

CHAPTER 4

PREDICTION OF IMPACTS

4.0 INTRODUCTION

Identification and assessment of the environmental effects arising from the construction and operation of the proposed facility also considers the duration and significance of the impacts. Prediction of impacts is the most important component in the Environmental Impact Assessment studies. Several scientific techniques and methodologies are available to predict impacts of developmental activities on physical, ecological and socio-economic environments. Such predictions are superimposed over the baseline status of environmental quality to derive the ultimate (post-project) scenario of environmental conditions.

The prediction of impacts helps to minimize the adverse impacts on environmental quality during pre and post project execution. In case of air, water, land and socio-economic environments, the predictions have been made based on available scientific knowledge and judgments.

Considering the issues involved in setting up of the proposed cement plant, the activities can be divided into two phases viz; Construction Phase and Operation Phase.

4.1 CONSTRUCTION PHASE

Construction phase activity involves infrastructure development like roads, water, electricity, drainage etc. It is anticipated that soil shall be excavated for laying foundations of various structures of the proposed cement plant. The soil excavated shall be put back in the pits and the remaining shall be used to level the undulation in the cement plant area. Also the soil shall be used to raise the level of internal roads and general ground level. All surfaces shall be cemented to avoid generation of fugitive dust during operational phase.

Aesthetics and Landscaping

The site preparation for construction of the proposed cement plant will alter the land scape and aesthetics of the area resulting in air and noise pollution and land degradation however this is a pre-project scenario and is of short duration.

There are no settlements or grazing lands present at the site. The area proposed for the cement plant site has no vegetation.

The greenbelt development proposed within and along the plant periphery will improve vegetal cover in the study area. An area of about 10 hectares (peripheral green belt, avenue plantation etc) would be developed under greenbelt in plant and the colony.

The muck and building materials debris shall be managed to use the same as foundation for all of the equipments and machineries to be used. Any unused muck shall be utilized in landscaping and development of aesthetics. No muck shall be discharged out of the site for disposal. The generalized impact Matrix during construction phase is given in Table 4.1.

TABLE 4.1: Nature of Impacts During Construction Phase

Activity	Impact	Net result
Acquisition of land for industrial development	Affect the present land use pattern. The presence of sensitive areas, archeological sites, human settlements may create conflicts.	Moderate
Removing undulating ground to facilitate construction	Affects air quality due to increase in SPM levels, impact on flora and fauna, impact on noise quality.	Negligible
Construction of roads and civil engineering structures	Affects air quality due to increase in SPM and NOx levels, impact on noise quality. Generation of muck and debris.	Moderate
Migration of Labor	Impact on infrastructure like housing, creates health hazards due to poor sanitation problems.	Negligible

4.2 OPERATION PHASE

During the Operational Phase the commissioning and establishment of the plant results in generation of emissions, wastewater and solid waste. Considering the magnitude, the impacts are termed as High/Low and Long-term impacts / Short-term impacts. The activities in construction phase are short term in nature. The impacts during Operational Phase are listed in Table 4.2.

Table 4.2: Nature Of Impacts During Operational Phase

Activity	Impact	Net Result
Air Emissions	Affects air quality, ecology due to increase in SPM, SO ₂ , NO _x and HC levels depending upon the type of process and energy requirements of an industry	Moderate to high
Effluent Discharges	Affects water quality, soil quality of the region due to release of both organic and inorganic pollutants	Moderate
Noise Generation	Affects community noise environment of the region due to increase in day-night equivalent noise levels	Moderate
Transportation	Impact on existing infrastructure	Moderate

4.2.1 AIR ENVIRONMENT

A) Primary Sources

Kiln/Raw Mill

Major source of air pollution in a cement plant is from kiln exhaust gases. Combustion in the kiln causes rapid flow of gases resulting into generation of airborne dust. The combustion gases include SO₂, NO_x, CO and CO₂. SO₂ and CO₂ are formed due to the decomposition of limestone and burning of coal respectively. NO_x is formed as thermal and fuel component due to high temperature conditions. CO and CO₂ are the typical combustion products. As regards SO₂, it may be emphasized that due to the peculiar counter flow of gases with the direction of advancing raw meal in the suspension preheater circuits, almost 85% SO₂ gets adsorbed in the clinker formation.

Coal Mill

Coal Mills are used for pulverizing the raw coal for use in the kiln. As coal contains moisture hot gases from clinker cooler are used for drying of coal. This hot air from the mills carries fine coal particles along with to form suspended particulates (SPM) which may be air borne later.

Clinker Cooler

Clinker cooler is used for cooling of hot clinker from the kiln. Exhaust from clinker cooler is partly used for drying of coal and a part of it is exhausted. This exhaust air contains fine particles of clinker resulting in formation of SPM.

Cement Mill

Like raw meal grinding, cement grinding is another location that generates considerable amount of dust. This dust is nothing but cement itself and exhaust from this section also forms SPM.

Limestone Crusher

The limestone crusher receives boulders and lumps from limestone quarry. The ROM limestone is dropped into crusher hopper and fed to the crusher circuit. The crushing of limestone generates particulates which have to be suppressed and controlled.

B) Secondary Sources

Transfer Points

Cement manufacturing is the process where handling of materials forms an integral part. Material from one section to another is generally transferred using conveyor belts starting from stacker reclaimer to packaging plant. Dust is generated when the material is transferred from one point to another due to fall / movement of considerable amount of raw material.

Limestone Stacker/Reclaimer

Crushed material from crusher is stored in stacker and is blended in required proportion to form homogenous mix. During stacking there is generation of dust due to handling of crushed limestone in dry form.

Raw Mill Hoppers

These hoppers are used for storing and feeding thereafter the raw meal for the raw mills. Material is conveyed using weigh feeders to the inlet of the kiln where generation of fugitive dust takes place in the form of SPM.

Raw Mill House

Various materials such as lateritic clay, blue dust etc., are handled in this section and fed in the raw mill. Handling of these materials individually and collectively results in generation of SPM. In the present case handling/transfer of lateritic clay shall generate fugitive dust emissions.

