	1	DUST COLLECTOR
	Volume flow	:	15000 m³/hr
	Temperature	:	50 °C
	Static pressure	:	-200 mm WG
	Dust emission	:	30 mg/Nm³
6	K31.BF3 SLAG TT-10	1	DUST COLLECTOR
	Volume flow	:	15000 m3/hr
	Temperature	:	50°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm3
	K31.BF2 SLAG IIOP	1	DUST COLLECTOR
	Volume flow	:	15000 m³/hr
	Temperature	:	-50°C
	Static pressure	:	-200 mmWG
	Dust emission		30 mg/Nm3
7	521.BF1	2	DUST COLLECTOR
	Volume flow	:	8000 m3/hr
	Temperature	:	-50°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm3
8	521&522.BF2	2	DUST COLLECTOR
	Volume flow	:	5000 m3/hr
	Temperature	:	45 °C
	Static pressure	:	-200 mmWG
	Dust emission	:	10 mg/Nm3
9	521-2.BF3 SLAG BLD	2	DUST COLLECTOR
	Volume flow	:	12000 m³/hr
	Temperature	:	100°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm3
10	521-2.BF3A	2	DUST COLLECTOR
	Volume flow	:	12000 m³/hr
	Temperature	:	-80°C

	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm3
11	521&522.BF4	2	DUST COLLECTOR
	Volume flow	:	8000 m^3/hr
	Temperature	:	60°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm^3
12	521&522.BF5 GGBS	2	DUST COLLECTOR
	Volume flow	:	5000 m^3/hr
	Temperature	:	100°C
	Static pressure	:	-200 mmWG
	Dust emission	:	10 mg/Nm^3
13	551&552.BF1FINE COAL	2	DUST COLLECTOR (INSERTABLE TYPE)
	Volume flow	:	1500 m^3/hr
	Temperature	:	100°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm3
14	612 .BF1&2	2	DUST COLLECTOR
	Application	:	GGBS silo top & bottom
	Volume flow	:	12500 m3/hr
	Dust emission	:	10 mg/Nm3
15	621.BF2	1	DUST COLLECTOR
	Volume flow	:	3000 m^3/hr
	Temperature	:	50°C
	Static pressure	:	-200 mmWG
	Dust emission	:	15 mg/Nm3
16	622.BF3	1	DUST COLLECTOR
	Volume flow	:	7500 m^3/hr
	Temperature	:	50°C
	Static pressure	:	-200 mmWG
	Dust emission	:	15 mg/Nm3
17	621.BF1	1	DUST COLLECTOR
	Volume flow	:	3000 m^3/hr
	Temperature	:	-80°C
	Static pressure	:	-200 mmWG
	Dust emission	:	10 mg/Nm3
18	622.BF4	1	DUST COLLECTOR
	Volume flow	:	10000 m3/hr
	Temperature	:	80°C
	Static pressure	:	-100 mmWG
	Dust emission	:	10 mg/Nm^3
19	631.BF1	1	DUST COLLECTOR

	Volume flow	:	15000	m^3/hr
	Temperature	:	80°C	
	Static pressure	:	-200 mmWG	
	Dust emission	:	10 mg/Nm^3	
20	632.BF2	1	DUST COLLECTOR	
	Volume flow	:	15000	m^3/hr
	Temperature	:	50°C	
	Static pressure	:	-200 mmWG	
	Dust emission	:	10 mg/Nm^3	
21	631.BF1PSC SILO1	1	DUST COLLECTOR	
	Volume flow	:	15000	m^3/hr
	Temperature	:	50°C	
	Static pressure	:	-200 mmWG	
	Dust emission	:	15 mg/Nm^3	
22	632.BF1PSC SILO 2	1	DUST COLLECTOR	
	Volume flow	:	12500	m^3/hr
	Dust emission	:	10 mg/Nm3	
23	631.BF3	1	DUST COLLECTOR	
	Volume flow	:	5000 m^3/hr	
	Dust emission	:	10 mg/Nm3	
24	631.BF4	1	DUST COLLECTOR	
	Volume flow	:	5000 m^3/hr	
	Dust emission	:	10 mg/Nm3	
25	631.BF5	1	DUST COLLECTOR	
	Volume flow	:	5000 m^3/hr	
	Dust emission	:	50 mg/Nm3	
26	211.BF1 MAIN CRUSHER	1	DUST COLLECTOR	
	Volume flow	:	4000 m^3/hr	
	Temperature	:	100°C	
	Static pressure	:	-200 mmWG	
	Dust emission	:	30 mg/Nm^3	
27	211.BF2	1	DUST COLLECTOR	
	Volume flow	:	4000 m^3/hr	
	Temperature	:	100°C	
	Static pressure	:	-200 mmWG	
	Dust emission	:	30 mg/Nm^3	
28	211.BF3	1	DUST COLLECTOR	
	Volume flow	:	4000 m^3/hr	
	Temperature	:	70°C	
	Static pressure	:	-200 mmWG	

	Dust emission	:	30 mg/Nm^3
29	311.BF1	1	DUST COLLECTOR
	Volume flow	:	6000 m^3/hr
	Temperature	:	80°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm^3
30	221.BF1-3 COAL BRU	3	DUST COLLECTOR
	Volume flow	:	6000 m^3/hr
	Temperature	:	40°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm3
31	221.BF5	1	DUST COLLECTOR
	Volume flow	:	6000 m^3/hr
	Temperature	:	40°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm^3
32	321.BF1	1	DUST COLLECTOR
	Volume flow	:	6000 m^3/hr
	Temperature	:	40°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm^3
33	321.BF2	1	DUST COLLECTOR
	Application	:	Aux. equipment
	Volume flow	:	3000 m^3/hr
	Temperature	:	60°C
	Static pressure	:	-200 mmWG
	Dust load in gas	:	30 g/m^3
34	411.BF1	1	DUST COLLECTOR
	Volume flow	:	6000 m^3/hr
	Temperature	:	40°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm^3
35	431.BF1	1	DUST COLLECTOR
	Application	:	Transport equipment
	Volume flow	:	4000 m^3/hr
	Temperature	:	80°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm^3
36	391.BF2	1	DUST COLLECTOR
	Volume flow	:	3000 m^3/hr
	Temperature	:	80°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm^3
37	431.BF2	1	BAG FILTER

	Volume flow	:	500400 m^3/hr
	Temperature	:	110°C
	Inlet pressure	:	-640 mmWG
	Dust emission	:	30 mg/Nm^3
	Inlet Dust Concentration	:	416 g/m^3
	Inlet Dew Point	:	33°C
38	491.BF1	1	DUST COLLECTOR
	Volume flow	:	4000 m^3/hr
	Temperature	:	-80°C
	Static pressure	:	-200 mmWG
	Dust emission	:	15 mg/Nm^3
39	481.BF1 FINECOAL BIN	1	DUST COLLECTOR
	Volume flow	:	500 m^3/hr
	Temperature	:	50°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm^3
40	491.BF3	1	DUST COLLECTOR
	Volume flow	:	500 m^3/hr
	Temperature	:	50°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm^3
41	401.BF3 CSP TUNNEL1	1	DUST COLLECTOR
	Volume flow	:	500 m^3/hr
	Temperature	:	50°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm^3
42	401.BF4	1	DUST COLLECTOR
	Volume flow	:	500 m^3/hr
	Temperature	:	50°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm^3
	401.BF5	1	DUST COLLECTOR
	Volume flow	:	500 m^3/hr
	Temperature	:	50°C
	Static pressure	:	-200 mmWG
	Dust emission	:	30 mg/Nm^3

Bag Filters are designed to control dust emisston upto 30 mg/Nm^3 are provided to Kiln & Raw mill, Cement Mill, Cooler, Crusher, Slag mills and Storage Silos for control of particulate emissions.

All the flue gas outlets are provided with state of art air pollution control equipment with control efficiency of 99.8-99.9 % to maintain the particulate emission level below 30 mg/Nm^3. The cement dust collected in the pollution control devices is recycled back to the cement manufacturing process.

Ventilation systems are provided with bag filters in the plant. All the pollution control equipment are designed to meet outlet particulate emission of less than 30 mg/Nm^3 emission for particulate matter. Interlocking facility has been provided in the pollution control equipment.

All the material handling systems are covered with aprons.

COVERED RAW MATERIAL STORAGE

ADEQUACY OF POLLUTION CONTROL EQUIPMENT FOR EXPANSION

JSWCL will be achieving the increase in production of clinker by optimization and de-bottlenecking of existing systems and processes. All the pollution control equipment in the cement plant are in place for various units as per requirement.

The increase in capacity of unit under the modification will result in increase in volumetric flow rates. Keeping in view of this, JSWCL has conducted a detailed technical assessment of the pollution control equipment of the main units and found that the flows at 2.5 MTPA enhanced capacity are well within the existing designed flows. Details of the same are given below

EMISSION LOADS ON VARIOUS POLLUTION CONTROL EQUIPMENT OF MAIN UNITS

	(m^3/hr)		
	FLOWS AT 2.5 MTPA	**EXISTING DESIGN FLOWS**	**REMARKS**
Raw Mill/Kiln	502312	7.80,000	Adequate
Cooler	410080	5.00,000	Adequate
Coal Mill	124080	1,62,000	Adequate

JSWCL has installed all pollution control equipment and carrying regular monitoring to check the emission level at outlet of stack.

The measures have resulted in maintaining the Ambient Air Quality within the NAAQS 2009 standards.

4.1.6. FUGITIVE EMISSIONS

Fugitive dust control

Sources of fugitive dust in the plant are:

- Transportation activities within the cement plant
- Dropping/transfer points of the belt and bucket conveyors at transfer points
- Raw material stock piles
- Coal handling areas

Adequate air pollution control systems are provided as detailed below to maintain SPM well within the prescribed limits.

Raw mill & Kiln	: Pulse Jet Bag House
Clinker Cooler	: Pulse JetBag House
Limestone crusher,	
Coal mill & cement/slag mills	: Bag House
All transfer points	: Bag Filters
Limestone dump hopper	: Water spray system
Limestone conveyor	: Water spray system
Limestone stacker	: Water spray system

- All transfer points and storage silos are provided with dust collection and extraction systems for effective control of fugitive emissions. All the installed pollution control equipment are designed for ≤30 mg/Nm^3.

- The dust collected from the pollution control equipment is being recycled back into the process.

- Clinker is being stored in clinker storage silo to control fugitive emissions.

CLINKER STORAGE SILO

- Gypsum and additives are being stored in covered storage sheds
- All raw material transfer conveyors are covered with GI sheets.
- All roads and open area in the plant are cement concreted.

PAVED ROADS (CEMENT CONCRETE) IN THE CEMENT PLANT

To ensure and reduce impact of transport on the surrounding environment, raw materials and cement is transported in trucks covered with tarpaulin.

Transport vehicles are periodically checked for Pollution under Control certificate from approved RTA agencies.

Suitable bag filters are installed to control the fugitive emissions generated during material transfer, packing, loading and unloading.

Raw materials such as Gypsum, Aul. Laterite/ Flue dust are stored in the covered sheds.

Construction of Coal Shed for coal stockpile is in progress and is expected to be completed by Oct'15.

Fugitive emissions in the work zone are regularly monitored. Bag filters are provided at all transfer points of raw material conveying, stacking, packing of finished product etc. in order to control fugitive emissions. All the roads are concrete paved. Water spraying is carried out to control fugitive emission all around the stock yard and loading/ unloading areas.

Fully covered conveyors are provided for material conveying throughout the plant.

4.1.7 ACTION PLAN TO COMPLY THE NATIONAL AMBIENT AIR QUALITY EMISSION STANDARDS ISSUED BY THE MINISTRY VIDE G.S.R. NO. 826(E) DATED 16TH NOVEMBER, 2009

Six online continuous stack monitoring facilities attached to the Raw mill/Kiln bag house, Cooler Bag house, coal mill bag house, Cement mill and Slag mill-1 & 2 bag houses have been provided. High efficiency pulse jet bag filters are installed in the crushing plant, raw mill hoppers, coal mill hoppers, blending silo, cement mill hoppers, cement silo and in all belt conveyor transfer towers. Particulate emissions from the stacks are maintained well within the prescribed limits.

Ambient air Quality is being monitored from fixed monitoring stations by an approved third party on monthly basis for the parameters PM_{10}, $PM_{2.5}$, SO_2, NOx, for 24hours basis and the levels are well within the prescribed limits.

4.2 NOISE ENVIRONMENT

4.2.1 IMPACT ON NOISE ENVIRONMENT DUE TO CEMENT PLANT

The major noise generating sources are Limestone Crusher, Cooler fans, blowers and compressors. These sources are located far off from each other. Under any circumstances the noise level at plant boundary will not exceed 75 dB (A) at day time and 70 dB (A) at night time.

