AUROBINDO PHARMA LIMITED, UNIT-I.

Sy. No. 379, 385, 386, 388 to 396 & 269,
Borapatla(V),
Hathnoora Mandal, Medak District
Telangana

I ENVIRONMENTAL IMPACT ASSESSMENT REPORT
II ENVIRONMENTAL MANAGEMENT PLAN

Submitted By
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AUROBINDO PHARMA LIMITED, UNIT-I.

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EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

Pharmaceuticals Chemicals are used for the benefit of human and health and animal health. The production volumes and the usage rates of most pharmaceutical active ingredients (referred to here as pharmaceutical chemicals or pharmaceuticals) used for either human or animal health consumption are small relative to many consumer products.

M/s. Aurobindo Pharma Limited is an existing unit located at Sy. NO 379,385,386,388 to 396 & 269 in Borapatla (V), Hathnoora (M), Medak District, Telangana. Due to market demand, it is proposed to expand the production capacity of the plant from 96.0 TPM to 421.2 TPM and establish 3.95 MW co-generation plant. As production infrastructure is in existence at the plant, it is proposed to augment utilities, power generation equipment and environmental infrastructure. Total Cost of the Project is Rs. 70.0 Cores out of this an investment of Rs. 15.0 Cores proposed to invest on environmental infrastructure in addition to Rs. 33.08 Cores invested. The land area of the plant is 71.0 acres with a green belt of 24.5 Acres (Current 18.4 Acres and proposed additional 6.1 acres of green belt)

Location of the Plant

M/s Aurobindo Pharma limited at Sy. NO 379,385,386,388 to 396 & 269 in Borapatla(V), Hathnoora (M), Medak District, Telangana. Between $17^0$40’01” N Latitude and $17^0$40’21” N Latitude and $78^0$10’21.4” East Longitude and $78^0$10’41.0” East Longitude The land area of the plant is 71.0 acres. The plant is surrounded by Kamasami Kunta in west direction, Nareti Kunta in east direction and Agricultural lands in south direction and Road and Company parking area in north direction. The nearest human settlement from the site is Boraptla village located at distance of 0.5 km from the site in west direction. There are no ecologically sensitive areas like national parks, sanctuaries within 10 km radius of the site.

The nearest airport is located at a distance of 75.0 Km at Hyderabad. There are no Reserve Forests within 10 KM radius. Nearest reserve Forest Narsapur RF is at about 15.0 KM from the site. No ecologically sensitive

areas like national parks, sanctuaries within 10 km radius of the site. Nearest surface water bodies are Manjeera River is at 2.5 Kms and Manjeera reservoir at 9.5 Kms from site in the upstream of project.

Product Profile

The manufacturing capacities are presented in the following table.

Table 1.0

Proposed Products & Capacities

S. No.	Name of the Product	Quantity in TPM
1	Amisulpride	0.50
2	Aripiprazole	0.50
3	Atorvastatin	4.00
4	Bisprolol Fumarate	0.50
5	Bupropion HCl	0.50
6	Candesartan Cilexetil	1.00
7	Cefaclor Monohydrate	1.00
8	Cefadroxil	3.00
9	Cefalothin Acid	2.00
10	Cefazolin Sodium	3.00
11	Cefdinir	2.50
12	Cefditoren Pivoxil	0.50
13	Cefepime HCl	2.00
14	Cefixime Trihydrate	1.50
15	Cefotaxime	3.00
16	Cefoxitin Sodium	0.50
17	Cefpirome Dihydroiodide	0.20
18	Cefpodoxime Proxetil	3.00
19	Cefprozil	3.00
20	Cefradin	2.00
21	Cefsulodin Sodium	0.50
22	Ceftazidime DiHydrochloride	2.00

23	Ceftibuten Dihydrate	2.00
24	Ceftiofur HCl	3.00
25	Ceftizoxime Acid	0.50
26	Ceftriaxone Disodium Hemiheptahydrate	3.00
27	Cefuroxime Axetil	23.50
28	Cephalexin Monohydrate	15.00
29	Cephapirin Benzathine	0.50
30	Ciprofloxacin HCl	7.00
31	Citalopram Hydrobromide	2.50
32	Donepezil Hydrochloride	0.50
33	Doxazosin Mesylate	0.50
34	Entacapone	3.00
35	Escitalopram Oxalate	2.00
36	Famciclovir	2.00
37	Florfenicol	5.00
38	Fluvastatin	0.50
39	Gabapentin	40.00
40	Gemfrozil	10
41	Glyburide	2.50
42	Irbesartan	5.00
43	Lamivudine	1.00
44	Lisinopril	1.00
45	Losartan Potassium	5.00
46	Metformin HCl	200.00
47	Metoprolol Succinate	2.00
48	Metoprolol Tartrate	10.00
49	Mirtazapine	2.00
50	Modafinil	1.00
51	Nevirapine	5.00
52	Ondansetron	0.20
53	Pantoprazole Sodium Sesquihydrate	3.00
54	Paroxetine HCl	3.00

55	Perindopril tert-Butylamine	0.50
56	Rabeprazole Sodium	0.50
57	Ritonavir	2.00
58	Ribavirin	0.50
59	Risperidone	0.50
60	Sevelamer HCl/Carbonate	1.00
61	Simvastatin	7.00
62	Stavudine	1.00
63	Telmisartan	2.00
64	Terazosin HCl Dihydrate	0.30
65	Terbinafine HCl	3.00
66	Topiramate	5.00
	Total	**421.20**

Manufacturing Process

Chemical Synthesis products are the majority of drugs currently in the market. Chemical Synthesis consists of four steps – reaction, storage, separation, purification and drying. Large volumes of solvents are used during chemical synthesis, extractions and solvent inter changes. The manufacturing process of the above mentioned molecules involve various types of reactions like acetylation, Oxidation, Reduction, hydrogenation, hydrolysis etc. the manufacturing process of all the compounds, reactions involved, materials balance are presented in chapter 3 of EIA report.

Utilities

The current utilities and utilities required for the proposed expansion capacity are presented in following table.