Blending Silo

Blending silo is used for homogenous blending of crushed raw meal. Raw meal is stored and blended using compressed air. During the process due to pressure build up there is generation of fugitive dust.

Clinker Silo

Clinker from the cooler is conveyed to the clinker silo. It enters from the top of the silo through chute. During this process due to free fall of clinker from chute considerable amount of dust is generated.

Gypsum Crusher

Raw gypsum is crushed to required size before being fed in the cement mill. Crushing of gypsum in dry state causes generation of airborne dust.

Cement Mill Hopper

Clinker and gypsum stored in hoppers and fed in the cement mill. Handling of these materials in dry state leads to generation of airborne dust.

Cement Silo

Crushed cement is stored in these silos and subsequently transferred to packinghouse. During the transfer of cement fugitive dust is generated.

Packaging Plant

Final product that is cement is packed through packers in this section. Packing is done pneumatically through spouts. Air leaks and handling of bags cause generation of fugitive dust.

Coal Hoppers

Fine coal is stored in these hoppers and is fed in the kiln pneumatically. Handling of this pulverized coal results in fugitive dust generation.

C) Point Sources of Emission

The particulates shall be released from various point sources i.e. stacks attached to different sections of the proposed cement plant. The details of each stack viz. physical dimensions and kinetics of the gaseous flow have been calculated and given in Table 4.3 and Table 4.4.

TABLE 4.3: Details of Stacks, Physical Dimensions and Kinematics of Gas Flows

Plant Section	Stack Height M	Stack Dia m	Exit gas T ⁰ C	Exit gas velocity m/s	Vol. Flow Nm ³ /h	Design out let conc.	Emission Rate of SPM, g/s	Emission Rate of SO ₂ , g/s	Emission Rate of NO _x , g/s	APCE Type
Raw Material Section	30	1.00	50	8.00	24504	@50mg/N m ³	0.38	--	--	BF
Raw Mill/Kiln	100	2.5	130	15	358287	@50mg/N m ³	4.95	27.77	40	BH
Coal Mill	45.0	1.52	70	11.91	89505	@50mg/N m ³	1.24	--	--	BF
Clinker Cooler	40.0	2.50	280	12.0	393316	@50mg/N m ³	5.46	--	--	ESP
Packing Plants	30.0	1.0	50	16	49009	@50mg/N m ³	0.68	--	--	BF
Cement Mill	30.0	1.2	93	16	79968	@50mg/N m ³	1.11	--	--	BF
Coal Crusher	30	0.60	50	11	12129	@50mg/N m ³	0.16	--	--	BF
Limestone Crusher	30	1.5	50	8	55135	@50mg/N m ³	0.76	--	--	BF

TABLE 4.4: Comparative Emissions With & Without APCE

Plant Section	With APCE			Without APCE			APCE Type & Efficiency %
	Emission Rate of SPM, g/s,*	Emission Rate of SO ₂ , g/s **	Emission Rate of NO _x , g/s ,***	Emission Rate of SPM, g/s	Emission Rate of SO ₂ , g/s	Emission Rate of NO _x , g/s	
Raw Material Section	0.38	--	--	76	--	--	BF (99.5)
Raw Mill/Kiln	4.95	27.77	40	990	13.60	93.33	BH (99.5)
Coal Mill	1.24	--	--	248	--	--	BF (99.5)
Clinker Cooler	5.46	--	--	1092	--	--	ESP (99.5)
Packing Plants	0.68	--	--	136	--	--	BF (99.5)
Cement Mills	1.11	--	--	222	--	--	BF (99.5)
Coal Crusher	0.16	--	--	32	--	--	BF (99.5)
Limestone Crusher	0.76	--	--	152	--	--	BF (99.5)

* ESP shall have efficiency of 99.5%

** SO₂ shall be absorbed in clinker by 85%

*** NO_x shall be controlled by using low NO_x burners and use of SNCR technology

SO₂ Emissions

The calculations are given in Table 4.5

TABLE 4.5: SO₂ emission

Description	Quantity	Unit
Clinker Capacity	1600	Tonnes per day
Coal consumption	200	Tonnes per day
SO ₂ generation ,sulphur in coal=4%,	16.00	Tonnes per day
SO ₂ adsorption in clinker@85%	13.60	Tonnes per day
Total SO ₂ emission	2.40	Tonnes per day
SO₂ emission rate	27.77	grams per second

D) Area Sources

Emission Factor for Handling of materials

$$E \text{ (kg/T)} = K \times 0.0016 \times \frac{(U/2.2)^{1.3}}{(M/2)^{1.4}}$$

Where:

E (kg/T) = Emission factor in kg per Tonne

K = Empirical constant = 0.74 for particle size <30 µm (SPM) and 0.35 for particle size < 10 µm (RPM)

U = Wind Speed (m/s)= 1 m/s

M = Moisture content of the material= 5%.

Predictions are carried out for the worst-case of simultaneous operation of excavators (area sources) and tippers for transportation of limestone from mine pit to the asphalted road. Particle size concentration assumed in the modeling consisted of five separate particles size classes 1.25, 3.75, 7.5, 12.5, and 20 micrometers with a particle concentration of 0.0262, 0.0678, 0.1704, 0.1536 and 0.5820 respectively.