The noise levels are being monitored and efforts are being made to maintain the noise levels within the prescribed limits. Measures implemented in the plant to reduce noise levels are:

1. Grinding of raw material and finished products is performed by Roller Press that generates less noise compared to traditional ball mills.
2. Single chamber ball mill for cement grinding; i.e. no crushing chamber to create high noise during cement grinding.
3. All major industrial fans are fitted with silencers.
4. DG sets are provided with acoustic enclosures & installed in enclosed rooms.
5. Sound barriers/ walls provided at certain locations in coal mill area.
6. Wobbler (In place of grizzly) has been installed in Limestone crusher.
7. Compressors are installed within enclosed rooms.
8. Speed limit restrictions for vehicles within plant premises.
9. Regular preventive maintenance of plant and machinery by competent staff.

Noise levels generated in the cement plant are confined within the boundary and with attenuation after greenbelt and construction of boundary wall, the impact of noise levels on surroundings is negligible.

4.3 WATER ENVIRONMENT

4.3.1 IMPACT ON WATER ENVIRONMENT

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, toilets and also for greenbelt development.

The present water requirement of the cement plant including CPP and colony is about 4500 m^3/day. No additional water consumption is required.

The water balance of Cement plant, CPP and Colony* is given below.

WATER CONSUMPTION BALANCE IN THE CEMENT PLANT, m^3/day

	DESCRIPTION	PRESENT	FUTURE UNITS (EC OBTAINED)	TOTAL	EVP. LOSS/ USE	WASTE WATER
A	Cement Plant (Including Slag Grinding Unit) - cooling	1300	0	1300	1300	0
B	Captive Power Plant	0	1800	1800	1480	320
C	Domestic – Plant	100	0	0	20	80
	Domestic – Township	500	100	600	60	540
D	MINES	100	0	100	100	0
E	GREENBELT/PLANTATION	600	0	600	600	0
	Total	**2600**	**1900**	**4500**	**3560**	**940**

**CPP and colony have yet not been installed.*

No increase in water consumption for expansion is envisaged.

4.3.1.1 WASTEWATER GENERATION AND DISPOSAL

No wastewater is generated from cement plant process. The wastewater generation from the cement plant is mainly from domestic consumption.

The wastewater generation from the Captive power plant operation in future includes cooling tower blow down, boiler blow down, filter backwash, DM plant rinsing water, and Service Water.

DM wastewater after neutralization and service water after oil and grease removal will be diluted with other wastewater streams of the power plant. A total of 320 m^3/day wastewater will be recycled for reuse in the process, dust suppression and greenbelt development.

Fig – 4.4 shows the details of wastewater treatment and reuse for various operations.

In order to treat the sewage generated from the plant canteen and toilets, a full-fledged sewage treatment plant (STP) in operation within plant premises.

The STP is designed for a maximum load of 50.m^3/day with the BOD of 150 - 200 mg/L for raw sewage and after treatment less than 20 mg/L.

SEWAGE TREATMENT PLANT (STP)

STP of 50 KLD capacity has been commissioned in plant premises with following units

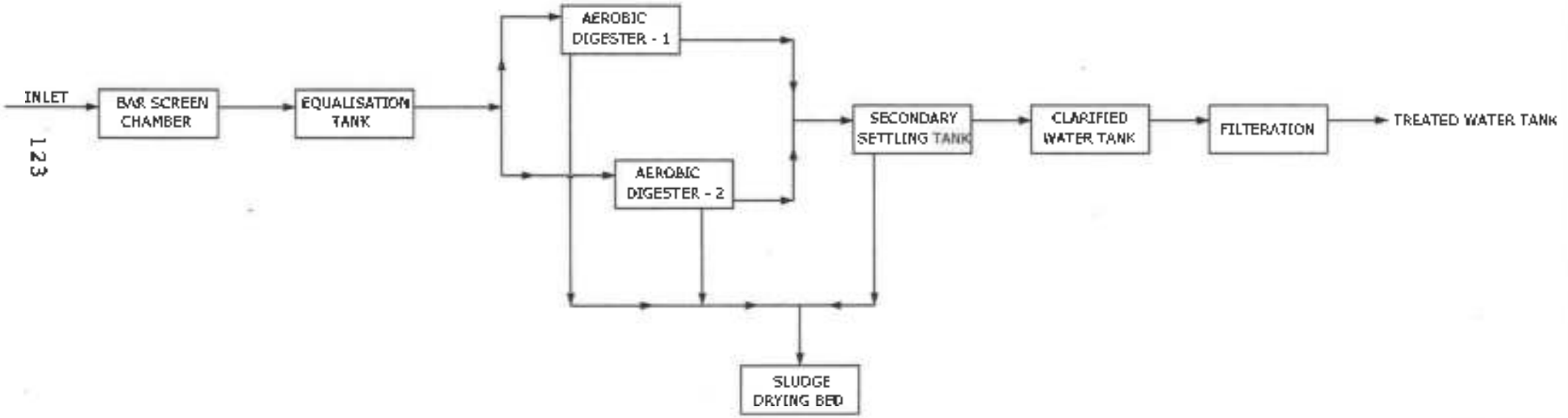
a. Bar screen
b. Equalization tank
c. Aerobic Digester
d. Secondary Settling tank
e. Pre Filtration tank
f. Treated water tank
g. Equipment Room

Treated water is being used for their green belt development and dust suppression purpose. No waste water is discharged to outside the plant premises and they are adopting a zero discharge concept.

STP sludge is being used as manure for their green belt development

FIG - 4.4

SEWAGE TREATMENT PROCESS DIAGRAM



4.3.2 RAIN WATER HARVESTING

CEMENT PLANT

16 nos. of recharge cum bore wells to harvest the runoff from the storm water drains inside factory premises. The location of structures is given in the following table

TABLE –4.4
RAINWATER HARVESTING STRUCTURES WITHIN PLANT SITE

S. No.	Nomencla ture	Type of str.	Location
1	RWHS # 1	Recharge cum Injection well	Near Crusher Bldg.
2	RWHS # 2	Recharge cum Injection well	Near Crusher Bldg.
3	RWHS # 3	Recharge cum Injection well	Between Petron Office & Crusher
4	RWHS # 4	Recharge cum Injection well	Near Petron Office
5	RWHS # 5	Recharge cum Injection well	Backside of Canteen near scrap yard
6	RWHS # 6	Recharge cum Injection well	Opp. RM Silo
7	RWHS # 7	Recharge cum Borewell	Near Project Office
8	RWHS # 8	Rooflop	Central Stores Building
9	RWHS # 9	Rooftop	Bilakalagudur School Bldg.
10	RWHS # 10	Mine Pit	Mine working pit (Southern Side)
11	RWHS # 11	Percolation tank # 1 with recharge cum borewell	North east lease boundary (towards village BKLGDR)
12	RWHS # 12	Percolation tank # 2 with recharge cum borewell	North east lease boundary (towards village BKLGDR)
13	RWHS # 13	Percolation tank # 3 with recharge cum borewell	North east lease boundary (towards village BKLGDR)
14	RWHS # 14	Recharge cum Injection well	Near MRSS Bld
15	RWHS # 15	Recharge cum Injection well	New Sec Bld
16	RWHS # 16	Recharge cum Injection well	Near LC -2 Bld

Rainwater structures implemented at cement plant have a potential to harvest rainwater to the tune of 524499 m^3/annum at 715 mm of annual average rainfall.

Photograph of rainwater harvesting structures within the plant site is shown below

PHOTOGRAPH OF RAIN WATER HARVESTING STRUCTURES WITHIN CEMENT PLANT PREMISES

RAINWATER HARVESTING PITS AT MRSS BUILDING AND NEAR to CRUSHER.

RAINWATER HARVESTING STRUCTURE AT GADIVEMULA SCHOOL BLDG.

RAINWATER HARVESTING STRUCTURE AT GADIVEMULA SCHOOL BLDG

3 Nos. of percolation tanks with recharge bore wells along the eastern periphery of limestone mine located adjacent have already been completed. In addition, the working pit of mine (approx. 400 x 300 x 13 M) also receives huge quantity of water through surface runoff and canal seepage. Water discharged from this pit is channeled into a nearby canal and thus used for paddy irrigation in the area whereas part of the water slowly percolates down to recharge the groundwater aquifer.

Rainwater structures implemented at Mines have a potential to harvest rainwater to the tune of 338100 m^3/annum at 715 mm of annual average rainfall.

4.3.3 FLOOD HAZARD ZONATION MAPPING

Flood Hazard Zonation Mapping was done using Digital Elevation Model (DEM) for demarcating the water extent at different levels of water rising.

River Kundu is at 2.2 Km from the site in WSW direction with bed level of 248 m AMSL. High Flood Level of River Kundu is at 230 m AMSL and is at a distance of 2.2 km from the plant site. The average elevation of plant site is 261m AMSL. Hence, the chance of Flooding does not arise.

A map with the plant site and flood zone of River Kundu is shown as **Fig – 4.5**

4.3.4 WATER CONSERVATIONS AND RECHARGING OF THE GROUND WATER

The following water conservation measures are implemented in the plant.

a. Treated waste water is used for greenbelt development.
b. Roof top rain water is harvested, led into a tank and is recycled
c. Paved roads lead result in proper channeling of rain water in to storage ponds.

4.4 LAND ENVIRONMENT

All the raw material is stored either in closed silos or in closed sheds and on lined surfaces. Hence there is no possibility of leachate taking place.

The dust collected in the air pollution control equipment in the cement plant is recycled back to the process. Hence no solid waste which requires disposal is generated from the plant.

Refractory bricks are one of the solid waste generated from the kiln section. Due to wear and tear, JSWCL normally replaces the refractory bricks once in a year. These bricks due to high recycling value are being disposed to outside agencies.

No further solid waste is generated from the plant.

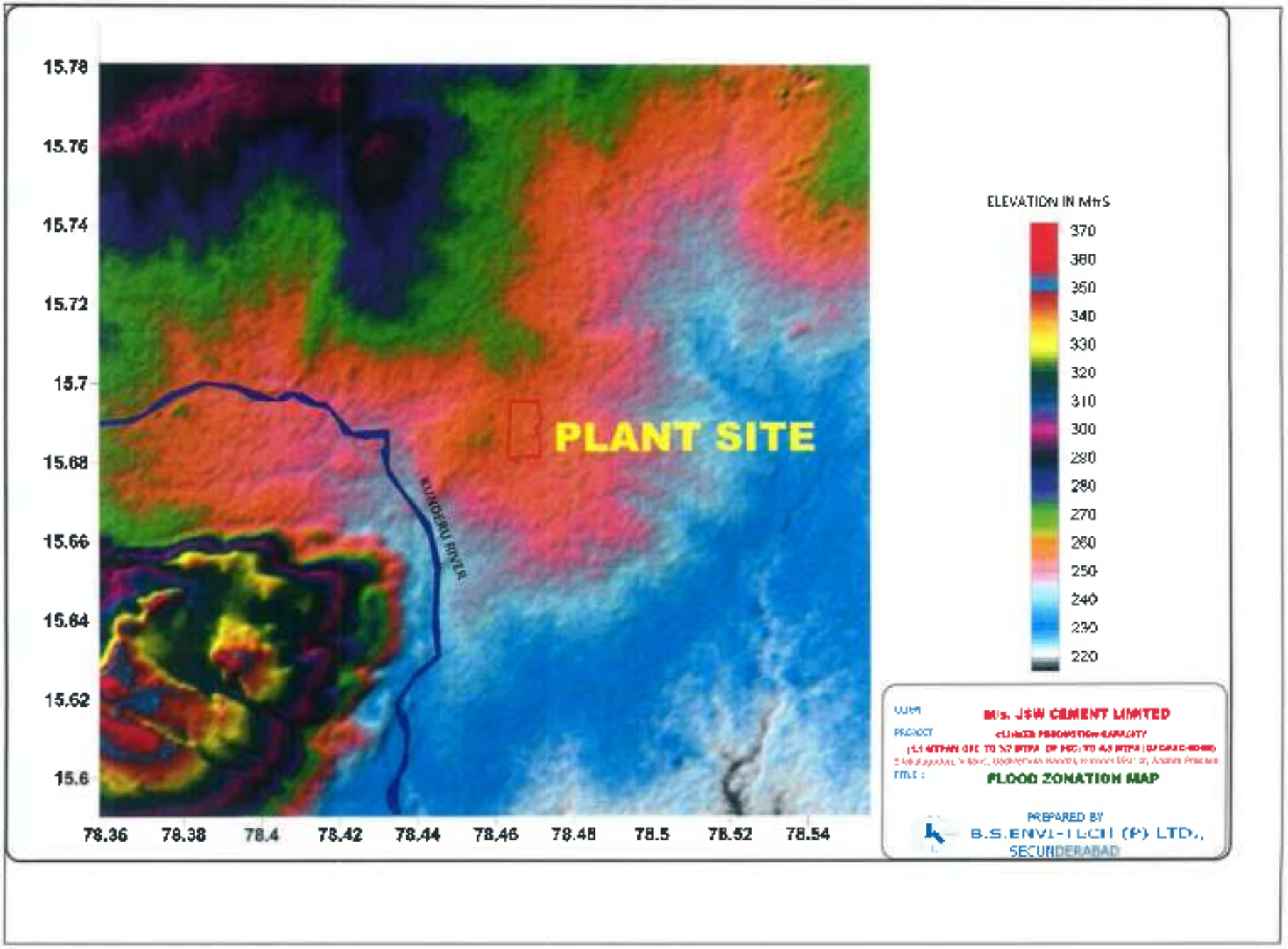

15.78
15.76
15.74
15.72
15.7
15.68
15.66
15.64
15.62
15.6
78.36
78.38
78.4
78.42
78.44
78.46
78.48
78.5
78.52
78.54
PLANT SITE
KUNDERU RIVER
ELEVATION IN MtrS
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
M/s. JSW CEMENT LIMITED
FLOOD ZONATION MAP
PREPARED BY
B.S.ENVI-TECH (P) LTD.,
SECUNDERABAD

FIG - 4.5

4.4.1 SOLID WASTE FROM SEWAGE TREATMENT PLANT

Solid waste generated from sewage treatment plant is disposed after segregating the waste into bio-degradable and non-degradable. JSWCL is composting the Bio degradable waste and non-degradable waste is land filled at identified areas.