Table 2.0

Utilities & Effluent handling facilities – Current & Proposed

Utilities & Effluent handling facilities – Current		
S.NO	**Utility**	**Capacity**
Existing		
1	Boilers	27.5 TPH(coal Fired) and 8TPH (coal Fired)
2	Diesel Generator sets(backup power)	1x1000 KVA and 3x 750 KVA, 2 X 500 KVA
3	Process Ro Plants	3 No's with a capacity of 1000 KLD
4	Cooling Towers	Total 17000 TR (52Nos)
5	Waste Water treatment facilities	1) Stripper, Multiple Effect Evaporator and ATFD Systems –1x300 + 1 X 120 KLD 2)1x300 & 1 X 250 KLD Bio ETP 3) 1 x 300 KLD RO Plant 4) Detoxification facility for containers and container liners. 5) Dedicated fractionation column for enrichment of stripper distillate wastewater treatment 6) 100 KLD STP for domestic waste water treatment
Utilities & Effluent handling facilities – Proposed		
S.NO	**Utility**	**Capacity**
1	Coal/ Husk fired Boiler	39 TPH
2	Turbine & generator	3.95 MW
3	DG Sets	3 x 750; 4 x 1010 KVA
4	DM/ Softener	10 KL
5	Cooling Towers	2000 TR
4	Waste Water Treatment plant	1) Stripper, Multiple Effect Evaporator and ATFD System 1 x 500 KLD 2) RO System for Effluents –1x500 KLD 3) up-gradation of existing 200 KLD Bio-ETP

Note:

- Existing boiler will be kept as stand by
- DG sets are used only during load shutdown by APTRANSCO.

Water Requirement and Water Balance

Water is required for Process, Utilities, domestic purposes and gardening. The total requirement shall be 1280.7 KLD. The plant purposes to establish a zero liquid discharge system, and recycle the treated effluent for reuse to an extent of 394.3 KLD. Hence the fresh water requirement shall be 886.4 KLD. Water is procured from ground water and private parties.

The water balance for daily consumption is presented in the following table.

Table 3.0

Water Balance of the proposed expansion

S. No	Stream	Consumption in KLD	Waste water generation in KLD
1	Process	310.7	343.8
2	Reactor & Floor Washings	25.0	20.0
3	Scrubber	25.0	25.0
4	QC and R&D	20.0	15.0
5	DM/Softener (Regeneration)	25.0	25.0
6	Solvent Recovery plant	25.0	20.0
7	Boiler	325.0	32.5
8	Cooling Towers	350.0	25.0
9	RO back washes	35.0	35.0
10	Domestic	65.0	60.0
11	Garment washings	10.0	10.0
12	Gardening	50.0	Nil
13	Ash handling (Water sprinklers)	15.0	Nil
Total		**1280.7**	**611.3**

Process Effluents contain soluble raw materials, by products, solvents etc.

Baseline Environmental Data

The baseline data for ambient quality, surface and ground water quality, noise and soil quality collected and analyzed for various parameters. The analysis results show that the values are within the prescribed limits for air quality. The water quality of the area is found to be above limits for some parameters.

Identification and Quantification of Impacts

The sources of pollution in the proposed project are Air emissions from utilities, liquid effluents from process, utilities and domestic sources, solid waste from process and utilities and noise pollution from utilities and process equipment. The impact assessment report identified various sources of pollution and quantified the pollution loads and has identified the technologies to be adopted for the mitigation and control of the same

Impacts of air Quality

The additional impacts of air quality due to the proposed project are from the 1 X 39 TPH coal fired, and additional DG set of 3 x 750; 4 x 1010 KVA capacity. The impacts are quantified using ISC- AERMOD model based on ISCST3 Algorithm. The results indicate marginal increase in the ambient air quality parameters and the predicted concentrations are within the prescribed limits of CPCB. Details of current levels and proposed incremental levels of emissions are presented in **Table 4.0**

Table 4.0

Predicted GLC's at Monitoring Locations (24 Hours)

Village Name	Base Line			Prediction			Cumulative		
	PM10	SO2	NOX	PM10	SO2	NOX	PM10	SO2	NOX
Project Site	74.32	16.00	35.70	0.02	0.04	0.06	74.34	16.04	35.76
Borapatla	79.23	15.82	37.76	0.33	0.06	0.17	79.56	15.88	37.86
Reddy Khanapur	71.34	13.88	28.88	0.01	0.23	0.04	71.35	14.11	28.92
Chandapur	72.56	12.88	24.88	0.01	0.02	0.03	72.57	12.98	24.91
Gundlamachanoor	78.10	14.88	31.82	0.01	0.02	0.04	78.11	14.90	31.86
Palpanur	71.56	12.88	21.88	0.02	0.03	0.05	71.58	12.91	21.93
Goudcherla	68.23	11.88	27.88	0.31	0.51	0.88	68.54	12.39	28.75
NAAQS Limit	100	80	80						

Note: Base Line Values are Maximum 24 hour concentrations

Impacts on water

The required water is going to be procured from ground water and private sources in the area. The effluents generated from the process and washings contain high COD and TDS values which shall be handled carefully to avoid any impacts on surface and ground water sources. It is therefore APL proposed to provide state of art treatment system based on "Zero Liquid Discharge "concept with an additional investment of nearly 3 Crores

Impacts on Noise quality

The noise levels may increase due to the motors, compressors, DG set and other activity.

Impacts on Soil

The solid waste generated from the process, from utilities and from effluent treatment plant may have significant negative impacts if disposed indiscriminately.

Impacts on Ecology

There are no endangered flora and fauna in the impact area. Hence there are no significant impacts

Impacts on socio Economy

Employment generated is the major benefit of this project. The area which has low industrial density and high agricultural activity will have positive benefits due to this project.

Environmental Management Plan

The management plan is drawn in consultation with the project proponents, technical consultants after evaluating a number of technologies available for mitigation and control of pollution. The environmental management plan is drawn to address the impact identified during construction which is temporary and the impacts identified during operation stages.

Construction Stage

As the unit already exists and only few additional utilities and environmental infrastructure are added, potential of pollution during the construction phase will be minimal when compared to the operational stage. However the industry will ensure to keep the pollution potential level in the construction phase to a minimum. Wherever applicable, detailed procedures will be developed for control of pollution during project execution phase. The following are few important parameters to be appropriately managed to minimize the pollution load.