Substituting values in the equation, the Emission Factor for fugitive dust works out to 0.118g grams per tonne

The various other area sources of fugitive dust emission due to handling of following items are as follows:

Handling of crushed limestone and Stacking

Quantity	Crushed limestone and Stacking	Clay	Coal	Gypsum	Clinker
Quantity, tpa	706223	105527	66000	13200	528000
Operational Hours per year	3600	2720	2000	2000	4000
Activity rate, t/h	126.11	38.75	33	6.6	132
Emission of Dust, g/t	0.118	0.118	0.118	0.118	0.118
Emission of Dust gm/hr	--	4.5	3.89	0.77	15.576
Area of Influence, m ²	25	16	9	9	25
Uncontrolled Emission rate, g/s/m ²	0.000165	0.000079	0.00012	0.000024	0.000173
Controlled Emission rate, g/s/m ²	0.000049	0.000023	0.000030	0.0000072	0.0000519

E) Line Sources

Estimation of emission of Particulate Matter

$$E(\text{kg/VKT}) = \frac{K \times (S/12)^A \times (W/3)^B}{(M/0.2)^C}$$

(assumptions: wind velocity, U=1 m/s; silt moisture M=5%; silt content S=5%; weight ,W=16 tonnes(gross wt of truck), constants A= 0.8,B=0.5,C=0.4, K=2.82)

Putting given values in the equation to get emission factor: **E = 0.899 kg /VKT**

The various line sources of fugitive dust emission due to transportation of following items are as follows:

Quantity	Limestone	Clay	Coal	Fly Ash	Gypsum	Finished Products
Quantity, tpa	706223	105527	66000	184800	13200	660000
Operational Hours per year	3300	3300	3300	3300	3300	3300
Capacity of each Tipper (T)	10	10	10	10	10	10
Total No of Tippers/year	70622	10552	6600	18480	1320	66000
Lead length /trip, Km	4	4	4	4	4	4
Total VKT/Year	282488	42208	26400	73920	5280	264000
Emission kg/VKT	0.899	0.899	0.899	0.899	0.899	0.899
Total emission kg/year	253957	37945	23734	66454	4745	242748
Uncontrolled emission rate g/s/m	0.0213	0.0031	0.00199	0.00559	0.000399	0.0199
Controlled emission rate, g/s/m	0.00213	0.00033	0.000199	0.000559	0.0000399	0.00199

The mathematical model used for predictions in the present study is an EPA approved ISCST3 model which is based on steady state Gaussian plume dispersion model designed for point sources and area sources for air quality. The predicted ground level concentrations computed using EPA approved **ISC AERMOD VIEW** model. In case of water, land, biological and socio-economic environments, the predictions have been made based on available scientific knowledge and judgments.

In the earlier paragraphs, various pollution sources were identified. In this chapter, an attempt has been made to predict the incremental rise of various cumulative ground level concentrations above the baseline status due to the emissions during operational activities.

AIR DISPERSION MODELING

The meteorological data recorded continuously during winter season of 2009-10 on hourly basis for wind speed, wind direction and temperature has been processed for application of ISC AERMOD View model. Stability classes 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.

SCENARIOS CONSIDERED FOR ESTIMATION OF GROUNDLEVEL CONCENTRATIONS.

The following scenario is considered for estimation of ground level concentrations:

Scenario: Emissions from cement plant, haulage and handling of raw materials and finished product as described above.

ISC - AERMOD VIEW

ISC–AERMOD View is a complete and powerful air dispersion-modeling package, which seamlessly incorporates the popular USEPA Models, ISCST3, ISC-PRIME and AERMOD into one interface without any modifications to the models. These models are used extensively to assess pollution concentration and deposition from a wide variety of sources.

THE AERMOD MODEL

The AMS/EPA REGULATORY MODEL (AERMOD) was specially designed to support the Environmental Regulatory Modeling Programs.

AERMOD is a regulatory steady–state-modeling system with three separate components;

- AERMOD (AERMIC Dispersion Model)
- AERMAP (AERMOD Terrain Preprocessor)
- AERMET (AERMOD Meteorological Preprocessor)

The AERMOD Model includes a wide range of options for modeling air quality impacts of pollution sources, making it popular choice among the modeling community for a variety of applications. AERMOD contains basically the same options as the ISCST3 model:

- AERMOD requires two types of meteorological data files, a file containing surface scalar parameters and a file containing vertical profiles. AERMET Meteorological Preprocessor Program provides these two files.
- PRIME building downwash algorithms based on the ISC– PRIME model have been added to the AERMOD model
- Use of allocatable arrays for data storage
- Incorporation of EVENT processing for analyzing short-term source culpability
- Explicit treatment of multiple – year meteorological data files and the Annual average
- Options to specify emissions that vary by season, hour-of-day and day-of-week

- Deposition algorithms have been implemented in the AERMOD model – results can be output for concentration, total deposition flux, dry deposition flux, and / or wet deposition flux
- The model contains algorithms for modeling the effects of settling and removal of large particulates and for modeling the effects of precipitation scavenging for gases or particulates.

AERMET

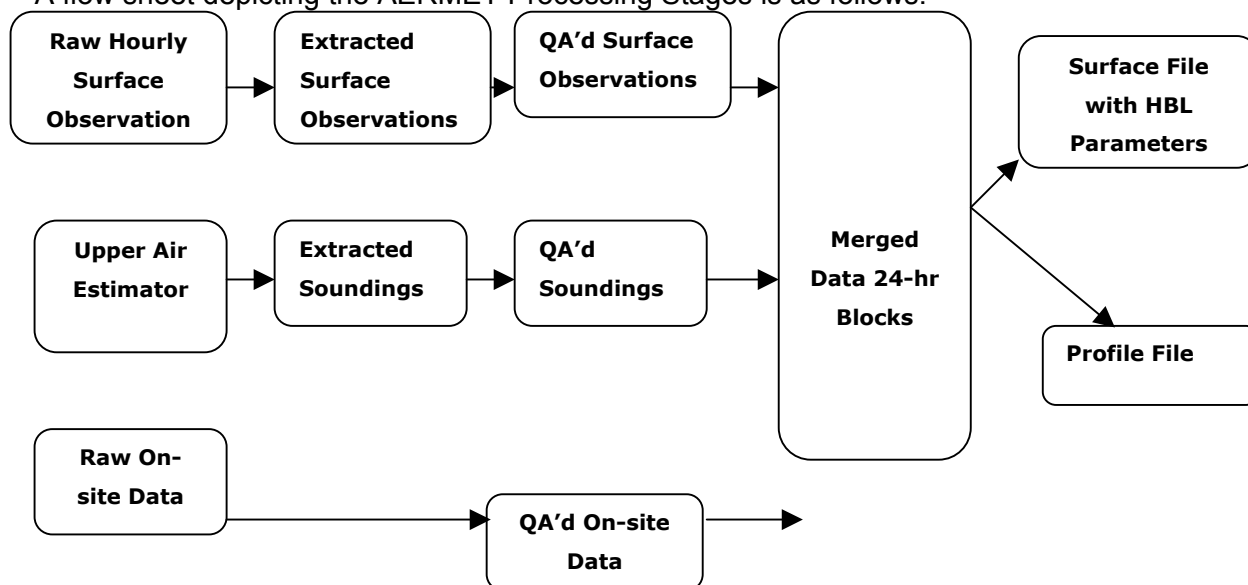
In order to conduct a refined air dispersion-modeling project using the AERMOD short-term air quality dispersion model, it is necessary to process the meteorological data representative of the study area being modeled. The collected meteorological data is not always in the format supported by the model, therefore the meteorological data needs to be pre-processed using AERMET Program