4.4.2 HAZARDOUS WASTE MANAGEMENT RULES

Necessary provision (Inline Calciner) for use of the high calorific value hazardous wastes in the Kiln has been made and application for grant of authorization has been submitted to APPCB, Hyderabad.

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

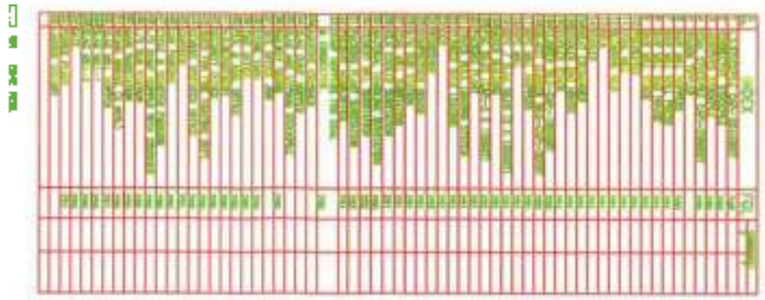
Spent Oil from the gear boxes and automobile batteries is disposed to the authorized vendors as per the Hazardous Wastes (Management and Handling) Amendment Rules.

Authorization for collection, treatment, storage, and disposal of hazardous wastes has been obtained from APPCB vide letter no APPCB/KNL/KNL/124/HO/CFO/2012-955 Dt: 03.01.2015. All the conditions of the said authorization are duly complied.

4.4.3GREEN BELT DEVELOPMENT

The cement plant is located in an area of 263.05 Ha. The greenbelt developed so far in the plant is about 34.3 % of the plant area which is about 90.3 Ha. **Fig – 4.6** shows the greenbelt development plan. **Fig – 4.7** shows the photographs of the greenbelt developed in the plant.

The plant species along with number of saplings/trees developed at plant and mines are given in table below



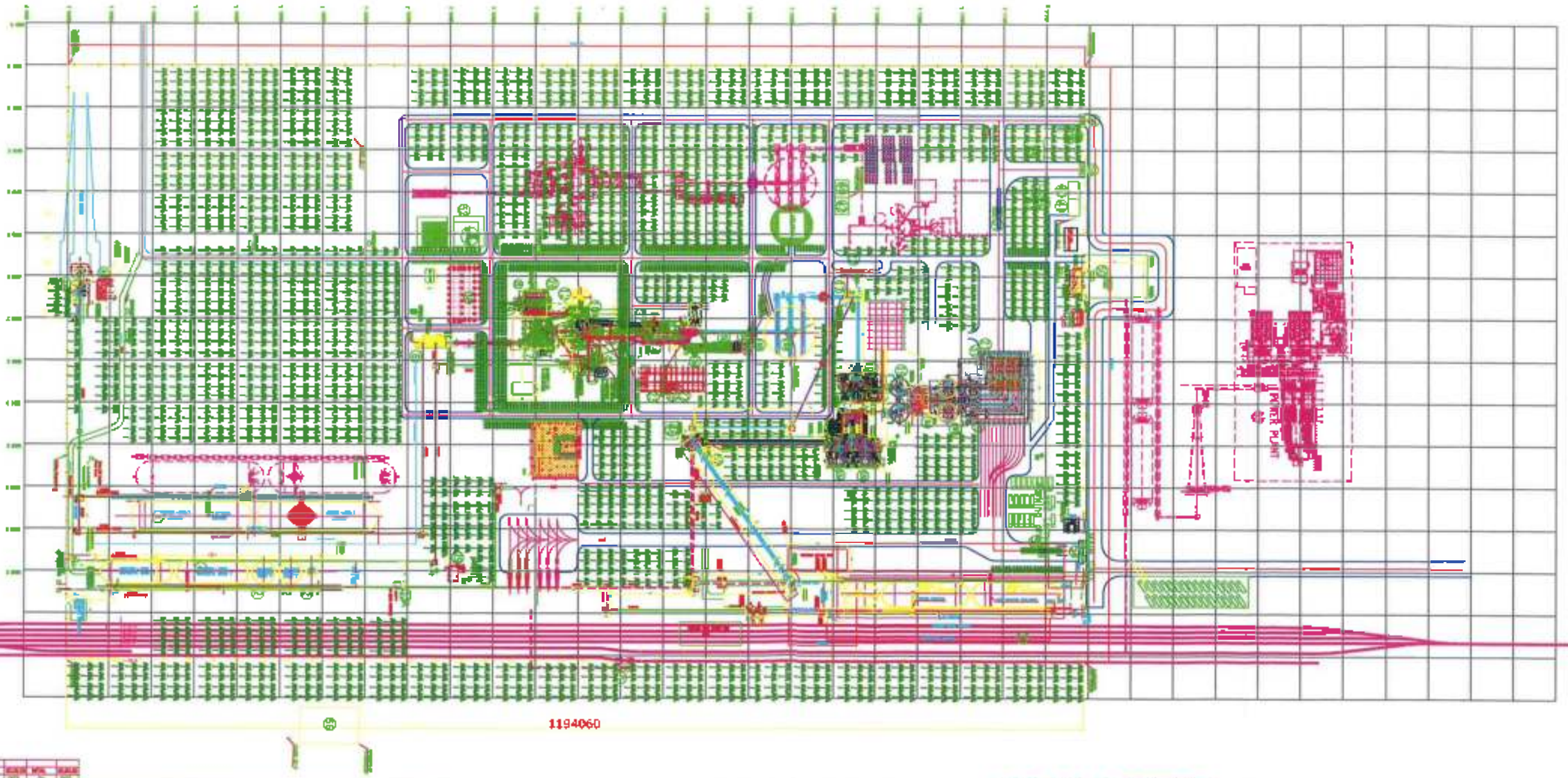


FIG - 4.6

CLIENT : M/s. JSW CEMENT LIMITED

PROJECT : 2.5 MTPA CLINKER PRODUCTION & 4.5 MTPA OPC/PSC/GGBS PRODUCTION

TITLE : GREENBELT DEVELOPMENT PLAN

FIGURE – 4.7
PHOTOGRAPHS SHOWING GREENBELT DEVELOPMENT

GREENBELT SPECIES

S.No	Name of Plant	Total
1	Fox tail Palm	20
2	Gulmohar	21300
3	Copper Pod tree	25053
4	Pongamia	2840
5	Mango	247
6	Tamarind	544
7	Bamboo	9770
8	Custard Apple	36
9	Sapota	80
10	Cassia sannea	1420
11	Rain Tree	2450
12	Millingtonia	17
13	Mahagony	1250
14	Acacia nilotica	2600
15	Tabubeiaargentia	110
16	Tabubeiarosea	110
17	Tabubeiaavvalaendula	75
18	Spathodeacompanulata	780
19	Royal palm	200
20	Magnolia champaka	120
21	Ficusreligiosa	170
22	Azardiracthaindica	270
23	Bauhinia	730
24	Forest Almond	820
25	Acacia auriculoformis	990
26	Calophylluminophyllum	120
27	Mimusopselengi	130
28	Rigeliapinnata	230
	Total	**72482**

4.5 SOCIO ECONOMIC ENVIRONMENT

REHABILITATION AND RESETTLEMENT

No additional area is required for the expansion, hence the point of Rehabilitation and Resettlement does not arise. Thus no adverse impact is anticipated.

Socio Economic Status in the study area is found to be moderate with respect to livelihood, amenities etc., Transport and other

infrastructural facilities such as market centers, business establishment, recreation etc., in the area were improved.

Employment potential both direct and indirect coupled with business opportunities and strong social commitment of the company in the form of better educational and medical facilities would result in enhancement in the status and standard of living of the local populace resulting in positive impact.

4.6 OCCUPATIONALHEALTH & SAFETY MANAGEMENT

4.6.1 OCCUPATIONAL HEALTH

JSWCL has set up a dispensary inside the factory premises with qualified doctors, paramedical staff and all emergency arrangements including an ambulance. In addition, the company, as part of its CSR programme, has also deployed one Mobile Health Care Van for providing medical aid to nearby villages.

As part of Occupational health Surveillance programme, JSWCL is conducting 6 monthly health checkup for workers exposed to dust and noise. The health check up includes spirometry (lung function test), audiometry, chest x-ray, blood examination among others.

4.6.2 OCCUPATIONAL SAFETY

JSWCL has qualified and experienced safety officer who is carrying out the safety patrols in the factory to observe unsafe practices and unsafe observations. Apart from this JSWCL has a central safety committee which includes HODs of the department to workers level. The meeting is being conducted regularly and action plan of the meeting will be prepared and implemented.

JSWCL 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.

JSWCL 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 JSWCL's activity. The

safety slogans/cartoons are displayed at strategic places in the factory premises.

4.6.3 OCCUPATIONAL HEALTH SURVEY

There are no endemic health problems in the area due to waste water/air/soil borne diseases. However stray cases of water borne diseases such as gastroenteritis and fever have been observed. JSWCL has an established dispensary. The medicines are being provided free of cost to the patients.
Following health checkups are being carried out for the employees periodically apart from pre-examination at the time of joining:

- Periodic medical examination
- Lung function test
- Audiometry
- Chest X-ray
- Eye test

The first aid box is made available at every section of the department for immediate treatment. First aid training is imparted to the selected employees of all departments regularly. The list of first aid members is being displayed at strategic places.

4.6.4 OCCUPATIONAL HEALTH & SAFETY OF ALL CONTRACT AND SUB-CONTRACT WORKERS.

All workers are being evaluated for health status. The parameters which are monitored as per Occupational Health Checkup are Blood, Urine, Sputum, Stool, ECG, X-Ray (Tuberculosis & Silicosis), Eye Test, Audiometry and Lung Function Test (PFT) etc.

The health data of workers evaluated is enclosed as **Annexure– 4C.**

Plan and fund allocation for occupational health &safety of all contract and sub- contract workers.

JSWCL is carrying out the Occupational Health survey for the all the workers including the contract and sub-contract workers. The fund allocation is part of the occupational health budget which is about 50 Lakhs per year.

4.6.5 ACTION PLAN FOR THE IMPLEMENTATION OF OHS STANDARDS

The recommended threshold limit value (TLV) adopted by the American Conference of Governmental Industrial Hygienists (ACGIH) for nuisance respirable particulates is 10 mg/m^3 and/or less than 1% silica and for silica TLV is 0.025 mg/m^3 (ACGIH, 2007).

JSWCL is carrying out Personal Sampling Analysis at workman area using personal sampler to know the exposure of workman to dust levels. The results of air borne dust survey are given below

RESULTS OF AIRBORNE DUST SURVEY

(By using Gravimetric Dust Sampler type 113 A, Casella, London)

S.No.	Locations	Employee Name& ID No.	Dust Concentration [mg/m^3]	Threshold limit [mg/m^3]
1	Packing Plant	Tuphani (26089)	1.519	10.00
2	Raw Mill Hopper	K. Narayana (10171)	1.536	10.00
3	Coal Mill Hopper	Anil (17196)	1.416	10.00
4	Crusher	S. Mabasba (20006)	1.252	10.00

Free silica in the work zone is carried out on regular basis. Audiometric tests are also being carried out to study the exposure and effect of personnel working in noise prone areas. All the exposure limits are well within the Permissible Exposure Levels (PEL).

The measures proposed to be adopted in case these are not within PEL are:

a. Work breaks for the workman
b. Shifting of workman to other work areas after imparting proper training

CHAPTER - 5

ANALYSIS OF ALTERNATIVES (TECHNOLOGY & SITE)

CHAPTER – 5 : ANALYSIS OF ALTERNATIVES (TECHNOLOGY & SITE)

5.1 ANALYSIS OF ALTERNATIVE TECHNOLOGY

The cement plant is already in operation and the expansion is for increase of clinker production by modification of process unit. No change in technology and No additional land is required.

5.2 ANALYSIS OF ALTERNATIVE SITES

Cement plant already exists. The expansion is modification of the process within the existing cement plant complex. Hence no alternative sites were studied.

CHAPTER - 6

ENVIRONMENTAL MONITORING PROGRAM

CHAPTER – 6 : ENVIRONMENTAL MONITORING PROGRAM

6.1 ENVIRONMENTAL MONITORING

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

The following monitoring programme is implemented to monitor various environmental components.

A) METEOROLOGY

An automatic weather monitoring station installed within the plant premises for a proper measurement and record of meteorological parameters.