Operational Stage

Liquid Effluents

Liquid effluents generated from the manufacture process cause pollution if disposed on land untreated. The effluents generated in the process, separation techniques and during purification contain organic residues of raw materials, solvents and products. Some of the raw materials used in the process are also inorganic in nature. Hence the effluents contain both organic and inorganic in various quantities leading to high COD and TDS levels respectively. The effluent characteristics are presented in the following table;

Table 5.0

Waste water generation and mode of treatment

S. No	Stream	Discharge in KLD	Mode of treatment proposed
1	Process	343.8	Stripper, MEE with ATFD - Condensates to Bio ETP and RO RO Rejects to MEE **(ZLD)**
2	Reactor & Floor Washings	20.0	Stripper, MEE with ATFD - Condensates to Bio ETP and RO RO Rejects to MEE **(ZLD)**

3	Scrubber	25.0	Stripper, MEE with ATFD - Condensates to Bio ETP and RO RO Rejects to MEE (**ZLD)**
4	QC and R&D	15.0	Stripper, MEE with ATFD - Condensates to Bio ETP and RO RO Rejects to MEE (**ZLD)**
5	DM/Softener (Regeneration	25.0	Stripper, MEE with ATFD - Condensates to Bio ETP and RO RO Rejects to MEE (**ZLD)**
6	Solvent Recovery plant	20.0	Stripper, MEE with ATFD - Condensates to Bio ETP and RO RO Rejects to MEE (**ZLD)**
7	Boiler	32.5	Stripper, MEE with ATFD - Condensates to Bio ETP and RO
8	Cooling Towers	25.0	RO Rejects to MEE (**ZLD)**
9	RO back wash	35.0	Stripper, MEE with ATFD - Condensates to Bio ETP and RO RO Rejects to MEE (**ZLD)**
10	Domestic	60.0	STP and used for gardening
11	Garment washings	10.0	STP and used for gardening
12	Gardening	Nil	--
13	Ash handling (Water sprinklers)	Nil	--
Total		**611.3**	

Effluent Treatment Description in Effluent Treatment Plant

The main sources of effluent generation from the plant are process, washings, and scrubber, blow downs from utilities like cooling tower, boiler & domestic effluents. The process effluents are segregated on the basis on TDS and COD loads into high TDS, COD stream and low TDS and COD stream. It is proposed to establish MEE, stripper and ATFD with a capacity of 500 KLD. It is proposed to establish an effluent treatment system on zero liquid discharge plan. The details of the treatment system are as follows;

High TDS Effluent Treatment System

Effluents process and washings are equalized in the equalization tank followed by neutralization and pre-treatment. The pre treated effluents are sent to stripper to remove the organics. The distillate from the stripper sent to cement industries/ TSDF for co- incineration. The stripper effluents are passed through MEE followed by ATFD. The salts from the ATFD are dispose to TSDF. The condensate from MEE and ATFD will be sent to ETP (Biological) for further treatment.

Low TDS Effluent Treatment System

The low TDS and COD effluents from the blow downs along with the condensate from MEE and ATFD are proposed to be treated in biological treatment plant (Extended aeration principle) followed by reverse osmosis. The Biological system consists of screens, equalization, neutralization, aeration tank and clarifier. The sludge from the ETP, after dewatering in the decanter centrifuge will be disposed to TSDF. The filtrate is recycled to ETP for further treatment. It is seen from the above arrangements that the industry proposed for Zero Liquid discharge.

Air pollution

The additional sources of air pollution due to the expansion activities are from 39 TPH Coal/Husk fired Boiler (and use it for co-generation of 3.95 MW power) and DG set 3 x 750 KVA ; 4 x 1010 KVA capacity. The emissions from the boiler are passed through a multicone cyclone followed by bag filter

before releasing into atmosphere through a chimney. The stack heights are provided as per the guidelines of CPCB for effective stack heights.

The process emissions contain hydrochloric acid, CO2, Butane & H2. Process reactors are connected to vent condensers and scrubber. The other gas expected in the process is carbon dioxide, nitrogen, oxygen and hydrogen which are let out into atmosphere following a standard operating procedure.

Solvent Use and Recycle

Solvents are used for extraction of products, while solvents are used as reaction medium in process. The solvents used are recycled by recovering them by distillation. The distillation of solvents will yield pure solvents, and residues. The residues shall be sent to TSDF.

Solid waste

Solid waste are generated from the process, solvents distillation, salts from MEE, sludge from collection/ neutralization tank of stripper, waste oil from DG set, used batteries from DG sets. The ash from boiler is sold to brick manufactures. The solid wastes: ETP sludge, MEE salts, wastes from the process i.e., residues, and distillation residues shall be disposed to the TSDF or cement manufacturers. Total waste proposed to be send to TSDF facilities for land fill is 43.62 TPD. Other incinerable wastes which is having fuel value will be disposed to cement plants. This waste would be 111.65 TPD. While the hazardous wastes of waste oil and used batteries shall be sent to authorized recyclers. The other solid wastes expected from the unit are containers, empty drums which will be used for packing product, and or the product seller or sold to authorized buyers after detoxification. Biomedical waste would be disposed to authorized biomedical waste collection centers.

Noise pollution

Noise is anticipated from motors, compressors and DG set. The DG shall be kept in a separate enclosed room with acoustic enclosure. The motors and compressors shall be provided with guards and shall be mounted adequately to ensure the reduction of noise and vibration. The employees working in noise

generating areas shall be provided with earplugs. The employees shall be trained in the mitigation measures and personal protection measures to be taken to avoid noise related health impacts.

Occupational Safety and Health

Direct exposure to the pharmaceuticals or its raw materials may effect the health of the employees. Hence direct exposure to the product is eliminated by providing closed handling facilities with pumps and pipelines in the process plant. Personal protective equipment viz. Hand gloves, safety gaggles, nose masks and safety helmets are provided to all the employees working in the plant. Company has a policy of providing protective equipment for al personnel including contract and casual workers.

Prevention, maintenance and operation of environment control system

The pollution control equipment, and the effluent treatment systems and effluents will be monitored periodically will be checked for its performance and pro-active maintenance will be adopted. The environmental monitoring results will be evaluated to identify the problems/under performance of the equipment. Necessary steps will be taken to rectify the identified problems/defects. The management agrees that the evaluation of the performance of pollution control measures and occupational measures to arrive at their efficiency and proposes to adopt new measures for efficient pollution control which will be a regular exercise.

All pollution control equipment are adequately sized manner and operating staff of the pollution control equipment have good experience in the operation and maintenance of the equipment. Standby equipment provided for all the critical equipment to ensure continuous operation of pollution control equipment and preventive maintenance is done as per the schedule to avoid break down. Characteristics of influent and effluent are monitored on daily basis by the industry and air emissions and effluent characteristics on monthly basis by third party.

Transport systems

All the raw materials and finishes products are transported by road. Sufficient parking facilities are provided for vehicles loading and unloading of goods. As the plant is located near the major road there will not be any unauthorized shop or settlements along the road connecting the plant site. There will be 5 truck trips per day to the factory. The vehicles are provided with parking space near the gate, and traffic signs are placed in the battery limit. All the drivers of the vehicles will be provided with TREM cards and will be explained the measure to be adopted during various emergencies.