The AERMET Program is a meteorological preprocessor, which prepares hourly surface data and upper air data for use in the AERMOD air quality dispersion model. AERMET is designed to allow future enhancements to process other types of data and to compute boundary layer parameters with different algorithms.

AERMET processes meteorological data in three stages and from this process two files are generated for use with the AERMOD Model

- ✓ A Surface File of hourly boundary layer parameters estimates
- ✓ A Profile File of multiple-level observations of wind speed, wind direction, temperature and standard deviation of the fluctuating wind components.

A flow sheet depicting the AERMET Processing Stages is as follows:



AERMAP – TERRAIN PROCESSOR

The Terrain Processor allows to import and process terrain elevation data of the project. ISC-AERMOD View imports terrain elevation from various digital elevation maps to:

- ✓ Extract Terrain Elevation for Receptor and Sources
- ✓ Generate the Terrain Grid
- ✓ Generate visualization of the surrounding terrain in 2D and 3D

Application of AERMOD

ISC-AERMOD MODEL with the following options has been employed to predict the cumulative ground level concentrations due to emissions from the proposed activity.

- ✓ Area being rural, rural dispersion parameters are considered
- ✓ Predictions have been carried out to estimate concentration values over radial distance of 10 km around the project area
- ✓ Uniform polar receptor network has been considered
- ✓ Emission rates from the sources were considered as constant during the entire period
- ✓ The ground level concentrations computed without any consideration of decay coefficient
- ✓ Calm winds recorded during the study period were also taken into consideration
- ✓ 24-Hourly mean ground level concentrations were estimated using the entire meteorological data collected during the study period.

Predicted Ground Level Concentrations

In order to estimate the worst case scenario, the ground level concentrations were computed considering the cement plant emissions and transportation. The predicted ground level concentrations of SPM, SO₂ and NO_x are given below:

Suspended Particulate Matter

24-hourly average cumulative ground level concentrations of PM computed for 24-hour meteorological data showed maximum value of 7.25 µg/m³ of PM.

Sulphur dioxide

24-hourly average cumulative ground level concentrations of SO₂ computed for 24-hour meteorological data showed maximum value of 1.85 µg/m³ of SO₂ at a distance of about 1 km from the source in SW direction. This is due to buoyant rise of the plumes (kiln emissions) resulting in higher plume heights.

Oxides of Nitrogen

24-hourly average cumulative ground level concentrations of NO_x computed for 24-hour meteorological data showed maximum value of 2.34 µg/m³ of NO_x at a distance of about 1 km from the source in SW direction. This is due to buoyant rise of the plumes (kiln emissions) resulting in higher plume heights.

Cumulative Pollutant Levels due to proposed Cement Plant

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

Project Scenario considering the Worst Case (µg/m³)

24-Hourly Concentrations	Respirable Particulate Matter (SPM)	Sulphur Dioxide (SO ₂)	Oxides Of Nitrogen (NO _x)
Baseline Scenario (max)	30.8	6.3	10.9
Predicted GLC's (Max)	7.25	1.85	2.34
Anticipated GLC's	38.05	8.15	13.24

The predicted GLC's for SPM, SO₂ and NO_x are shown in Figure 4.1, 4.2 and 4.3 respectively.