PHOTOGRAPH OF WEATHER STATION

B) CONTINUOUS EMISSION MONITORING INSTRUMENTS

Stack emission is also being monitored continuously through online dust monitors installed on 6 Nos. of major stacks i.e. Kiln /Raw mill bag house, Cooler Bag house, Coal mill bag house, Cement mill bag house, Slag mill-1 and Slag mill -2 with online transmission of real time data to APPCB and CPCB.

ONLINE EMISSION MONITORING ATTACHED TO STACK

ONLINE DATA FROM CONTINUOUS EMISSION MONITORING EQUIPMENT

Stack	Permissible limits	Achieved values mg/Nm^3
Kiln/ Raw Mill	30 mg/Nm^3	9.22
Cooler		9.12
Coal Mill		10.11
Cement mill		8.33
Slag Mill-1		9.0
Slag Mill-2		11.01

In addition to the above, JSWCL is carrying out the stack monitoring through third party on monthly basis.

C) AMBIENT AIR QUALITY MONITORING

Four ambient air quality monitoring stations have been provided in-consultation with PCB officials. 3 CAAQMS were installed 120° apart on the plant periphery and real time AAQ data with online transmission of realtime data to APPCB/CPCB and public display through electronic board at plant main security gate. The same will be continued.

CONTINUOUS AMBIENT AIR QUALITY MONITORING STATION

CONTINUOUS AMBIENT AIR QUALITY MONITORING STATION

AAQ DATA RECORDED BY CAAQM STATION

Period Apr'14 to Oct'14	APPCB Standards	Near old Security Gate	Near MRSS Building	Near Colony Gate
PM 10	100	57.83	66.00	54.17
PM 2.5	60	20.42	25.00	18.42
Sulfur dioxide (Sox)	80	8.00	8.63	7.51
Nitrogen Dioxide (NOx)	80	13.92	15.04	12.34

Regular monitoring is also being carried out through an outside approved agency.

Ambient air Quality is being monitored from fixed monitoring stations by an approved third party on monthly basis for the parameters PM_{10}, $PM_{2.5}$, SO_2, NO_x, for 24hours basis and the levels are well within the prescribed limits. Three nos. of high Volume samplers of M/s Envirotech make for Ambient Air Quality monitoring for PM_{10}, $PM_{2.5}$, So_2, NO_x have been installed in the sampling site itself.

D GROUND WATER MONITORING

Ground water monitoring in and around the plant is being done once in a month.

6.2 BUDGET FOR IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT PLAN

As part of Environment management, JSWCL have so far invested around Rs.34.12 Crores till 31.03.2015 (including slag unit and mines). The Company has also spent Rs.120 Lakhs as recurring expenditure towards environment and pollution control during 2014-15.

CHAPTER - 7

ADDITIONAL STUDIES

CHAPTER – 7: ADDITIONAL STUDIES

7.1 PUBLIC CONSULTATION

Public consultation is exempted for the proposal.

7.2 DISASTER MANAGEMENT AND EMERGENCY PREPAREDNESS PLAN

A major emergency in a plant is one which has the potential to cause serious injury or loss of life. It may cause extensive damage to property and serious disruption both inside and outside the plant. Sometimes, it would require the assistance of outside agencies.

Emergency may be caused by a number of different factors, e.g. plant failure, it will normally manifest itself in three basic forms, viz. fire, explosion or toxic release.

SCOPE

The aim of hazard control and disaster management is concerned with preventing accidents through good design, operation, maintenance and inspection, by which it is possible to reduce the risk of an accident, but it is not possible to eliminate it. Since, absolute safety is not achievable; an essential part of major hazard control must also include mitigating the effects of a major accident.

An important element of mitigation is emergency planning, i.e. recognizing that accidents are possible, assessing the consequences of such accidents and deciding on the emergency procedures, both onsite and offsite, that would need to be implemented in the event of an emergency.

OBJECTIVES

The overall objectives of an emergency plan are:

- To localize the emergency and, if possible, eliminate it; and
- To minimize the effects of the accident on people and property.

Elimination of hazards will require prompt action by operators and emergency staff using, for example, fire-fighting equipment, emergency shut-off values and water sprays. Minimizing the effects will include rescue, first aid, evacuation, rehabilitation and giving information promptly to people living nearby.

IDENTIFICATION AND ASSESSMENT OF HAZARDS

This stage is crucial to both on-site and off-site emergency planning and requires to systematically identifying what emergencies could arise in the plant. These should range from small events which can be dealt with by plant personnel without outside help to the largest event for which it is practical to have a plan. Experience has shown that for every occasion that the full potential of an accident is realized, there are many occasions when some freak event occurs or when a developing incident is made safe before reaching full potential.

Most major hazard accidents come within the following categories:

EVENTS PERTAINING TO THE MANUFACTURING PROCESS OF CEMENT

The following areas are identified as hazard prone in case of cement plant where Disaster management plan is required.

- Handling of coal
- Handling of fine dust
- Handling of hot clinker
- Handling of cement
- Packing areas

HANDLING OF COAL

The coal is received in by rail and stored in stock yard.

The possible hazards are envisaged due to failure of wagon tipplers while unloading.

During summer season, there is chance of coal catching fire due to hot temperatures.

Effective sprinkling systems should be provided all round the coal stock yards.

HANDLING OF FINE DUST

The hot raw meal (Powdered limestone, laterite additives etc., will be heated in a six stage pre heater cyclone) will be stored in the raw mill silos. It is very common that the hot raw meal gets jammed in the chute and screw conveyers. During the maintenance process, the operator generally works in the preheater cyclone and other areas. Always there is a possibility of hazard that the jammed material falls on the workers and due to hot temperature of the material, possibility of injury may occur to the worker, sufficient care should be taken in the maintenance operations.

HANDLING OF HOT CLINKER

The hot clinker will be transported by deep pan conveyor (DPC) to the top of the silo. During this operation, there is a possibility of spill out of hot clinker. Proper care for the conveyor system and the bund wall for the clinker stock pile should be provided.

HANDLING OF CEMENT

Cement is the fine dust which requires proper care in handling, storage and packing to avoid any health hazards.

The management system to be provided in cement plant and power plant to avoid/minimize the disasters are detailed below:

ALARM AND COMMUNICATION SYSTEMS

Communication is crucial factor in handling an emergency. It is the practice at many plants that any employee can raise an emergency alarm, so allowing the earliest possible action to be taken to control the situation.

Alarm systems vary and will depend on the size of the plant. There should be an adequate number of points from an audible warning, or indirectly, viz. a signal or message to a permanently manned location. The alarm should alert the people to implement appropriate

emergency procedures. In areas where a high level of noise, it may be necessary to install more than one audible alarm transmitter or flashing lights. Automatic alarms may be appropriate on some sites.

There should be a reliable system for informing the emergency services as soon as the alarm is raised on site. The details of the communication arrangements should be agreed locally; in some cases it may be advisable to have a direct line to the fire bridge. Predetermined code works to indicate the scale and type of the emergency may be valuable.

7.2.1 FIRE PROTECTION AND SAFETY MEASURES FOR FIRE AND EXPLOSION HAZARDS

For protection of the plant against fire, all buildings / equipment, storage yards and plant would be protected by any one or a combination of the following system.

- Hydrant System
- Medium velocity water spray system
- High velocity water spray system
- Low expansion foam system
- Mobile & portable fire extinguishing equipment
- Fire alarm & detection system

The system will be designed in accordance with the recommendations of TAC / National Fire Protection Association (NFPA).USA will be followed, as applicable. While designing the fire protection system for this power station its extreme ambient condition will be taken into account.

The water for hydrant and water spray system will be met from a dedicated firewater storage tank. Fire hydrants are located in the plant covering the following buildings:

- Coal handling area & yard
- Bag House
- Administration building and canteen
- Workshop & stores
- Water treatment plant area

All fire hydrants are provided with necessary accessories and hose houses.

Dry powder type fire extinguisher and CO_2 type portable and mobile fire extinguishers will be kept at strategic locations in the plant area. In addition to these, manual call points will also be provided at different locations and there will be one mobile fire tender consisting of fire water storage, pump, hose reels, foam proportioner, foam containers etc. stationed within the plant premises.

Automatic fire detection & alarm system comprising of smoke/ heat/ fire sensors will be provided as per NFPA 72 recommendation.

7.2.2 EMERGENCY PREPAREDNESS PLAN

As per the rules 10 to 13 under Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 of Environment (Protection) Act, 1986, the occupier of the industry using hazardous chemicals in its manufacturing activity should develop an Emergency Management Plan. This includes description of the emergencies likely to arise out of the activity together with measures to overcome the situation.

The purpose of the Emergency Preparedness Plan is to minimize the danger to life and property in the event of a Plant emergency. To achieve this goal, well-defined, clear-cut steps are to be taken. For the purpose of this Plan, emergency procedures will be implemented for fires and explosions, material spills or natural disasters which require immediate emergency action and/or evacuation of the Plant.

An onsite emergency in the industries involving hazardous processes or in hazardous installations is one situation which has potential to cause serious injury or loss of life. It may cause extensive damage to property and serious disruption in the work area and usually, the effects are confined to factory or in several departments of factory, premises.

A quick and effective response during an emergency can have tremendous significance on whether the situation is controlled with little loss or it turns into a major emergency. Therefore, the purpose of this preliminary Onsite Emergency Plan (OSEP) is to provide basic guidance to the personnel for effectively combating such situations to minimize loss of life, damage to property and loss of property.

7.2.3 EMERGENCY EQUIPMENT

Emergency handling teams will consider maintaining on-site equipment to help mitigate damage. The common practice is to have

disaster 'bins' at strategic points around the building containing paper towels, plastic sheeting, torches and similar supplies. Readymade disaster bins and optional extras will be obtained. Contents of a disaster recovery bin will include:

Recovery bin	CO_2 fire Extinguishers
Blotting paper	bucket butchers paper
Cotton gloves	dust mask
Extension cord	fire blanket
Freezer bags	glove liners
Hand towel	knife
Note pad/folder	Paperclips
Paper towel	pegs
Pencil	plastic canister
Plastic bin liners	plastic sheeting
Post it notes	power board
Rubber gloves	scissors
Sponge	tags/ties torch and batteries
Waterproof marking pens	
Apron	

7.3 OCCUPATIONAL & SAFETYHAZARDS

Occupational and safety Hazards in the cement plant are given below:

PRELIMINARY HAZARD ANALYSIS

Equip.	Process	Potential Hazard	Severity Area & Population	Mitigation measures already in place
Stacker & Reclaimer (Lime Stone, Additives & Raw Coal)	Stacking & Reclaiming of Raw Material	Stacker & Reclaimer can overrun, which overturn the equipment	Stacker & Reclaimer Area About 6-7 Workers	➢ Proximity Switches are provided along with Mechanical Stoppers for stopping of over travel
		Fire	Coal Yard Area About 8-10 workers	➢ The Fire Hydrant System with closed loop system
		Air Pollution		➢ Dust Collectors / Water Spray Nozzles System are provided

Equip.	Process	Potential Hazard	Severity Area & Population	Mitigation measures already in place
Raw Mill	Grinding of Raw Material	Personnel can come in contact with Rotating parts	Raw Mill area 1 Worker	➢ The area are restricted ➢ Safety guards are provided
		Noise Pollution		➢ The complete area are covered with closed shed
		Air Pollution		➢ Properly designed Dust Collectors & Bag House are Provided
Storage Silo (Raw Meal, Cement, Fly Ash)	Storage of Raw Meal, Cement, Fly Ash	Air Pollution	Silo Area 5-7 Workers	➢ Storage Silo are completely sealed structure ➢ Extraction & Transportation through closed system like Air Slide ➢ Bag filters are provided at Silo top
		Breakage of Silo wall		➢ It is properly designed, taking care of the Load factor ➢ Pre-stress tandons are provided for better load taking ➢ Pressure relief valves are provided on Silo top ➢ Continuous monitor of Silo structure
VRM (Vertical Roller Mill)	Crushing of Raw Coal	Dust Emission	VRM Area 4-5 Workers	➢ Adequately designed Bag Filter are provided ➢ The complete system is in closed circuit ➢ The total process transportation is through covered &Pneumatic system

Equip.	Process	Potential Hazard	Severity Area & Population	Mitigation measures already in place
		Fire		➢ Inert gas plant will be installed ➢ Auto inert gas purging system is provided ➢ Adequate Fire Extinguishers at every floor & Fire Hydrant system are installed
Pre-Heater	Pre-Heating & Pre-Calcination of Raw Meal	Hot Air & Hot Surfaces	Pre-Heater Area 4–5 Workers	➢ Brick lining is done from inside ➢ Proper Heat Insulation is done ➢ Water Hydrant pipeline tapping's at every floor will be provided ➢ Controlled Air lines tapping's are given at every floor ➢ Fire Extinguisher is placed on every floor of Pre-Heater building
		Falling from Height		➢ Every floor of Pre-Heater building is properly barricaded by hand/knee railings ➢ Toe guards are provided ➢ Passenger lift is installed
Clinker Storage	Storage of Clinker	Air Pollution	Clinker Silo Area 5-7 Worker	➢ Storage Silo is completely sealed structure ➢ Extraction & Transportation through Deep Pan conveyors system ➢ Bag filters are provided at Silo top
		Breakage of Silo Wall		➢ It is properly designed taking care of Load Factor ➢ Pre stress Tandons