Recovery-Reuse of Waste Products

The following measures are suggested for waste minimization: Reaction optimization- Alternative use of non-toxic/less toxic solvents and catalysts, Choice of catalysts that would provide highest reaction yields, Selection of Reagents with lowest toxicity. Additionally the treated effluents are reused for cooling tower make up, first batch mother liquors are reused, solvents are recycled and reused where ever possible. Condensers are provided for storage tanks, reactors etc., to reduce emissions of volatile organic compounds.

Green Belt Development

Green belt is recommended as one of the major components of Environmental Management Plan. The existing industry has green belt and the management emphasizes the development of further greening of the site to enhance environmental quality through; mitigation of fugitive emissions, attenuation of noise levels, balancing eco-environment, consumption of treated effluent, prevention of soil erosion, and creation of aesthetic environment. Currently green belt is developed in an area of 18.4 acre. It is proposed to acquire 6.1 more acres of land adjacent to plant for development of additional greenbelt

Post project monitoring in plant

Environmental monitoring for water, air, noise and solid waste quality shall be conducted periodically either by the proponent or a third party, the frequency

of monitoring and the quality parameters shall be suggested by the Ministry of Environment and Forests Government of India.

Environmental Management Cell

The Environmental Management Cell of the project shall be headed by the plant manager, and shall be assisted by adequate supporting staff. Also our corporate environmental group will assist the plant in complying the requirements and implementing Environmental Management Plan

Corporate Social Responsibility

Aurobindo Pharma Limited has been contributing significantly for the development of the socio-economic environment in the area. Besides providing sustainable livelihoods through direct and indirect employment APL has been contributing to the vocational skills development of youth on a continual basis.

APL has also been contributing to the physical infrastructure development through construction and maintenance of CC roads in the closely surrounding villages, maintenance of street lighting and drinking water supply and subsidized transportation to local employees.

Towards improvement of social infrastructure, APL has been organizing health camps, carrying out repairs to school buildings, distribution of books, uniforms and bicycles to the poor students.

APL has also been contributing to enhance green cover through tree plantations in and around the factory site.

APL spent Rs. 63.64 lakhs over the last 5 years period in the surrounding areas. Apart from this APL also sponsored monthly salaries of two vidya Volunteers of local elementary school, Two temporary teachers in ZP school and ZP school watchman

As per the new companies Act 2014, APL would continues to allocate funds for the development of surrounding areas under corporate social responsibility.

Chapter 1 : INTRODUCTION

1.1 PURPOSE OF THE REPORT

M/s. AUROBINDO PHARMA LIMITED (APL) – UNIT-I, (formerly known as M/s. Sri Chakra Remedies Limited) was started in the year 1992 as M/s. Gold Star Remedies to produce Bulk Drugs & Intermediates. **Aurobindo Pharma Limited** acquired this Unit to manufacture Bulk Drugs & Intermediates. Sy. No. 379, 385, 386, 388 to 396 & 269, Borapatla(V), Hathnoora Mandal of Medak District in Telangana.

M/s. Aurobindo Pharma limited, Unit I obtained Environmental Clearance from MOEF in the year 2005 under EIA Notification of 1995 (vide **No. J-11011/116/2005 – IA II (I)** June 23, 2005. The site was inspected by the Officials of MOEF, Bangalore office and provided certified copy of the compliance report. The details of compliance report and actions taken on observations made are given in **chapter II** of this report

In order to meet the market demands and customer requirements, it is necessary to achieve economic scale of production. In order to achieve this now Aurobindo Pharma limited proposed to expand the production capacity with new products. The production capacity proposed to be increased from 96.0 TPM to 421.2 TPM. Also it is proposed to establish a co-generation plant to generate 3.95 MW power by establishing high steam 39 TPH coal/husk fired boiler.

As per the Environmental Impact Assessment (EIA) Notification S.O.1533 on 14th Sept, 2006, issued by Ministry of Environment and Forests (MoEF),Govt. Of India, the proposed Bulk drug manufacturing facility is categorized as Category- A project, and comes under Schedule Sl. No. Item 5(f) which mandates obtaining prior Environmental Clearance from MOEF, Govt. of India.

The Expert Appraisal Committee (Industries) considered the project in the meeting held on 16- 17th May, 2013 and issued the 'TORs' vide letter No.

F. No. J-11011/289/2012- IA II (I) dated 26.06.2013. A copy of the TOR and compliance are given at **Annexure I of the report**

Borapatla area was declared as notified industrial area by the Government of Andhra Pradesh vide GO MS No. 120 dated 22.10.2013. Copy of GO is enclosed at **Annexure II** of this chapter

The task of carrying out EIA study preparing EIA study report was entrusted to Pridhvi Enviro Tech Private Limited, Hyderabad which is an accredited organization (S.No 116 of list of NABET accredited consultants). Copy of the accreditation is given at **Annexure III**

Accordingly, the study was carried out around 10 KM radius of the project site as per the approved TOR during October 2013 to January 2014, and the EIA study report is prepared based on the primary base line data generated during the study and secondary data collected from various sources and project proponents

1.2 IDENTIFICATION OF THE PROJECT AND PROJECT PROPONENT

M/S Aurobindo Pharma Limited, Unit I is operating a Bulk Drugs, Drug Intermediates manufacturing unit which is identified as Unit I having its registered office at Plot No 11,Sy.No.9, Water mark Building, Kondapur, Hi-tech City, Hyderabad 500 084.

M/S Aurobindo Pharma Limited, unit I is an existing manufacturing unit with state of Art manufacturing facility which got approved from US FDA, EU GMP, UK MHRA, South Africa- MCC, Health Canada and Brazil ANVISA, and obtained quality and EMS (ISO 14001: 2004) Certifications.

The site is located in Borpatla(V), Hathnoora (M), Medak District, Telangana. Total area of the project is 71.0 Acres. The site is at about 45 KM from Hyderabad

1.2.1 Introduction to proponents & Group:

M/s. Aurobindo Pharma Limited, Unit I Founded in 1986 by Mr. P.V. Rama Prasad Reddy, Mr. K. Nityananda Reddy and a small group of highly committed professionals, Aurobindo Pharma was born off a vision. The company commenced operations in 1988-89 with a single unit manufacturing Semi-Synthetic Penicillin (SSP) at Pondicherry. Through cost effective manufacturing capabilities and a few loyal customers, the company entered the high margin specialty generic formulations segment. In less than a decade Aurobindo Pharma today has evolved into a knowledge driven company manufacturing active pharmaceutical ingredients and formulation products. It is R&D focused and has a multi-product portfolio with manufacturing facilities in several countries.