Figure 4.1: Map showing 24hrly Predicted SPM Concentration

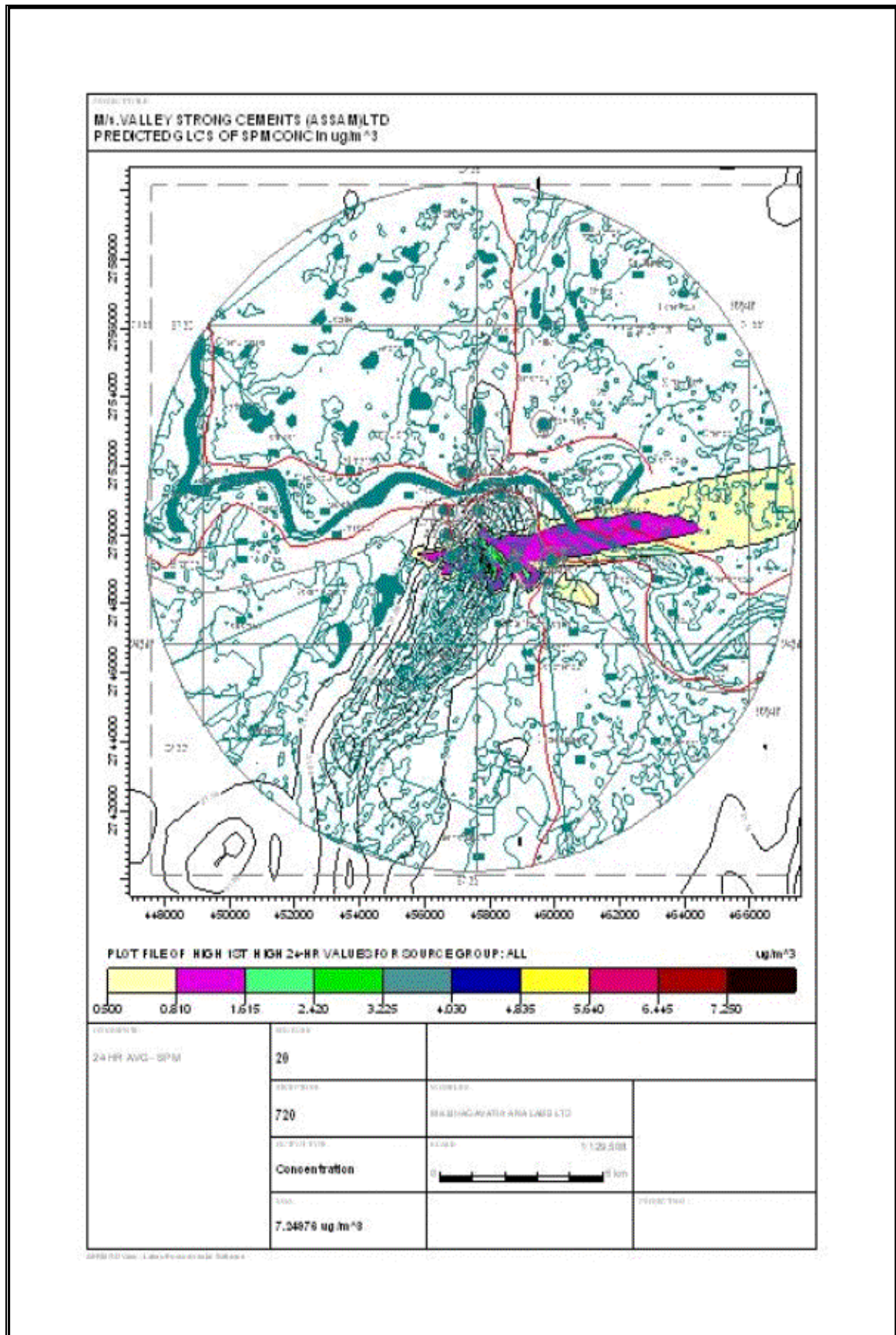


Figure 4.2: Map showing 24hrly Predicted SO₂ Concentration

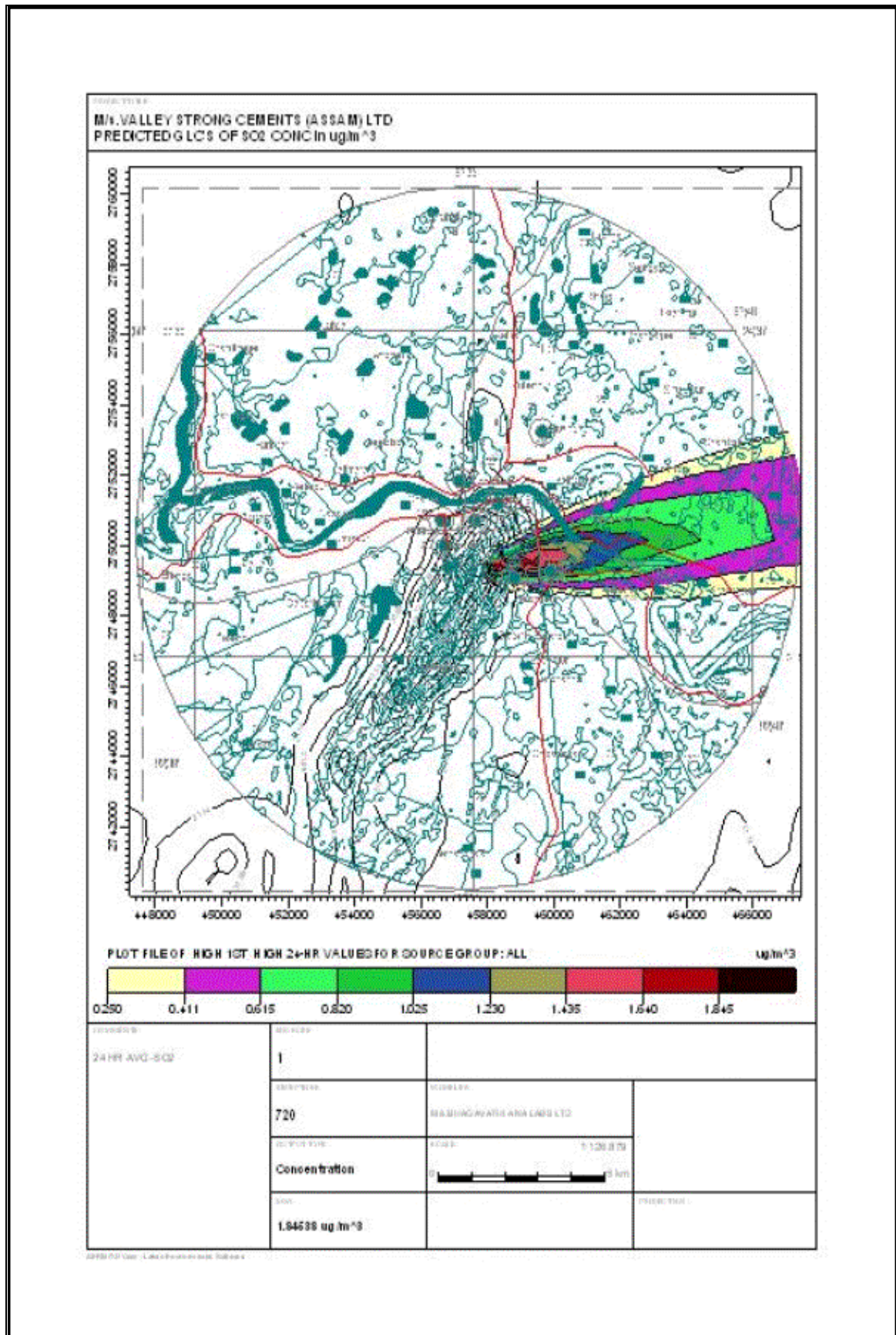
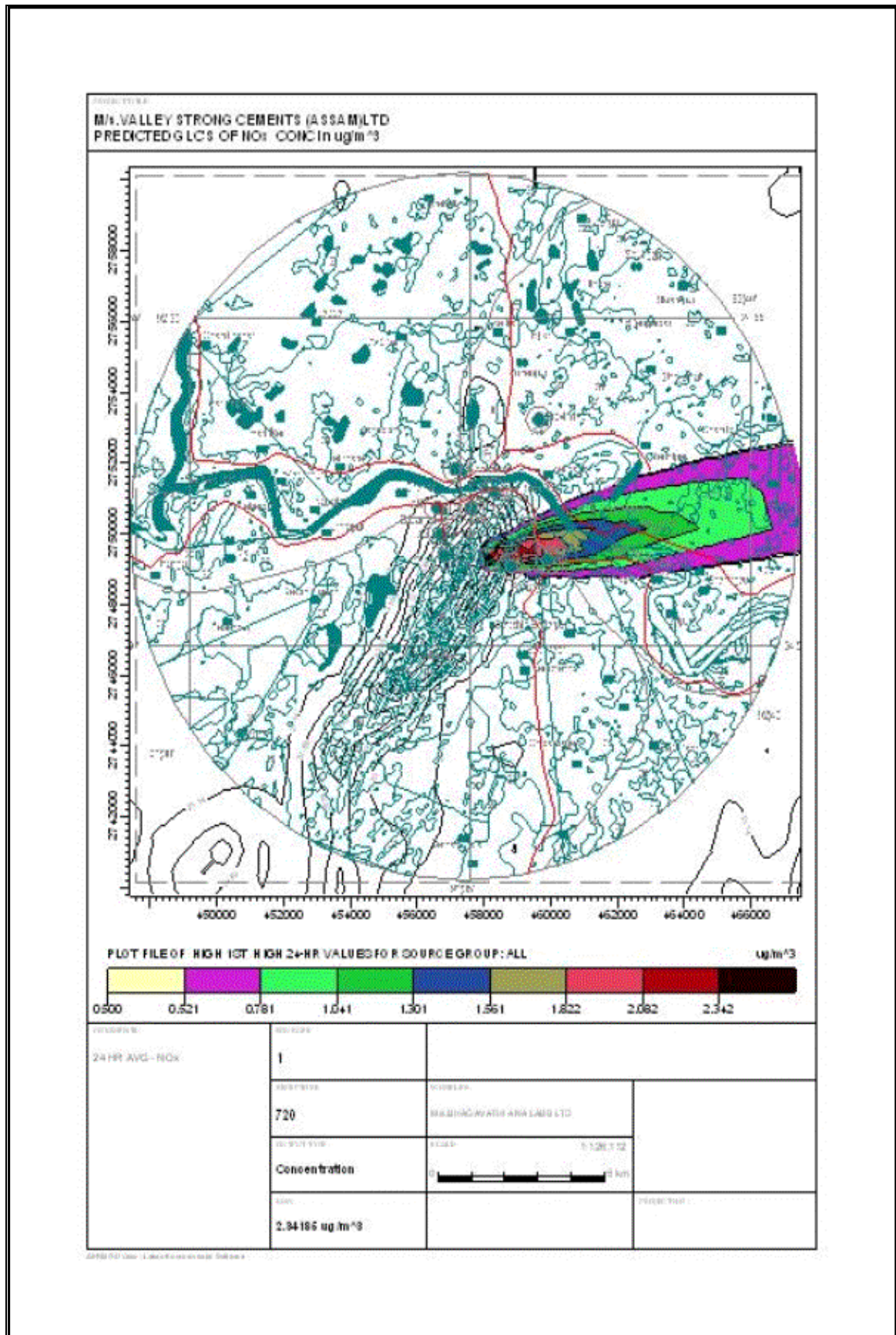


Figure 4.3: Map showing 24hrly Predicted NOx Concentration



Atmospheric Inversion

The data pertaining to inversion phenomenon is available for Silchar station of IMD. This is the nearest station to the proposed cement plant and is therefore the data available for this has been interpolated for present modeling studies.

The inversion phenomenon at Silchar is maximum during winter season and particularly highest in the months from November to February. The inversion is ground based and is rare at 1200 noon and highest at 00 hours in night. The highest altitude for inversion layer is 950 m at 00 hours in night.

The phenomenon of elevated inversion is rare in summer months and highest in winter. The highest height during winter for elevated inversion is 600m at 00 hrs in night. It is rare in summer months. The average mixing height at 1200 hrs noon considered 900 m.

IMPACT DUE TO OPERATING TRUCKS FOR TRANSPORT