Equip.	Process	Potential Hazard	Severity Area & Population	Mitigation measures already in place
				are provided for better load taking ➢ Continuous monitor of Silo Structure ➢ Controlled movement of Workers
Storage Yard	Storage of Raw Material	Air Pollution	Raw Material Storage Yard 4-5 workers	➢ Storage yard is covered with Shed ➢ Moisture is provided through continuous Water Spray
Packing Plant	Packing of Cement in Bags through Rotary Packers	Dust Emission	Packing Plant 30-35 Workers	➢ Dust suction ports are provided near the Rotary Packer ➢ Suction ports are provided above the Belt Conveyors ➢ Appropriate PPEs are provided to all workers like Masks, Goggles & Ear Muffs

Type of Hazard	Area	Mitigation
Dust ➢ Respiratory Infection ➢ Bronchial Diseases ➢ Gastrointestinal Diseases ➢ Skin Allergy ➢ Pulmonary Disorder	➢ Material Yard ➢ Crushers ➢ Stacker – Reclaimer ➢ Storage Silos ➢ Grinding Mills ➢ Packing Plant	➢ Continuous Water Spraying ➢ Sealed Silos ➢ Storing in Covered Areas & Bins ➢ Adequately Designed Bag Filters & Pollution Control Equipment ➢ Periodic Medical Check-ups ➢ Adequate Medical Facilities ➢ Continuous Medical Surveillance
Noise ➢ Nausea ➢ Head Aches ➢ Loss of Hearing	➢ Crushers ➢ Grinding ➢ Mills ➢ Packing Plant	➢ Provision of Insulation ➢ Use of Damping Material ➢ Shock Absorption Techniques are adapted ➢ Ear Muffs are provided ➢ Greenbelt Corridor is developed along the periphery of the Plant

COMMON ACCIDENTS

- Slip, Trip and fall on the same level
- Fall from the height
- Unguarded Machinery
- Falling Objects
- Work in confined space
- Moving Machinery, on-site Transport, Fork lifts & Cranes
- Inhalable agents (Dust)
- Electric burns & electric shocks

PREVENTIVE MEASURES

- Suitable guarding of machineries
- Providing safety interlocking arrangements
- Examination & testing of all the lifting machines & tackles
- Maintaining good housekeeping & dust free environment
- Preventive Maintenance of all the equipment
- Fencing of all the working platforms, pits & sumps
- Providing safe working platforms, safety belts & other PPEs
- Providing ELCBs using approved & use correct cables
- All workers will be provided with necessary PPEs like Helmet, goggles, Respirators, ear mulls, Safety Shoes etc.,
- Safety Committee headed by Plant Head with equal representations by Workers and Management Staff and has to meet regularly and to organise Safety & Occupational Health related Programs regularly

EMERGENCY PREPAREDNESS INFRASTRUCTURE

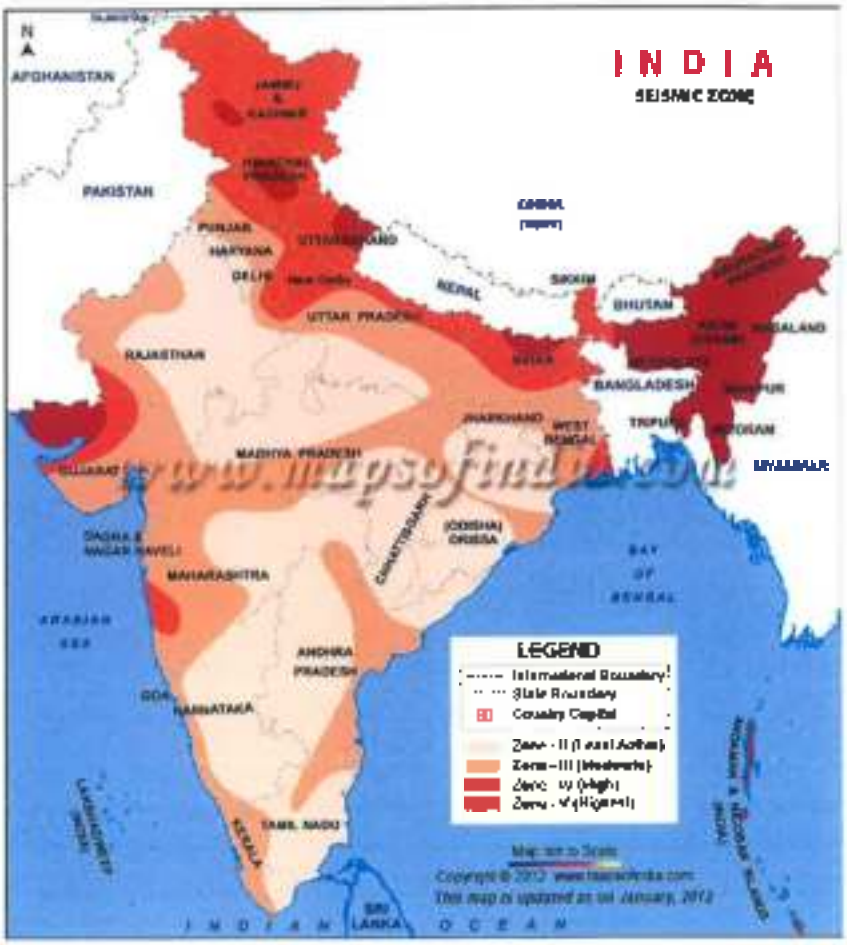
- Entry Gates (Separate Entry & Exit and Separate gates for People & Material) with clear passage onto Approach road
- Public Address System
- First Aid room with Paramedical staff at Site
- Ambulance at the plant Site
- In house Medical Facility
- Purified Drinking Water
- Neat & Clean Toilet Blocks (Ladies and Gentlemen)
- Hygienic Dining Facilities
- Rest rooms

TRAINING & REHEARSALS

- Training of all the factory personnel about Safety & Emergency Management before employing them on regular work
- Induction Training
- Training of all workers about their Role & Responsibility
- Basic Orientation Training
- Specific Training
- Semi-Skilled & Un Skilled
- Carpenters, Bar-Binders & Masons
- Fitters, Riggers & Welders
- Electricians
- Drivers / HEM Operators
- Crane & Winch Operators

7.4 EARTH QUAKE HISTORY

Seismic Map of India as on January, 2012 shows that the plant at Bilakalagudurfall is in the Seismic zone – II which is least active.



7.5 CARBON CREDIT PROJECT:

Installation of the waste heat recovery power plant (WHRPP) is in progress is planned and considered during next five years. Possibilities for carbon credit are also being exploded for WHRPP.

7.6 FUGITIVE EMISSIONS

Sources of fugitive dust in the plant are:

- Transportation activities within the cement plant
- Dropping/transfer points of the belt and bucket conveyors at transfer points
- Raw material stock piles
- Coal handling areas

Adequate air pollution control systems are provided as details below to maintain PM well within the prescribed limits.

Raw mill & Kilns	: Pulse Jet Bag House
Clinker Coolers	: Bag House
Limestone crusher,	
Coal mill & cement mills	: Bag Filters
All transfer points	: Dust Collectors
Limestone dump hopper	: Water spray system
Limestone conveyor	: Water spray system
Limestone stacker	: Water spray system

- All transfer points and storage silos are provided with dust collection and extraction systems for effective control of fugitive emissions. All the installed pollution control equipment are designed for ≤30 mg/Nm^3.
- The dust collected from the pollution control equipment is recycled back into the process.
- Clinker is stored in clinker storage tanks to control fugitive emissions.
- Gypsum and additives stored in covered storage sheds
- Cement stored in silos
- All raw material transfer conveyor are covered with GI sheets.
- All roads and open area in the plant are proposed to be cement concreted.
- To ensure and reduce impact of transport on the surrounding environment, raw materials and cement is transported in trucks covered with tarpaulin.

Transport vehicles are periodically checked at the main security gate for Pollution under Control certificate issued by approved RTA agencies.

All the above listed measures will be implemented for control of fugitive dust.

7.6.1 MONITORNG OF FUGITIVE DUST

PROCESS EQUIPMENT MONITORING

The following monitoring progamme as per the CPCB guidelines is being implemented.

- Differential pressure transmitter are fitted to all bag houses/bag filters to measure the pressure drop across bag filter systems.

- The minimum dust extraction volume has been designed based on the guidelines for ventilating various sources as per industrial ventilation hand book guidelines.
- The flow rate and static pressure at the bag filter inlet is being monitored monthly to ensure appropriate functioning of the bag filter installed.
- The details such as bag house specifications, layout drawing, and operation and maintenance guidelines are maintained.

7.6.2 MONITORNG OF FUGITIVE DUST

AMBIENT AIR QUALITY MONITORING

The dust from the fugitive sources is monitored by using the following equipment

a. Respirable dust samplers
b. Fine Dust Samplers
c. Gravimetric dust samplers
d. Personal Samplers

Monitoring is being carried out as per the frequency specified by the SPCB/MoEFCC.

7.7 FUGITIVE DUST PROTECTION FOR WORKERS

JSWCL employed all the dust reduction measures for the process units to meet the environmental standards.

The following measures for workers from fugitive dust were taken up and monitored:

a. Pre-Employment medical examination of all the workers assessment of fitness for the particular type of work with due regard for adaption of work place to the worker taking into account individual susceptibility.
b. Provision of dust masks, goggles, safety shoes and helmet
c. Review of health status of workers by maintaining the health record & their occupation

7.7.1 TRAFFIC STUDY – IMPACT DUE TO TRANSPORTATION

Major quantity of transportation for the cement plant is limestone and finished product.

Traffic study has been carried out on road connecting Cement plant and Nandyala Town with monitoring point at JSWCL gate.

TRAFFIC OBSERVATIONS

Timing	2 Wheelers	3 Wheelers	4 Wheelers (Cars, Jeeps, Vans)	Buses/ Lorries	Total
8:00-9:00 am	210(105)	20(20)	45(45)	32(70)	307(240)
9:00-10:00 am	185(93)	13(13)	32(32)	34(55)	264(193)
10:00-11:00 am	136(68)	18(18)	25(25)	31(68)	210(179)
11:00-12:00 pm	90(45)	16(16)	10(10)	35(77)	151(148)
4:00-5:00 pm	190(95)	32(32)	26(26)	33(73)	281(226)
5:00-6:00 pm	175(88)	28(28)	21(21)	30(66)	254(203)
6:00-7:00 pm	120(60)	10(10)	18(18)	34(75)	182(163)
7:00-8:00 pm	85(43)	6(6)	9(9)	31(68)	131(126)

Note: The highest peak observed is **240**PCUs/hr as per IRC-106:1990 during **08:00-09:00 am** as per IRC, the traffic count is taken for both the side together. **Values reported in brackets are PCUs.**

No additional material will be transported by road. Additional clinker produced from expansion will be dispatched to clinker grinding unit by rail. Hence no additional impact on surrounding villages or traffic on road will be there due to expansion.

JSWCL constructed a 10 M x 30 Km concrete road from factory to Nandyal town to reduce the impact of transport of raw material/ finished goods on the environment/ agriculture land. All trucks are carrying raw material and finished products are covered with tarpaulin in compliance with the CPCB guidelines. Loose powdery material viz. cement /GGBS/ fine coal etc. are transported in bulkers.

Pollution under Control (PUC) check of company owned vehicles is regularly done whereas random PUC certificates are checked at factory gate for the vehicles.

Parking arrangements

JSWCL has provided concreted parking facility for about 200 vehicles in the parking yard located just outside the main security gate. The area occupied by parking facility is about 4 Ha. All facilities, such as canteen, toilets, rest rooms, etc. are provided for truck drivers. Separate office building equipped all communication and other infrastructure has also been provided to the transporters.

CHAPTER - 8

PROJECT BENEFITS

CHAPTER – 8 : PROJECT BENEFITS

8.1 PROJECT BENEFITS

Any industrial activity will help in improving the socio-economic benefits in areas like employment, communication, educational etc.

8.2 EMPLOYMENT POTENTIAL

The plant and mine has given direct employment to about 320 people. In addition there is indirect employment to many more people in the form of contractual jobs, business opportunities, service facilities etc. This will enhance the economic status.

Apart from the jobs, the company had provided medical and educational facilities to the employees. The company has also constructed a full-fledged colony.

8.3 SOCIAL WELFARE MEASURES

As responsible corporate citizens JSWCL have always given top most priority for Corporate Social Responsibility in our vision and philosophy. Today, taking its iconic shape, JSWCL became a formidable brand and this mission is accomplished with the support of great people and their values. Apart from delivering superior cement products, constructing socially responsible housing and commercial projects; we are dedicating ourselves in paying back all those humble human beings as a token of gratitude for their outstanding contribution.

JSWCL is continuously contributing toward welfare & community development activities under its CSR programmes not only at villages where it is operating its units but also in other parts of Andhra Pradesh.