M/s. Aurobindo Pharma Limited, Unit I became a public company in 1992 and listed its shares in the Indian stock exchanges in 1995. In addition to being the market leader in Semi-Synthetic Penicillins, it has a presence in key therapeutic segments such as neurosciences, cardiovascular, anti-retrovirals, anti-diabetics, gastroenterology and cephalosporins, among others.

The formulation business is systematically organized with a divisional structure, and has a focused team for key international markets. Leveraging on its large manufacturing infrastructure for APIs and formulations, wide and diversified basket of products and confidence of its customers, it aims to achieve USD 2 billion revenues by 2015-16. Aurobindo's nine units for APIs / intermediates and seven units for formulations are designed to meet the requirements of both advanced as well as emerging market opportunities. A well-integrated pharma company, Aurobindo Pharma features among the top 10 companies in India in terms of consolidated revenues. Aurobindo exports to over 125 countries across the globe with more than 70% of its revenues derived out of international operations.

Our customers include premium multi-national companies. With multiple facilities approved by leading regulatory agencies such as USFDA, EU GMP,

UK MHRA, South Africa-MCC, Health Canada and Brazil ANVISA, Aurobindo makes use of in-house R&D for rapid filing of patents, Drug Master Files (DMFs), Abbreviated New Drug Applications (ANDAs) and formulation dossiers across the world. Aurobindo Pharma is among the largest filers of DMFs and ANDAs from India.

Vision

"To become Asia's leading generic Pharma company and one among the top 15 in the world, by 2015"

Mission

Aurobindo's mission is to become the most valued Pharma partner to the World Pharma fraternity by continuously researching, developing and manufacturing a wide range of pharmaceutical products that comply with the highest regulatory standards.

1.2.2 Corporate Environmental Policy:

Company adopted Environmental Management & Safety and Health Management system policies integrated with corporate quality management system. Company employed professional man power to take care of Environmental and Safety & Health management systems and adopted corporate reporting system companywide for all the units. Top management reviews compliance to legal requirements and other management programs adopted from time. Company's Environmental Policy, Health & safety policies are here again

Environment Health and Safety Policy

The management of Aurobindo Pharma Limited, Commits to operate all its units in an environmentally friendly manner, while protecting health and safety of its employees. The management is committed to prevention of pollution, injury and ill health to its employees. Aurobindo Pharma Limited will comply with applicable laws and other requirements.

This commitment will be fulfilled by:

- Providing suitable equipment and maintaining them in line with the requirements of law and good engineering practices
- Using innovative R & D techniques and process development to minimise and control adverse impacts of our operations on safety and health of our employees and on surrounding environment
- Establishing, implementing, and maintaining, programs for risk reduction, emergency preparedness, recycling and reusing of wastes, and pollution prevention by using effective technologies, wherever feasible.
- Working for a continual improvement in our environment, safety and health performance by setting appropriate objectives, targets, management programs and periodic review of the same
- Providing necessary training to all employees to make them aware of their obligations under this policy, and other legal requirements related to their area of responsibility
- Updating ourselves on the latest industry practices and changes in legislation, and applying this knowledge to improve manufacturing procedures and systems

This policy will be made available to public on request

1.3 BRIEF DESCRIPTION OF THE PROJECT

1.3.1 NATURE OF THE PROJECT

Currently the unit is manufacturing Bulk Drugs and Drug Intermediates with a capacity of 96 TPM and now propose to increase the capacity to 421.2 TPM and establish a co-generation plant of 3.95 MW capacity. No additional manufacturing facilities will be required as existing infrastructure is sufficient for the enhancement of drug production. Few additional utilities such as boiler, Power generation system and other environmental infrastructure needs to be created with an additional investment of Rs. 72.0 Cores

Salient features of the project is given in table 1.1 below

TABLE 1.1

Salient Features of the Project

Location	Survey No. 379, 385, 386 to 396 & 269, Borapatla (Village), Hathnoora Mandal, Medak Dist. of Telangana
Longitude and latitude	Between $17^0$40'01" N Latitude and $17^0$40'21" N Latitude and $78^0$10'21.4" East Longitude and $78^0$10'41.0" East Longitude
Year of establishment	1992
Product category	5(f), Drugs & Drug Intermediates
Proposed Activity	Capacity expansion from 96.0 TPM to 421.2 TPM And establishment of captive Co-Generation plant with a capacity of 3.95 MW
Total investment on the plant	Current - Rs. 201.3 Crores Proposed – Rs.70.0 Crores
Total Investment on Environmental Infrastructure	Current Rs. 33.08 Crores Proposed Rs. 15.0 Crores
Total area of the plant	Current -65.5 Acres, Proposed-5.5 Acres, Total-71.0 Acres
Total area of green belt	Current-18.4, proposed- 6.1 Acres, Total-24.5 Acres
Water requirement	Total Water requirement 1280.7 KLD Fresh water requirement 886.4 KLD Recycled water 394.3 KLD
Source of water	Ground water & from outside suppliers through tankers
Nearest habitation and distance from the site	Borapatla (V) 0.5 KM from the site
Nearest surface water bodies	Manjeera River – 2.5 KM (in upstream of site) Manjeera Reservoir – 9.5 KM in the upstream of the site
Nearest reserve forest	There are no Reserve Forests within 10 KM radius of project
Environmentally sensitive areas within 10 km radius	Manjeera Reservoir – 9.5 KM from site in the upstream of project site
Any national parks, wild life sanctuaries within 10 km radius	None
Nearest air port and distance	Samshabad 75 KM
Nearest railway station and distance	Sankarapally at about 25 KM

1.3.2 PRODUCTS AND CAPACITIES:

Currently the unit is permitted to manufacturing 6 products at a time @ 3 products (regular products) + 1 product each Group A, Group B and Group C (Campaign products) thus the total production capacity is 3.2 TPD or 96.0 TPM in worst case scenario. Table 1.2 gives list of products and permitted capacities under current CFO of A.P .Pollution Control Board. Table 1.3 gives list of proposed products and capacities.