Raw material and final product of the cement plant will be transported by road. In order to estimate the incremental rise of CO, and HC+NOx from the additional traffic of VSCL, a vehicular impact assessment study has been carried out. The existing vehicular traffic is given in Annexure 3.3

The major emission from the vehicular traffic are Suspended particulate matter, carbon monoxide and hydro carbon+ Oxides of nitrogen. The following is the estimation of trucks for transport of the raw material and finished products.

EMISSION ESTIMATION DUE TO MOVEMENT OF TRUCKS

	Raw Material	Finished Product
Total Quantity	3260 TPD	2000 TPD
Capacity of each truck,	10 T for all raw materials	10 T
Number of trucks for total quantity	326	200
Operational hours for trucks in a day	10	24
Number of trucks per hour	33	8.33

From the above table it can be seen that the additional anticipated traffic during operation of the cement plant will be about 33 Trucks/hr for raw material and about 8 Trucks/hr for finished product.

The following are the emission rates of various pollutants considered for estimation of impact as per EPA.

Source	Emission rate in (g/km)*	
	Carbon Monoxide	HC + Oxides of Nitrogen
Truck	1.0	0.7 – 0.9

Note *Euro –IV compliant vehicles

The following data as derived in earlier paragraphs has been considered for estimating vehicular emissions namely CO and HC+NOx.