Focus areas of JSWCL are :

- Health
- Education
- Women empowerment
- Cleanliness

- Rural Development
- Safety

The contribution of JSWCL as part of CSR in the above area are detailed below

8.3.1 HEALTH

A Artificial Limb Program

JSWCL initiated a program to help the people living with disability in Gadivemula Mandal to regain mobility and dignity by providing with artificial limbs and appliances as part of Corporate Social Responsibility of the company.

Our company collaborated with 'Mobility India', a renowned voluntary organisation in manufacturing the artificial limbs based at Bangalore and MariyaNilayam, Gargeyapuram, Kurnool for technical support to provide baseline survey and to make artificial limbs and appliances.

JSWCL planned to cover the disabled people of GadivemulaMandal, with hand and leg impairment in two phases. 129 appliances were distributed to 79 beneficiaries belonging to Gadivemula, Bilakalaguduru, Bujanoor, Pesaravai, Karimadella, Grandivemula, Childrukuru, Polluru, Pulimaddi, Koratamaddi, Tirupadu and Gadigarevula villages in January, 2014 in phase-I. Phase-II measurement camps were conducted in November, 2014 and Mobility India manufactured the artificial limbs and appliances as per the measurements taken.

Phase-II Artificial Limb Distribution Program was organized in July-2015 wherein 83 appliances were distributed to 40 beneficiaries belonging to Gani, Ondutla, L.K. Thanda, Paibhogula, Manchalakatta, Y.K. Thanda, Durveshi, K. Bollavaram, Korrapolur and Somapuram villages of Gadivemula Mandal. With this, JSWCL feels proud to have covered every Specially Abled Person – Hand & Leg suitable for replacement of limb in the Gadivemula Mandal.

B HIV/AIDS Awareness Campaign

The month of December is known as AIDS awareness month. 1st of December is designated as World AIDS Day. Despite of many efforts,

people do not know the facts about how to protect themselves and others from HIV. Stigma & discrimination remain a reality for many people living with HIV. World AIDS Day is important as it reminds the public and Government that HIV has not gone away – there is still a vital need to increase awareness, fight prejudice and improve education.

JSW Cement also undertakes awareness campaign through folk plays among the general public in the villages Bilakalagudur, Bujunur and also among the truckers at the plant.

"AIDS affects many parts of society, and so everyone needs to be aware of HIV and AIDS."

C MOBILE AND SPECIAL HEALTH CAMPS

To keep our DIZ healthy, daily health care services are provided in 10 villages of mandal through our mobile health camps. Our medical team provides general health care service (Dental, ENT, Diabetic and Hyper tension). 325 Units of blood have been donated by employees of JSWCL to Shantiram General Hospital, Nandyal District hospital and Red Cross Society.

8.3.2 EDUCATION

Under the Education program we are providing scholarship to toppers to ensure continuity of education 16 students bagged these scholarships. CALC (Computer Aided Learning Centers) was setup to provide basic computer skills to the school children. Inverter and tutor facilities are provided to the centers.

To Create Awareness on Science theories and models a modern science lab was installed in Zilla Parishad High School of Gadivemula mandal with latest and innovative equipment for easy learning of science concepts. Training was provided to all science teachers of Zilla Parishad High Schools in Gadivemula Mandal in the working of these innovative science models by Experiential learning solutions. To ensure a quality education in our DIZ we are now planning our mission initiative mode of approach.

Anganwadi centers come under the Integrated Child Development Scheme. The main objective of this program is to improve the

nutritional status of preschool children 3-6 years of age group. To provide supplementary nutrition Anganwadi Workers (AWW) would cook the food using firewood as source of energy and provide the food to children and nursing mothers. Besides the high expense, another problem of cooking over an open fire is the increased health problems brought on from the smoke, particularly lung and eye ailments. In order to save the AWW and Anganwadi Helpers (AWH) from harmful exposure of the smoke, JSWCL, Bilakalagudur, has provided gas connection along with Stove to each Anganwadi Center of DIZ villages.

To promote girl child education we have constructed and repaired 8 sanitation blocks in 8 schools of GadivemulaMandal and ensuring proper water and cleanliness of the sanitation block.

8.3.3 WOMEN EMPOWERMENT

TAILORING TRAINING CENTER

The main aim of establishment of tailoring centers is to enhance the quality of life of women through increased knowledge and skills. The company realised that women need some skills to uplift their economic status. They should be able to stand on their feet and provide support to their families.

During discussions with the women of Bilakalagudur, the women showed enthusiasm in learning some skills to supplement their household income. They showed interest in learning basic stitching skills and advance tailoring, fashion designing and more by a lady trainer. To facilitate these skills, JSWCL has established Tailoring Center at Bilakalagudur with 6 sewing machines. The main motivation for starting this center is to develop women in the community and provide an opportunity for them to better their livelihood. The women are very happy because of this center and many showed interest to join.

Currently, 30 students are enrolled. The classes are taken in two shifts every day and it is held weekly from Monday to Saturday from 10.00 am to 5.00 pm. The duration of the training is 5 months.

8.3.4 CLEANLINESS - SWACH VILLAGE

Improving access to sanitation in nearby villages is one of the aims of JSWCL as part of its CSR. Open defecation or lack of sanitation – is a major factor in causing various diseases.

To address this issue, JSWCL is creating awareness on two pit toilet method and supporting people below poverty line with 15 bags of cement to construct household toilets which are supplementary to the aid from government. JSWCL has given cement bags for 179 beneficiaries.

8.3.5 RURAL DEVELOPMENT - SAFE DRINKING WATER

To provide a safe drinking water JSWCL installed RO plant including building in Bilkalagudum Village which would serve 4500 population.

Installed 20 solar lamps in both Bilakalagudur and Bujunur villages.

8.3.6 SAFETY - AWARENESS CAMP ON ELECTRICAL SAFETY

Electricity is so much part of modern living that we can often take it for granted. It is a powerful and versatile energy but can be dangerous if it is not used properly. Serious accidents with electricity in the home are rare but each year there is a small number of fatalities and serious injuries. Most of the accidents that occur are due either to carelessness or to a lack of awareness of some basic rules that should always be observed when using electricity.

JSWCL conducted an awareness camp on 'Electrical Safety' at Bilakalagudur village on 5th May, 2015 to address the issues in using electricity safely. The experts from electrical department of JSWCL have briefed about safety measures. Also distributed the flyers contains essential information on electrical safety in general, and also hints and rules which one should always follow.

Eco-Development measures

Various eco-development measures have been implemented in the nearby villages. Major activities undertaken are supplement government midday meal scheme in nearby villages, distribution of artificial limbs to ortho disabled persons, tailoring centres for local

women in village Bilakalagudur, helping to eradicate malaria, AIDS and other communicable diseases, scholarship to 10th class meritorious students and vocational training to rural women and youth for soft skill development.

8.4 EXPENDITURE ON CSR ACTIVITIES FOR THE YEAR 2014-15

The key areas of community/ socio economic development are as follows:

1) Promotion of education
2) Reducing child mortality rate
3) Combating HIV/ AIDS, malaria and other communicable diseases
4) Employment enhancing/ vocational training programmes
5) Promoting gender equality and empowering women
6) Environmental sustainability
7) Social infrastructure development
8) Need based social development activities

JSWCL has incurred an amount of Rs. 250 lakhs for implementing various CSR activities during the year 2014-15

CSR ACTIVITIES – YEAR 2014-15

	CATEGORY AS PER THE COMPANY ACT	Amount Rs. In lacs
		Revenue
A	**PROMOTION OF EDUCATION**	**25.50**
1	Supplement Government mid-day meal scheme and expansition	2.5
2	Facilitate CALC center(computer centre) and maintenance/running cost (MLP)	1.5
3	Organize Science exhibitions in 4 Z.PHighs schools (Mandal level Programme)	1.0
4	Provide merit scholorships to tenth class government school students (MLP)	1.5
5	Upgradation of school libraries in 10 schools	1.0
6	Provide substitute Vidya volunteers in government schools	2.0
7	Celebrate School anniversaries and other important events like Childrens day (November-14th) and teachers days (september 5th)	1.0

	CATEGORY AS PER THE COMPANY ACT	Amount Rs. In lacs
		Revenue
8	Provide need based infrastructure in Government schools and Government welfare hostels (Solar panels and other related material support etc)	5.0
9	Provide solar LED reading lamps to Government school children	2.0
10	Celebrate OP Jindal birth anniversary (7th August) and provide educational material in government schools (school bags,ties,belt and shoes (Per child @ Rs.1000 in 10 schools and plan to reach 500 children)	5.0
11	Develop science labs in ZP schools (ZP=5 and MPUP=9 Total: 14)	1.0
12	Provide water facility in Government Schools and Villages (which includes minor bore repairs etc)	2.0
B	**Reducing child mortality and improving maternal health**	**9.0**
1	1. Provide low cost nutrition to children and mothers at AGWs. 2. Provide reading material to AGWs centers 3.Conduct low cost nutrition demos at AGWs	5.0
2	Develop kitchen gardens at suitable AGW Centers and villages	0.5
3	Special Health camps on RCH (Reproductive child health) Gynecological issues	1.0
4	Organize community events: World breast feeding week (1st to 7th August) and other related programmes	0.5
5	Provide need based material like almarahs,gas stoves, utensils, mats and children play material to AGW Centers (to support and ensure midday meal programme)	2.0
C	**Combating HIV/AIDS,malaria and other communicable diseases**	**23.0**
1	Medicines for mobile health service	3.0
2	Mobile health van maintenance cost	2.0
3	Combat HIV/AIDS and other diseases like malaria, TBetc (conduct awarnessprogrammes at community level)	1.0
4	Organize special helath camps on Dental, cancer screening,diabetic and Gynecological issues	2.0
5	Provide Nutrition support to People living with HIV/AIDS	2.0

	CATEGORY AS PER THE COMPANY ACT	Amount Rs. In lacs
		Revenue
	(Positive Network)	
6	Organize community events 1. Observe World Aids Day (December 1st)	1.0
7	Malaria remedial programme : Imosquito fogging in villages and purchase relevant material /equipment for effective implementation	2.0
8	Clinical lab maitenance (Lab matertal and chemicals and X-Ray plates)	1.0
9	1. Conduct awarnessprogrammes 2. spotmedicatiion to truckers and migrants on HIV/AIDS and STI (Sexually transmitted infections) 3. Develop relevant IEC material for awarness	2.0
10	Organize artificial limbs distributilonprogramme (remaining uncovered 11) villages	7.0
D	**Employment enhancing /vocational skills**	**115.0**
1	Establish 50 seater BPO training center at Gadivemula 2.conduct vocational trainings/coachings to rural women and youth in spoken english,softskills.computer skills and LSE (life skill education skills etc)	115.0
E	**Promoting gender equality and empowering women**	**5.0**
1	Conduct trainings/awarness/ empowerment programmes to women 2. Organize International women day (8th March, 2015) and recognize women achivements	1.0
2	EstablishTailoring center at Gadivemula and its maintenance cost.	4.0
F	**Ensuring Environment Sustainability**	**26.0**
1	Provide smokeless chullikas to rural women and women group samakyas	2.0
2	Individual sanitary latrine construction- support of 15 bags of cement to each eligible House Hold	6.0
3	Organize awarnessprogrammes on sanitation,waterborn diseases and personal hygiene practices	1.0
4	Provide sanitation kits to local community and govemement schools/AGWs	1.0
5	Develop solar LED street lighting facility in rural villages	5.0
6	Provide Dust bins in villages	3.0
7	Tree plantation in our neary by villages	1.0

	CATEGORY AS PER THE COMPANY ACT	Amount Rs. In lacs
		Revenue
8	Construct RO- Filter water plant in village to provide safe drinking water	7.0
G	**Social Infrastructure Development**	**35.0**
1	Construction of Internal roads in villages	25.0
2	Construction of 1 bus shelter in our neighbouring village	10.0
H	**Other need based Social developmental activities**	**20.5**
1	Celebrate Local village events/festivals (Mahanandi, peddammajatra and vinayakachavithi)	2.0
2	Develop IEC material for CSR programmes /activities	2.0
3	Organize sports competations and provide sports kits to rural youth associations/youth clubs	2.0
4	Indentify NGO partner to support and implement CSR annual 2014-15 plan	6.0
5	Emergency fund for natural disasters	1.0
6	Honorarium to Community Volunteers (They will be from local villages and support our outreach CSR-Programmes in the villages @ 5,000 per month	1.0
7	Develop and promote community structures like 1. school support groups 2. youth clubs 3.Adult support groups and organize monthly meetings	0.5
8	Organize meetings with NGOs /CSOs/FBOs based at mandal, division and district level to develop and maintain effective linkages	0.5
9	Organize programmes with local media persons (print and electronic) and village elders	0.5
10	Miscellaneous expenditure	5.0
	GRAND TOTAL (A+B+C+D+E+F+G+H)	**250.00**

8.5 CSR BUDGET FOR THE YEAR 2015-21

JSWCL has budgeted an amount of Rs.1422 lakhs for implementing various CSR activities during the year 2015-21.