TABLE 1.2
LIST OF EXISTING PRODUCTS & CAPACITY

S.No	Products	Quantities in Kg/day
	Regular Products	
1	Metaformin	833.33
2	Cephalexin	333.33
3	Amoxy Dane Salt (only final stage)	1666.67
	Group - A (Campaign Products)	
1	Ciftioufur Acid / Sodium	16.67
2	Cefuroxime Acid	133.36
3	Cefuroxime Axetil	33.34
4	Cefachlor	66.67
5	CefpodoximeProxetil	16.67
6	Cefixime	16.67
7	Cefotaxime	33.34
	Group - B (Campaign Products)	
1	Cefprozil	16.67
2	Cefridine	66.67
3	Cefdinir	10.00
4	Cefoxitine	8.33
5	Cefadroxil	66.67
6	Ceftrixone disodium	16.67
	Group - C (Campaign Products)	
1	Mirtazapine	8.33
2	Citalopram	8.33
3	Simvastatin	3.33
4	Amidoarone HCl	3.33

5	Losartan	40.00
6	Pentoxyfyline	166.67
7	Glibendamide	33.33
8	Terbinafine HCl	16.67
9	Gabapentine	33.33
10	Dilitiazam	66.67

TABLE 1.3
PROPOSED PRODUCTS & CAPACITIES

S. No.	Name of the Product	Quantity in TPM
1	Amisulpride	0.50
2	Aripiprazole	0.50
3	Atorvastatin	4.00
4	Bisprolol Fumarate	0.50
5	Bupropion HCl	0.50
6	Candesartan Cilexetil	1.00
7	Cefaclor Monohydrate	1.00
8	Cefadroxil	3.00
9	Cefalothin Acid	2.00
10	Cefazolin Sodium	3.00
11	Cefdinir	2.50
12	Cefditoren Pivoxil	0.50
13	Cefepime HCl	2.00
14	Cefixime Trihydrate	1.50
15	Cefotaxime	3.00
16	Cefoxitin Sodium	0.50
17	Cefpirome Dihydroiodide	0.20
18	Cefpodoxime Proxetil	3.00
19	Cefprozil	3.00
20	Cefradin	2.00
21	Cefsulodin Sodium	0.50
22	Ceftazidime DiHydrochloride	2.00
23	Ceftibuten Dihydrate	2.00
24	Ceftiofur HCl	3.00
25	Ceftizoxime Acid	0.50
26	Ceftriaxone Disodium Hemiheptahydrate	3.00
27	Cefuroxime Axetil	23.50
28	Cephalexin Monohydrate	15.00
29	Cephapirin Benzathine	0.50
30	Ciprofloxacin HCl	7.00
31	Citalopram Hydrobromide	2.50
32	Donepezil Hydrochloride	0.50
33	Doxazosin Mesylate	0.50

34	Entacapone	3.00
35	Escitalopram Oxalate	2.00
36	Famciclovir	2.00
37	Florfenicol	5.00
38	Fluvastatin	0.50
39	Gabapentin	40.00
40	Gemfrozil	10.00
41	Glyburide	2.50
42	Irbesartan	5.00
43	Lamivudine	1.00
44	Lisinopril	1.00
45	Losartan Potassium	5.00
46	Metformin HCl	200.00
47	Metoprolol Succinate	2.00
48	Metoprolol Tartrate	10.00
49	Mirtazapine	2.00
50	Modafinil	1.00
51	Nevirapine	5.00
52	Ondansetron	0.20
53	Pantoprazole Sodium Sesquihydrate	3.00
54	Paroxetine HCl	3.00
55	Perindopril tert-Butylamine	0.50
56	Rabeprazole Sodium	0.50
57	Ritonavir	2.00
58	Ribavirin	0.50
59	Risperidone	0.50
60	Sevelamer HCl/Carbonate	1.00
61	Simvastatin	7.00
62	Stavudine	1.00
63	Telmisartan	2.00
64	Terazosin HCl Dihydrate	0.30
65	Terbinafine HCl	3.00
66	Topiramate	5.00
	Total	**421.20**

1.3.3 Site details

M/s Aurobindo Pharma Limited, Unit I at Sy. No. 379, 385, 386, 388 to 396 & 269, Borapatla(V), Hathnoora Mandal of Medak District in Telangana. The site is in between $17^0$40'01" N Latitude and $17^0$40'21" N Latitude and $78^0$10'21.4" East Longitude and $78^0$10'41.0" East Longitude. The land area of the plant is 71 acres. The plant is surrounded by Kamasami kunta in west direction, Nareti kunta in east direction and Agricultural lands in south direction and road and company parking area in north direction. The nearest

human settlement from the site is Borapatla village located at distance of 0.5 km from the site in west direction. There are no ecologically sensitive areas like national parks, sanctuaries within 10 km radius of the site. Manjeera River, which is one of the drinking water source of Hyderabad city is at 2.5 KM from the site in the upstream. Manjeera Reservoir is at about 9.5 KM from the site in the eastern Direction. Both River and Reservoir are upstream of site. Kamasami Kunuta and Nareti Kunta are rainfed tanks adjacent to site on Western and Eastern Direction of the site. Bhima Cheruvu and Gundlamasanuru Cheruvu(rain Fed Irrigation tanks) are at 0.5 KM from the site in Eastern direction and 2.5 KM in South Eastern Direction respectively. The nearest railway station Shankarpally is located at a distance of 25.0 KM from the site. The nearest airport is located at a distance of 75 Km at Hyderabad. There are no Reserve Forests within 10 KM radius. Nearest reserve Forest Narsapur RF is at about 15 KM from the site.

There are 3 villages within 2 KM radius of the site ie., Borapatla at 0.5 KM, Chandapur at 1.5 KM distance, Palakanur is at about 2 KM radius of the site. Hathnoora which is Mandal Head quarters is at 7 KM from the site. Sangareddy which is District Head Quarters is at 10.1 KM from the site

There are total 47 villages within 10 KM radius of the site covering 15 Mandals. Total population covered within 10 KM radius is 90,445.

1.3.4 PROJECT COST

The total project cost for the current plant is Rs. 201.3 Crores. Cost on current environmental Infrastructure is Rs. 33.08 Crores

It is proposed to invest Rs. 70.0 Crores on utilities and additional environmental infrastructure.

1.3.5 MAN POWER

M/s. Aurobindo Pharma Limited, Unit I is providing employment currently to 1988 (1238 on rolls and 700 as casual work force). An additional

employment of 50 on rolls and 100 as casual work men is expected to be generated from the proposed expansion.