Estimating Vehicular Exhausts

Sl. No.	Raw Material Haulage	VKT/year
1	Limestone	282488
2	Clay	42208
3	Fly Ash	73920
4	Coal	26400
5	Gypsum	5280
6	Product	264000
	Total	694296

Rate of Exhaust Emission

Source	Emission rate in (g/km)*	
	Carbon Monoxide	HC + Oxides of Nitrogen
Truck	1.0	0.7 – 0.9
Total VKT=697464	644 kg/year = 88 g/hour	555 kg/year = 70 g/hour

4.2.2 NOISE ENVIRONMENT

During installation of cement plant, temporal impact is envisaged as most of the construction equipment produce noise level around 90 dB(A). The noise generated is expected to be intermittent and of short duration.

During operation, the major noise generating sources are plying of trucks, coal mill, Kiln/ Raw mill, clinker grate cooler operation, packers of cement plant and miscellaneous operations like repairing in workshops etc which may be discontinuous. These sources will be located not far off from each other. It is anticipated that the noise level from each of these sources will not exceed 90 dB(A).

Prediction of anticipated noise levels have been computed using point source model. Basic phenomena of the model are the geometric attenuation of sound. Noise at a point generates spherical waves, which are propagated outward from the source through the air at a speed of 1,100 ft/sec, with the first wave making an ever-increasing sphere with time. The propagation of sound is governed by the inverse square law of intensities.

The assumption of the model is based on point source relationship i.e. for every doubling of the distance the noise levels are decreased by 6 dB(A).

Point source propagation is defined by the following equation:

$$Lp2 = Lp1 - 20 \log r2/r1$$

where $Lp1$ and $Lp2$ are sound pressure levels at points located at distances $r1$ and $r2$, respectively, from the source.

Noise level at the plant boundary, calculated from the above equation, is expected to be less than 55 dB(A) without considering any attenuation factors. It is proposed to develop an area of about 10 hectares under greenbelt including the area along the periphery of the cement plant, which will act as a barrier and further reduce noise levels.

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

4.2.3 WATER ENVIRONMENT

Water requirements of the proposed cement plant will be met by drawing water from ground water regime. The water required shall be mainly for the cooling of bearings and gear boxes particularly for the kiln and raw meal section. Total water requirement including the domestic use is estimated as 500 M³ per day, however the make up water will be only 310 m³ per day.

Water Balance

Cement will be 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 includes circulating cooling water for bearings and gearboxes.

The other areas of water consumption other than process requirement is for domestic purposes in the plant canteen, colony. The domestic sewage shall be treated and the water shall be recycled for applications in greenbelt development.

In the proposed cement plant, it is proposed to install ESP for the cleaning of the kiln flue gas. The water balance for the proposed cement plant is given in Table 4.6.

TABLE 4.6: Water Balance for the Proposed Cement Plant

Sl. No.	Water Requirement	Quantity M ³ per day		
		Input	Output	Loss
1	Cement Plant Process(cooling water)	212	190	22
2	Domestic Water Requirement			
	i. For the Plant and Colony	224	178	
	II. Miscellaneous Applications(work shop, etc)	64	64	
Sub Total		288	242.00*	46
3	<i>Cement Plant cooling water recycled</i>	190	---	--
4	Make up Water			
	i)Cement Plant Process	22		
	ii)Domestic Requirement	288		
Sub Total (Make Up Water)		310	---	
Grand Total		500	432	68
*Waste water to be treated and used in Horticulture, dust suppression, fire hydrant etc.		----	242.00	

*Note : Coolant output water shall be recirculated with make up water

Sewage/Waste Water Treatment and Recycling

The domestic wastewater (sewage @ 242 M³ per day) from the plant shall be subjected to treatment in sewage treatment plant with following units such as Grit chamber, primary and secondary treatment and aeration for the removal of BOD. The solid waste generated from the Sewage Treatment Plant will be used as manure in the Green Belt. The treated and disinfected wastewater is utilized for gardening. The treated water shall be stored in underground tanks of suitable capacities from where it shall be drawn for various applications.

Pathways for Pollution via Seepages

The seepages or leachates from stock piles of additives (clay/gypsum) slag, fuels (coal) and likely secondary fuels such as combustible hazardous waste that may be proposed to be used as supplementary fuels may contain heavy metals or other toxic chemicals.

It is necessary to prevent seepages or leachates that may contain heavy metal or toxic chemicals to reach surface water or ground water regime. It is prescribed to chemically characterize all raw materials, additives, slag, gypsum, coal and likely to be used. This shall ensure to control the likely threat of contamination of surface water bodies or ground water regime.

The seepages from these sources during monsoon or heavy down pour containing toxic chemicals/heavy metals have potential to contaminate.

Therefore, in view of the risk, the stock yard for raw materials shall be properly built with cement concrete and thick layer of PVC sheet as liner at the base of the cement concrete. Further, the floor of stock yard shall be so designed as to have curbing along the periphery. This shall prevent the run off from heaped materials directly running over soil surface.

The ground water and surface water quality in and around the proposed cement plant shall be monitored every 3 months for knowing the concentration of heavy metals and other contaminants. The quality of water shall be monitored for parameters as prescribed in IS:10500.

4.2.3 FIRE PROTECTION SYSTEM

It is proposed to provide a full fledged fire protection system namely hydrant system for all the areas of the plant, high velocity water spray system for transformer, turbine lube oil tanks, medium velocity spray system for cable vault/gallery and portable fire extinguishers for all the buildings of the plant. The source of water will be recycled water from the storage tanks where adequate storage is available. This water is utilized in case of any fire. Therefore this requirement is not a consumptive requirement.

4.2.4 SOLID WASTE GENERATION

The wastes generated from the plant are segregated into Hazardous and non Hazardous wastes as detailed below:

A) NON HAZARDOUS WASTE

i) Cement Dust

The main solid waste generated from the cement plant is Cement Kiln Dust (**CKD**) collected from Kiln/Raw Mill ESP. This Cement Kiln Dust (**CKD**) will be approximately 85 TPD and shall be recycled to the process. Hence there shall be no solid waste for disposal from the cement plant.

ii) Domestic Waste

- The generated solid waste from colony will be segregated in biodegradable & non-biodegradable parts.
- The biodegradable waste will be composted and used as manure.
- The non-biodegradable waste will be processed into Pellets and fired in the kiln.