Sl.No	CATEGORY AS PER COMPANY ACT	2015-16 Amount in Lacs	2016-17 Amount in Lacs	2017-18 Amount in Lacs	2018-19 Amount in Lacs	2019-20 Amount in Lacs	2020-21 Amount in Lacs
1	**IMPROVING LIVING CONDITIONS**	**79.00**	**45.08**	**44.35**	**82.00**	**48.98**	**48.74**
1.1	AROGYAM- Safe motherhood & child Hood	69.00	35.08	35.08	72.00	38.98	38.74
1.2	Livestock Management	10.00	10.00	9.27	10.00	10.00	10.00
2	**PROMOTING SOCIAL DEVELOPMENT**	**130.62**	**139.84**	**142.60**	**84.62**	**71.16**	**56.50**
2.1	VIDYA The Education Program	130.62	139.84	142.60	84.62	71.16	56.50
3	**ADDRESSING SOCIAL INEQUALITIES**	**11.24**	**12.44**	**7.41**	**6.16**	**6.16**	**6.16**
3.1	Juse making unit	0.00	5.15	1.12	1.12	1.12	1.12
3.2	Promotion/Training/Supportin g SHGs	3.45	2.95	2.45	1.20	1.20	1.20
3.3	Tailoring Unit	7.79	4.34	3.84	3.84	3.84	3.84
4	**RURAL DEVELOPMENT PROJECTS**	**11.00**	**45.30**	**48.39**	**46.00**	**51.00**	**65.00**
4.1	Rural Roads and Drainages		44.30	42.33	36.00	36.00	50.00
4.2	Infrastructure facilities in Rural area						
a	Drinking/Domestic water supply	10.00	0.00	6.06			
b	Civic Amenities				5.00	10.00	5.00
c	Solar street light	1.00	1.00		5.00	5.00	10.00
d	Community Buildings						
5	**Swachh Bharat Mission**	**10.00**	**10.00**	**10.00**	**5.00**	**15.00**	**0.00**
5.1	Sanitation - Construction, Maintenanace & upgradation of						
a	Individual toilets	5.00	5.00	5.00			
b	Community toilets						
c	Institutional Toilets						
d	Other Sanitation measures						
5.2	Waste, Waste water Management	5.00	5.00	5.00	5.00	5.00	
a	Collection, Transportation & Disposal					10.00	
b	Waste treatment						
5.3	Awareness Campaign						
6	**Combating HIV/AIDS,malaria and other communicable diseases**	**15.00**	**11.00**	**11.00**	**11.00**	**11.00**	**11.00**
6.1	Fogging in 2 villages	1.00	1.00	1.00	1.00	1.00	1.00
6.2	HIV-AIDS program for truckers	14.00	10.00	10.00	10.00	10.00	10.00
7	**Overhead & Administration**	**1.14**	**1.34**	**1.25**	**3.00**	**3.00**	**3.00**
	TOTAL	**258.00**	**265.00**	**265.00**	**237.78**	**206.30**	**190.40**

CHAPTER - 9

ENVIRONMENTAL COST BENEFIT ANALYSIS

CHAPTER – 9: ENVIRONMENTAL COST BENEFIT ANALYSIS

Not applicable as it is not recommended at the Scoping stage.

CHAPTER - 10

CHAPTER – 10 : ENVIRONMENAL MANAGEMENT CELL

10.1 ENVIRONMENTAL POLICY

JSW Group, the $11billion conglomerate, is a part of the O.P.Jindal Group. With verticals that are exploring innovative and sustainable avenue sin Steel, Energy, Infrastructure and Cement, JSW Group is paving the way for India's development as a global superpower.

- The company, JSWCL recognisesits joint responsibility with the GovernmentandthePublictoprotectenvironmentandiscommittedtoregulateallits activities so as to follow best practicable means for minimising adverse environmental impact arising out of its operations.

- JSWCL is committed to making its products environmentally acceptable, on a scientifically established basis, while fulfilling consumer's requirements for excellent quality, performance and safety.

- Aim of the Environment Policy is to do all that is reasonably practicable to prevent or minimise, encompassing all available knowledge and information, the risk of an adverse environmental impact arising from manufacturing and supply of our products.

- Environment Policy document reflects the continuing commitment of the Board for sound Environment Management of its operations. The Policy is applicable to all company operations covering manufacturing, sales and distribution and other offices.

ENVIRONMENT POLICY

"JSWCL is committed to meeting the needs of customers in an environmentally sound manner, through continuous improvement in environmental performance in all our activities. Management at all levels, jointly with employees, is responsible and will be held accountable for company's environmental performance".

Accordingly, JSWCL aims to:

- Ensure safety of its products and operations for the environment by using standards of environmental safety, which are scientifically sustainable and commonly acceptable.

- Develop, introduce and maintain environmental management systems across the company to meet the company standards as well as statutory requirements for environment. Verify compliance with these standards through regular auditing.

- Assess environmental impact of all its activities and set continual improvement objectives and targets and review these periodically to ensure that these are being met at the individual unit and corporate level.

- Reduce waste, conserve energy and explore opportunities for reuse and recycle.

- Encourage efficient use of energy, water and utilities.

- Integrate the consideration of environmental concerns and impacts at the design, planning and operational stages of our activities.

- Involve all employees in the implementation of this Policy and provide appropriate training. Provide for dissemination of information to employees on environmental objectives and performance through suitable communication networks.

- Encourage suppliers & service providers to develop and employ environmentally superior processes and ingredients and co-operate with other members of the supply chain to improve overall environmental performance.

- Work in partnership with external bodies and Government agencies to promote environmental care, increase understanding of environmental issues and disseminate good practices.

10.2 CORPORATE RESPONSIBILITIES

The Executive Director of the Company is responsible for the Compliance of the Policy. The Executive Director may constitute a Committee called as Corporate Environment Committee (hereinafter

called as Committee). The Committee is committed to conduct the company operations in an environmentally sound manner. The Committee will:

- Set standards and establish environmental improvement objectives and targets for JSWCL as a whole and for individual units, and ensure these are included in the annual operating plans.
- Formally review environment performance of the company once every quarter.
- Review environment performance when visiting units and recognize exemplary performance.
- Nominate a unit head or senior employee as coordinator for compliance of environmental performance at the site.
- The Committee, through the nominated coordinator will:

- Ensure implementation of Policy on environment and compliance with the Company's environmental standards and the standards stipulated under relevant national/local legislation. Where appropriate, apply more stringent criteria than those required by law.
- Assess environmental impact of JSWCL operations and establish strategies for sound environment management and key implementation steps.
- Encouragedevelopmentofcleanermanufacturingprocessestofurtherr aisethe standards of environment performance.
- Establish appropriate management systems for environment management and ensure regular auditing to verify compliance.
- Establish systems for appropriate training in implementation of Environment.

❖ Management Systems at work.

- Ensure that all employees are made aware find individual and collective responsibilities to wards environment.

- Arrange for expert advice on all aspects of environment management.

- Participate, wherever possible, with appropriate industry and Government bodies advising on environmental legislation and interact with national and local authorities concerned with protection of environment.

10.3 ORGANISATION STRUCTURE – ENVIRONMENTAL CELL

❖ The overall responsibility for environment management at each unit will rest with the unit head or senior employee, who will ensure implementation of Policy on environment at unit level and report to Executive Director or Committee as the case may be. Concerned line managers / heads of departments are responsible for environmental performance at department levels.

❖ In order to full fill the requirements of the Policy at each site, the Unit Head will:

- Designateaunitenvironmentcoordinatorwhowillberesponsibleforco-ordinating environmental activities at unit, collating environmental data and providing/arranging for expert advice.

- Agree with the coordinator responsible for the unit specific environmental improvement objectives and targets for the unit and ensure that these are corporated in the annual objectives of the concerned managers and officers and are reviewed periodically.

- Ensure that the unit complies with JSWCL's environmental standards and the relevant national and state regulations with respect to environment.

- Ensure for mal environmental risk assessment to identify associated envy on mental aspects and take appropriate steps to control risks at acceptable levels.

- Ensure that all new operations are subjected to a systematic and formal analysis to assess environmental impact. Findings of such exercises should be implemented prior to commencement of the activity.

- Manage change in people, technology and processes through a planned approach based on training, risk assessment, pre-commissioning audits and adherence to design norms.

- Regularly review environment performance of the unit against set objectives and targets and strive for continual improvement.

- Sustain a high degree of environmental awareness through regular promotional campaigns and employee participation through training, safety committees, emergency drill sect.

- Ensure dissemination of relevant information on environment with in the unit and to outside bodies, and regularly interact with Government authorities concerned for protection of environment.

- Maintain appropriate emergency procedures consistent with available technologies to prevent/control environmental incidents.

- Provide appropriate training to all employees.

- Ensure periodic audits to verify compliance with environment management systems.

- Also ensure periodic 3rd party environment audits through certification bodies to check efficacy of the Environment Management Systems.

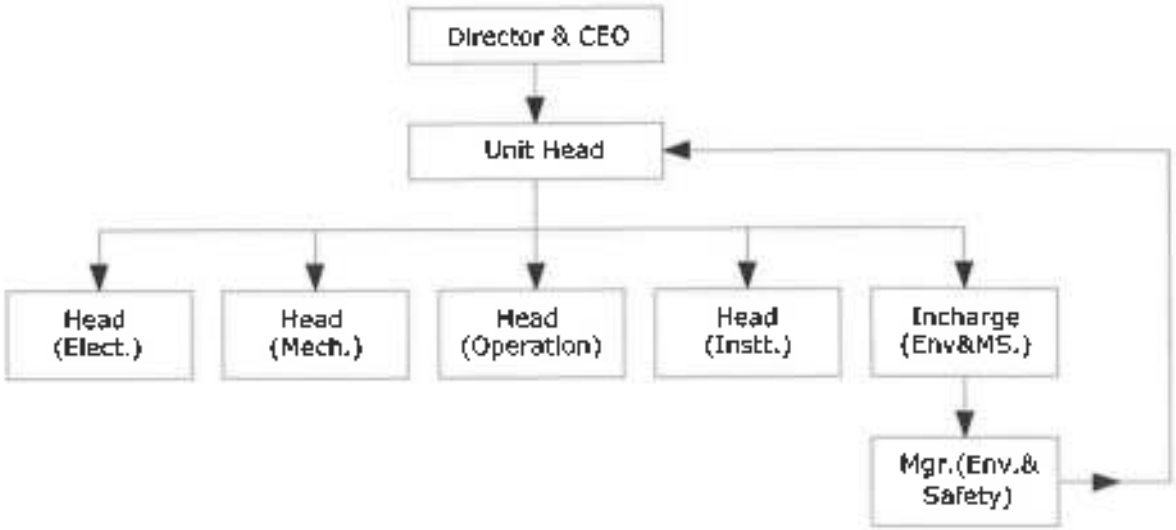
- Report environmental performance to committee on a monthly basis.

ORGANISATION CHART OF ENVIRONMENTAL MONITORING CELL

A separate Environment management cell is in place to carry out different environment management and monitoring functions under the control of Sr. Executive of Plant.

ORGANIZATION CHART

(Who reports to whom; to Environment Dept. to Top Management)



CHAPTER - 11

SUMMARY & CONCLUSIONS

CHAPTER – 11 : SUMMARY AND CONCLUSIONS

11.1 PROJECT DESCRIPTION

M/S. JSW CEMENT LIMITED (JSWCL) is operating a 2.0 Million Tonnes Per Annum (MTPA) Clinker & 4.8 MTPA Cement manufacturing unit at Bilakalagudur Village, Gadivemula Mandal, Kurnool District, Andhra Pradesh.

JSWCL proposes to increase the Clinker production capacity through Optimization and de-bottlenecking of existing equipment & processes not affecting land, air and water environment. In addition to increase of clinker production, change of product mix is also proposed keeping the production capacity of finished product at 4.8 MTPA.

Proposed changes in clinker production and Product Mix are as under:

Projects	Present Capacity	Proposed Expansion	Capacity After Expansion
Clinker Production (MTPA)	2.0	0.50	2.50
Cement Production (MTPA)	4.80 (1.10 OPC + 3.70 PSC)	Nil	4.80 (1.1 OPC + 3.7 PSC/GGBS)

REQUIREMENTS OF THE PROJECT

The limestone requirement for 2.5 MTPA (total) Clinker production after expansion is 3.75 MTPA. **JSWCL** has necessary clearances for limestone production from Captive Limestone Mines.

Cement Plant is located in an area of 263.05 Ha owned by JSWCL. No additional area will be required for expansion. No R&R is involved

The present water consumption of the plant is about 4500 m^3/day and is met from the groundwater resources. No additional ground water is required for the proposed expansion.

The peak power consumption in the JSWCL Cement plant complex including mine is 40 MW. Total power requirement for the JSWCL

cement plant complex is met from APCPDCL with a dedicated 132 kV overhead grid line. No additional power requirement is envisaged for the expansion project.

However JSWCL already received Environmental Clearance for the proposed 2 X 18 MW coal based captive power plant. And the required power will be tapped from CPP, once it is commissioned.

No additional infrastructure is required for increase of the clinker production from 2.0 to 2.5 MTPA.

The proposed changes for optimization and debottlenecking of process units are:

Section	Activities proposed for process optimization / Modernization
Raw Mill	Increasing separator efficiency through optimization and minor modification. Minor modification in material feeding system.
Kiln & Cooler	Reduction in pressure drop in cyclones. Process optimization to achieve maximum productivity (run factor & production factor) of Kiln and Cooler. Clinker cooler optimization to achieve maximum heat recuperation efficiency.
Coal Mill	Process optimization to achieve maximum productivity (run factor and production factor) of coal mill

The existing manpower working in plant is 800. No additional manpower is required.

All the necessary infrastructure facilities such as Dispensary, Park, Playground, Temple, Commercial Complex, etc., are provided

A full-fledged water supply and drainage system is already in place and the wastewater generated from the colony is being treated in the Sewage Treatment Plant to meet the discharge standards. The treated sewage is used for greenbelt development within plant and colony.

11.2 DESCRIPTION OF ENVIRONMENT

To study the impacts arising out of enhanced clinker production, EIA study was carried out in the study area of 10 km radius during Summer Season - 2015. Summary of the same is given below:

- Meteorology: The predominant wind directions during these hours were from WSW- W sector accounting to about 45.55% of the time. Calm winds of less than 1.65 kmph prevailed for 2.74% of the time. Wind speed during this period was mostly above 15 kmph.
- Ambient air quality monitored at eight locations showed all values well within the limits of NAAQ standards specified for Industrial, Rural, Residential& Other areas.
- Noise levels were monitored at eight locations at villages and were found to be well within the limits.
- Ground and Surface Water samples collected from ten locations within the study area. All the surface and ground water samples showed compliance of all parameters with the drinking water standard of IS 10500.
- Eight soil samples collected showed low to medium fertility.
- Socio economic status of the study area is found to be moderate.

11.3 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

11.3.1 AIR ENVIRONMENT

The baseline concentrations monitored in the EIA study includes the emissions of the existing unit of Cement Plant. Therefore, additional emissions are mainly due to enhancement of clinker production from 2.0 to 2.5 MTPA and change of product mix.

The additional emissions from the modification are mainly due to:

a. increase in flows resulting in increase in particulate emission load
b. Increase in coal consumption in the kiln resulting in increase of particulate, SO_2 and NOx emissions (about 90% of Sulphur will be absorbed by clinker)
c. increase in coal and furnace oil consumption at Hot air generator of slag grinding unit

In order to estimate the additional increase of emission due to expansion of cement plant, the present levels of emissions have been studied. In addition to increase of clinker production, the proposed change in raw mix design will increase emissions from Hot air generator which is mainly used for drying of slag. Therefore considering change in product mix, worst case emissions have been worked considering the following:

a. Additional increase of clinker production of 0.5 MTPA
b. Additional production of GGBS.

Incremental ground level concentrations estimated are discussed below:

OVERALL SCENARIO

Predicted maximum ground level concentrations obtained for 24-hour mean meteorological data of summer season '15 are superimposed on the following existing baseline concentrations to project the overall post expansion scenario in the study area.

The Overall Scenario with predicted concentrations over the baseline is shown below.

PREDICTED GROUND LEVEL CONCENTRATIONS AND OVERALL SCENARIO, µg/m³

24-Hourly Concentrations	Particulate Matter - 10 (PM_{10})	Sulphur Dioxide (SO_2)	Oxides Of Nitrogen (NOx)
Baseline concentration (Max)	64.5	15.1	15.5
Predicted Groundlevel Concentration (Max)	3.28	24.95	13.16
Overall Scenario	67.78 **(100)**	40.05 **(80)**	28.66 **(80)**

NOTE: Values in parenthesis are National Ambient Air Quality (NAAQ) standard limits specified for Industrial, Residential, Rural and other areas.

11.3.2 AIR ENVIRONMENT – ENVIRONMENTAL MANAGEMENT PLAN

The main pollutant emitted from the cement plant is particulate matter.

JSWCL has integrated the Environmental management with the manufacturing process. Cement manufacturing at JSWCL cement plant is a compound process with Vertical Roller Mill for Raw mill which helps in energy conservation. Additionally kiln operation is being controlled through fully automated, which takes action for coal firing based on various advanced information and also can take action by seeing the parameters in less than a minute time. By adopting this technology, JSWCL has avoided tripping of ESP.

JSWCL has invested about Rs. 10 Crores for the installation of various pollution control systems in the existing cement plant. Electro Static Precipitators have been installed in the plant to control the emissions from the chimneys and also to meet the emission norms. The emissions from all the chimneys are maintained well within the prescribed norms of APPCB.

High efficiency pulsejet type bag filters are installed in the crushing plant, raw mill hoppers, coal mill hoppers, blending silo, cement mill hoppers, cement silo and in all belt conveyor transfer towers to control the particulate emission less than 30 mg/Nm^3.

Details of the pollution control systems provided are given in following table

LIST OF POLLUTION CONTROL SYSTEMS IN THE PLANT

Process Unit	Pollution Control Equipment
Cement plant	
Rawmill/Kiln	Bag house
Coal mill	Bag filter
Cooler	Bag house
Cement Mill	Bag filter
Slag Mill	Bag filter

Bag Filters are designed to control dust emission upto 30 mg/Nm^3 are provided to Kiln & Raw mill, Cement Mill, Cooler, Crusher, Slag mills and Storage Silos for control of particulate emissions.

All the flue gas outlets are provided with state of art air pollution control equipment with control efficiency of 99.8-99.9 % to maintain the particulate emission level below 30 mg/Nm^3. The cement dust

collected in the pollution control devices is recycled back to the cement manufacturing process.

Ventilation systems are provided with bag filters in the plant. All the pollution control equipment are designed to meet outlet particulate emission of less than 30 mg/Nm^3 for particulate matter.

Interlocking facility has been provided in the pollution control equipment.

All the material handling systems are covered with aprons.

JSWCL will be achieving the increase in production of clinker by modification of process units. All the pollution control equipment in the cement plant is in place for various units as per requirement.

- All transfer points and storage silos are provided with dust collection and extraction systems for effective control of fugitive emissions. All the installed pollution control equipment are designed for ≤30 mg/Nm^3.
- The dust collected from the pollution control equipment is being recycled back into the process.
- Clinker is being stored in clinker silo to control fugitive emissions.
- Gypsum and additives are being stored in covered storage sheds
- All raw material transfer conveyor are covered with GI sheets.
- All roads and open area in the plant are cement concreted.

To ensure and reduce impact of transport on the surrounding environment, raw materials and cement is transported in trucks covered with tarpaulin.

Transport vehicles are periodically checked for Pollution Under Control certificate from approved RTA agencies.

Suitable bag filters are installed to control the fugitive emissions generated during material transfer, packing, loading and unloading.

Raw materials such as Gypsum, Aluminous Laterite/ Flue dust are stored in the covered sheds.

Construction of Coal Shed for coal stockpile is in progress and is expected to be completed by Oct'15.

collected in the pollution control devices is recycled back to the cement manufacturing process.

Ventilation systems are provided with bag filters in the plant. All the pollution control equipment are designed to meet outlet particulate emission of less than 30 mg/Nm^3 for particulate matter.

Interlocking facility has been provided in the pollution control equipment.

All the material handling systems are covered with aprons.

JSWCL will be achieving the increase in production of clinker by modification of process units. All the pollution control equipment in the cement plant is in place for various units as per requirement.

- All transfer points and storage silos are provided with dust collection and extraction systems for effective control of fugitive emissions. All the installed pollution control equipment are designed for ≤30 mg/Nm^3.
- The dust collected from the pollution control equipment is being recycled back into the process.
- Clinker is being stored in clinker silo to control fugitive emissions.
- Gypsum and additives are being stored in covered storage sheds
- All raw material transfer conveyor are covered with GI sheets.
- All roads and open area in the plant are cement concreted.

To ensure and reduce impact of transport on the surrounding environment, raw materials and cement is transported in trucks covered with tarpaulin.

Transport vehicles are periodically checked for Pollution Under Control certificate from approved RTA agencies.

Suitable bag filters are installed to control the fugitive emissions generated during material transfer, Packing, loading and unloading.

Raw materials such as Gypsum, Laterite/ Iron Ore are stored in the covered sheds.

Construction of Coal Shed for coal stockpile is in progress and is expected to be completed by Aug'15.

Fugitive emissions in the work zone are regularly monitored. Bag filters are provided at all transfer points of raw material conveying, stacking, packing of finished product etc. in order to control fugitive emissions. Most of the roads are concrete paved. Water spraying is carried out to control fugitive emission all around the stock yard and loading/ unloading areas.

Fully covered conveyors are provided for material conveying throughout the plant.

11.3.3 NOISE ENVIRONMENT

Under any circumstances the noise level at plant boundary will not exceed 75 dB(A) at day time and 70 dB(A) at night time.

Silencers are provided to all the Clinker Cooler fans to maintain the noise level well within the prescribed limits.

11.3.4 WATER ENVIRONMENT

The present water requirement of the plant including colony is about 4500 m^3/day. No additional water consumption is required.

No additional water consumption or wastewater generation will be there from the plant due to expansion.

No wastewater is generated from cement plant process. The wastewater generation from the cement plant is mainly from domestic consumption.

The wastewater generation from the power plant operation in future includes Cooling tower blowdown, boiler blowdown, filter backwash, DM plant rinsing water, and Service Water.

DM wastewater after neutralization and service water after oil and grease removal will be diluted with other wastewater streams of the power plant. A total of 320 m^3/day wastewater will be recycled for reuse in the process, dust suppression and greenbelt development.

In order to treat the sewage generated from the plant canteen and toilets, a full-fledged sewage treatment plant (STP) is in operation. The STP is designed for a maximum load of 50 m^3/day with an average

BOD of 150 - 200 mg/L for raw sewage and after treatment less than 20 mg/L.

11.3.5 SOLID WASTE MANAGEMENT

No further solid waste is generated from the plant. Ash generated from the power plant operation (as and when installed) will be used for cement production.

11.3.6 GREENBELT DEVELOPMENT

The cement plant is located in an area of 263.02 Ha. The greenbelt so far developed in the plant is about 37.73 % of the plant area which is about 99.19 Ha.

11.4 ENVIRONMENTAL MONITORING PROGRAMME

A dedicated Environmental cell was established to monitor and analyze the various environmental components of the cement plant.

11.5 ENVIRONMENTAL MANAGEMENT PLAN

As part of Environment management and pollution control, JSWCL has so far invested around Rs. 34.12 Crores till 31.03.2015 (including slag unit and mines). The Company has also spent Rs. 120 Lakhs as recurring expenditure towards environment and pollution control during 2014-15.

11.6 PROJECT BENEFITS

JSWCL is continuously contributing towards welfare & community development activities under its CSR programmes not only at villages where it is operating its units but also in other parts of the Andhra Pradesh and Telangana states.

JSWCL has incurred an amount of Rs 250 lakhs for implementing various CSR activities during the year 2014-15.

JSWCL has budgeted an amount of Rs 1422 lakhs for implementing various CSR activities during the years 2015-21.

Time bound action plan is prepared and presented in this report.

SUMMARY AND CONCLUSION

Increase in Clinker production capacity of cement plant from 2.0 to 2.5 MTPA through Optimization and de-bottlenecking of existing equipment & processes not affecting land, air and water environment.

In addition to increase of clinker production, change of product mix is proposed keeping the production capacity of finished product at 4.8 MTPA.

The increase in emissions due to expansion is marginal. And change of product mix will result in maximum consumption of waste i.e slag. The overall ground level concentrations due to expansion are well within the limits.

No additional water consumption or wastewater generation will be there due to expansion.

No solid waste generation due to expansion of the project.

JSWCL has budgeted an amount of Rs 1422 lakhs for implementing various CSR activities during the year 2015-21.

CHAPTER - 12

DISCLOSURE OF CONSULTANTS

CHAPTER – 12 : DISCLOSURE OF CONSULTANTS

Environmental Impact Assessment (EIA) of M/s **JSW CEMENT LIMITED** at Bilakalagudur Village, Gadivemula Mandal, Kurnool District, Andhra Pradesh for increase of Clinker production capacity of cement plant from 2.0 to 2.5 MTPA is prepared by B S Envi-Tech (P) Limited, Hyderabad.

B. S. Envi-Tech (P) Limited is accredited as Category "A" Consultant by National Accreditation Board for Education and Training (NABET), Quality Council of India (QCI).

The EIA report has been prepared by B. S. Envi-Tech (P) Limited with the qualified professionals having experience of more than 15 years in the field of Environmental Engineering and Management.

B. S. Envi-Tech (P) Ltd extends the Consultancy Services in the following fields:

- Environmental Impact Assessment studies for Environmental Clearance
- Obtaining Consent For Establishment/Operation from SPCB's
- Monitoring of Environmental Parameters as per Statutory requirements.
- Performance Testing Of Emissions/Pollution Control Equipment
- Environmental Audits
    - (1) Third Party Environmental Audit.
      (2) Environmental Statement (Form – V)
- Preparation of Mining Plans (Registered as Qualified Person (RQP) by Indian Bureau of Mines (IBM))
    - (1) Preparation Of Mining Plans
    - (2) Monitoring Of Environmental Parameters for Mines as Per IBM and DGMS Guidelines.