B) HAZARDOUS WASTE

The hazardous waste generated from the plant is mainly

- Waste oil and grease drained out of gear boxes and other equipment
- Scrapped auto mobile batteries

The above wastes will be disposed as per the Hazardous Waste Management Rules to the licensed vendors.

C) GARBAGE HANDLING & DISPOSAL ARRANGEMENT FROM THE COLONY

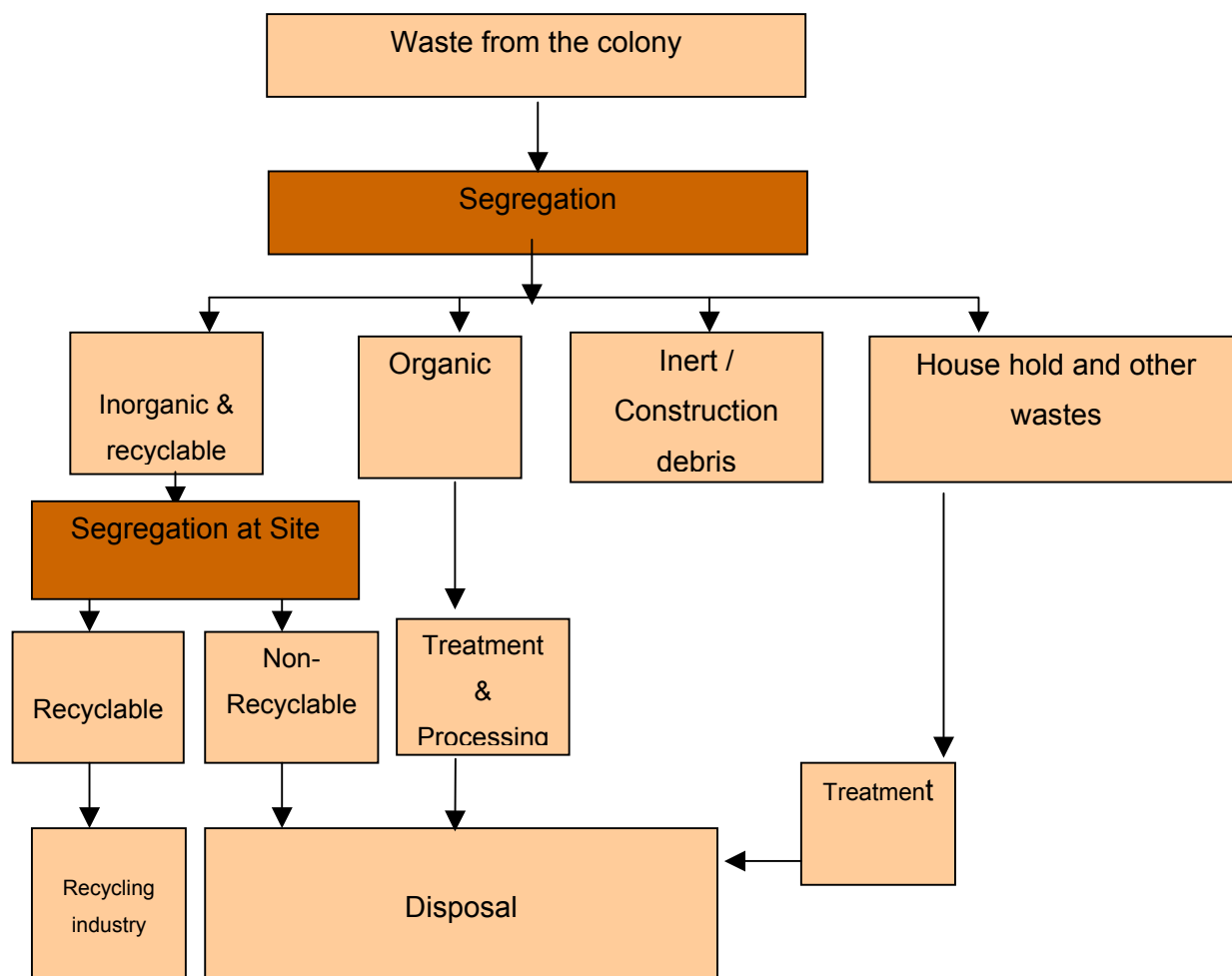
i) Collection and Transportation

During the collection stage, the bio-degradable and non recyclable/non biodegradable waste will be stored and collected separately. Only the non-recyclable and non-biodegradable waste will be transported to the waste disposal site. The segregation, transportation and disposal of wastes will be done by the authorized agency that will take care of the waste management for the proposed residential colony during the operational phase of the project. To minimize littering and odours, waste will be stored in well-designed containers/bins that will be located at strategic locations to minimize disturbance to traffic flow.

Care should be taken so that the collection vehicles are well maintained and minimize noise and emissions. During transportation, the waste has to be covered to avoid scattering.

II) DISPOSAL

The organic waste/biodegradable waste will be subjected to *vermin composting* and finally used for horticultural purpose. Regarding the disposal/treatment of other waste, the management will use the services of the authorized agency for waste management and disposal of the wastes emerging out of the project site during its operational phase.



4.2.5 SOCIO ECONOMIC ENVIRONMENT

The management has proposed to give preference to local people for recruitment in semi skilled and unskilled categories. A total of about 500 persons would be given indirect employment during construction and installation of cement plant and about 280 persons will be recruited in the operational phase. The company proposed to setup a colony with necessary infrastructural facilities. Present socio economic scenario in the area is lacking infrastructural facilities. Employment potential both direct and indirect coupled with trade opportunities and strong social commitment of the company in the form of Corporate Social Initiatives shall result in enhancement of the quality of life of the people.