1.3.6 JUSTIFICATION OF THE PROJECT

Telangana is considered to be the Pharma capital of India as it accounts for about 40% of the total bulk drug production of the country. There are many reasons for the growth of this sector in Hyderabad like:

- Availability of World Class research and testing organizations in Hyderabad
- Good infrastructure
- Availability of skilled manpower
- Government's positive attitude towards the industrialization
- Presence of Entrepreneurs with Pharma background in the state

Aurobindo is in forefront in the last 30 years with excellent customer base and markets. The demand for API's and intermediates is increasing every year and many new molecules are introduced by Aurobindo for different global market. As existing infrastructure facilities are sufficient to increase the production levels, the project is justified in techno commercial point of view

1.4 Scope of EIA Studies

Environmental impact assessment study involves three basic components, that is, identification, prediction and evaluation of impacts. The detailed scope of EIA Study is as follows,

- An intensive reconnaissance and preliminary collection of environmental information to plan field study.
- Field studies to collect preliminary information, particularly on the quality of the physical environment. Experienced scientists and engineers will collect the data.
- Baseline data generation and characterization of air, water, soil, noise and vegetation in the kilometer radius area (impact zone) over a period of three months.

- A through study of the process including provisions for air pollution control, and environmental management that includes prediction of impacts and relevant mathematical modeling.
- Preparation of Environmental monitoring program.
- Preparation of Environmental Management plan suggesting suitable methods for mitigating and controlling the pollution levels. Environmental monitoring plan is suggested for monitoring the pollution loads at various levels facilities in the premises and to ensure compliance with the statutory requirements.

Figure 1.1 Gives the photographs of the project site

Figure 1.2 Gives the topographical features of 10 km radius

Figure 1.3 Gives the plant lay out

Figure 1.4 Gives the Road net work in the area

Figure 1.5 Gives the drainage map of the area

FIGURE 1.1
PHOTOGRAPHS OF THE PLANT


ADVANTAGES:


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FIGURE 1.2

TOPOGRAPHICAL FEATURES OF THE STUDY AREA

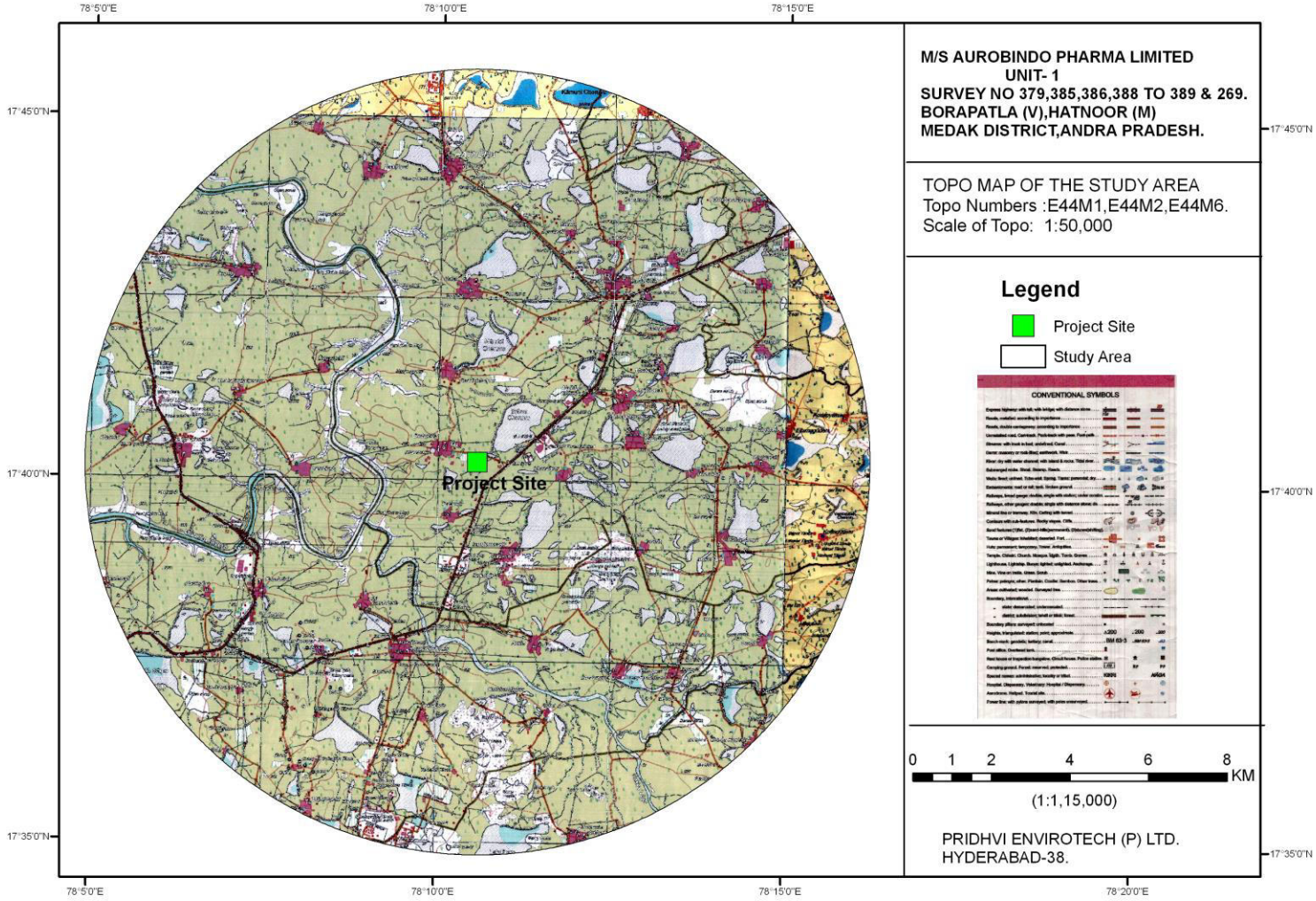


FIGURE 1.3

PLANT LAY OUT

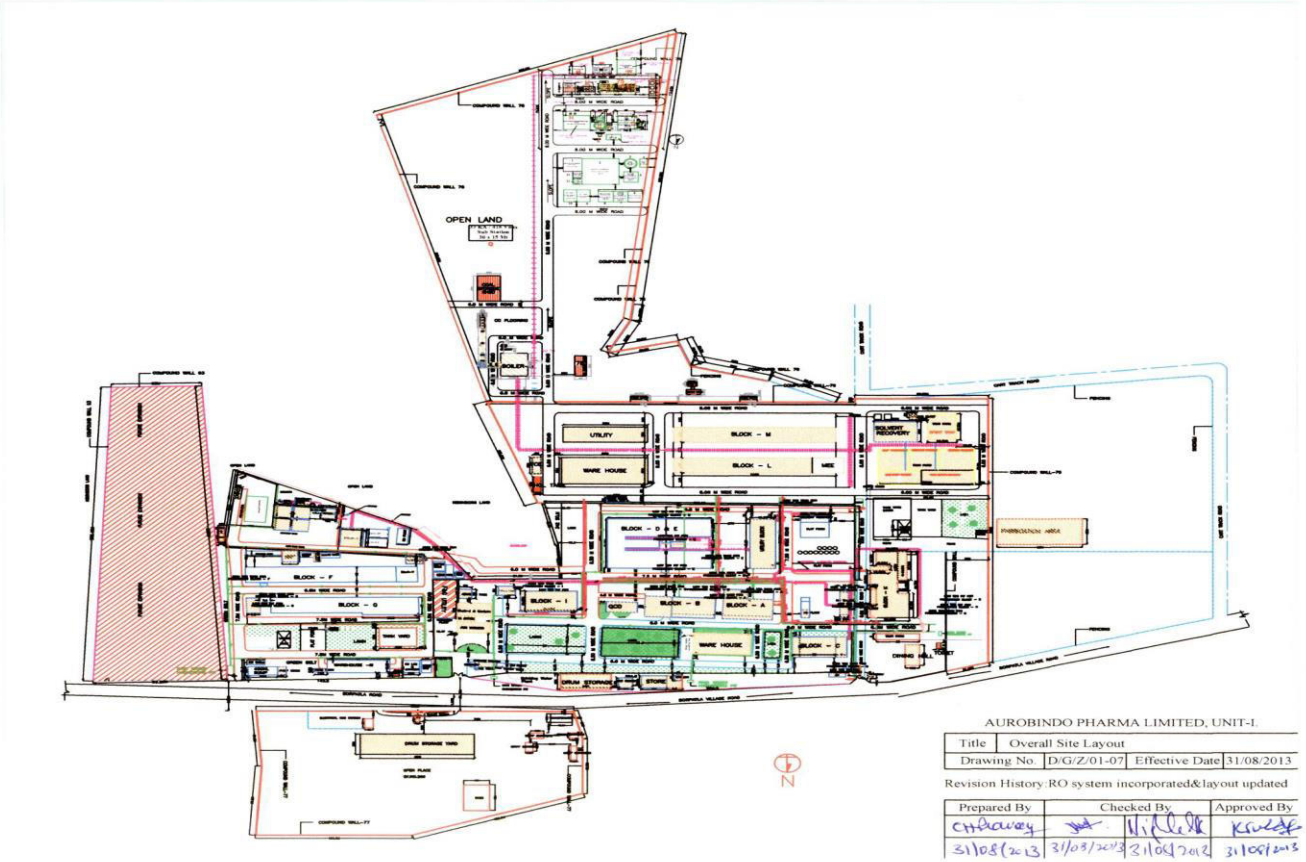


Figure 1.4

Road Network in the study area

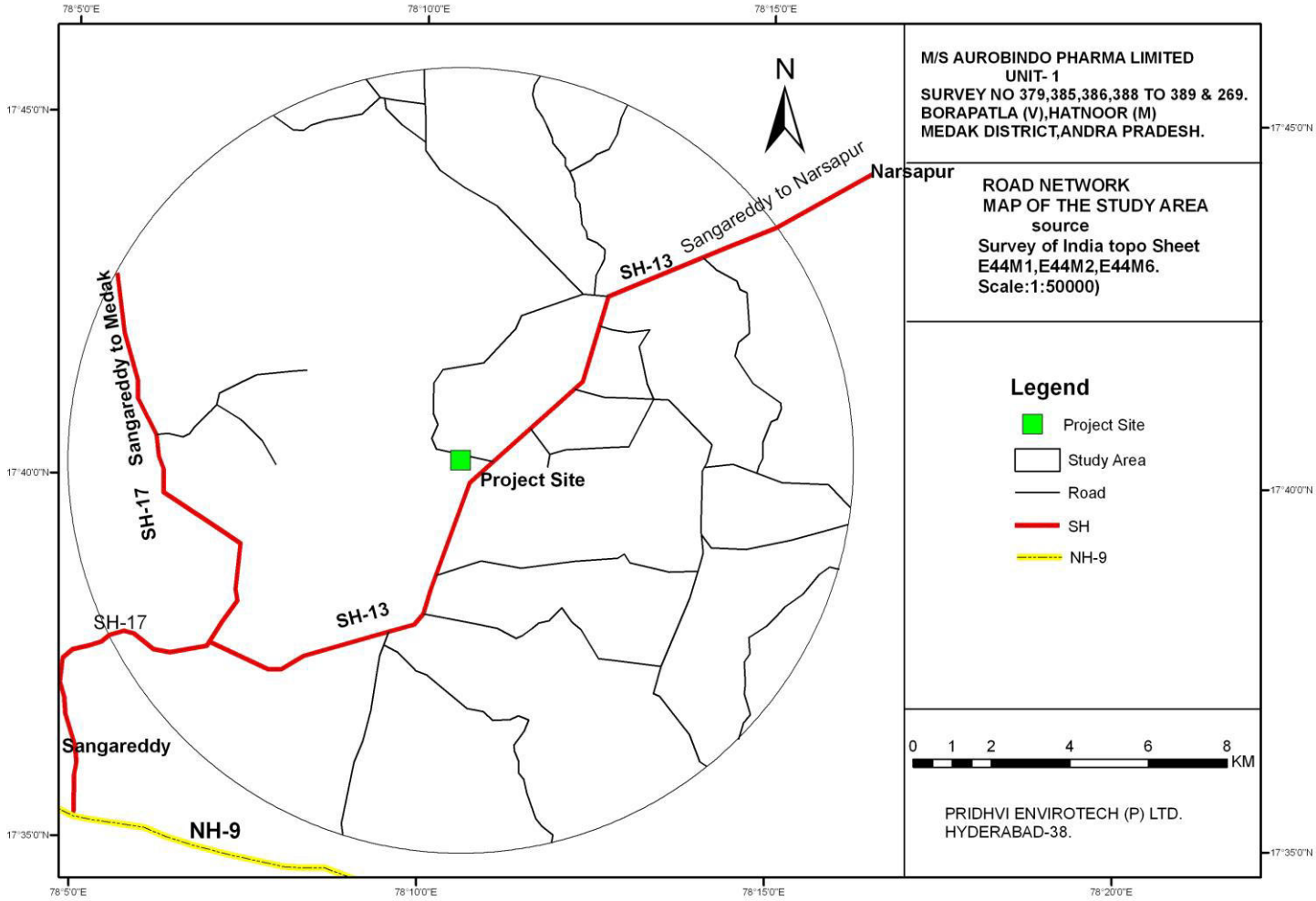
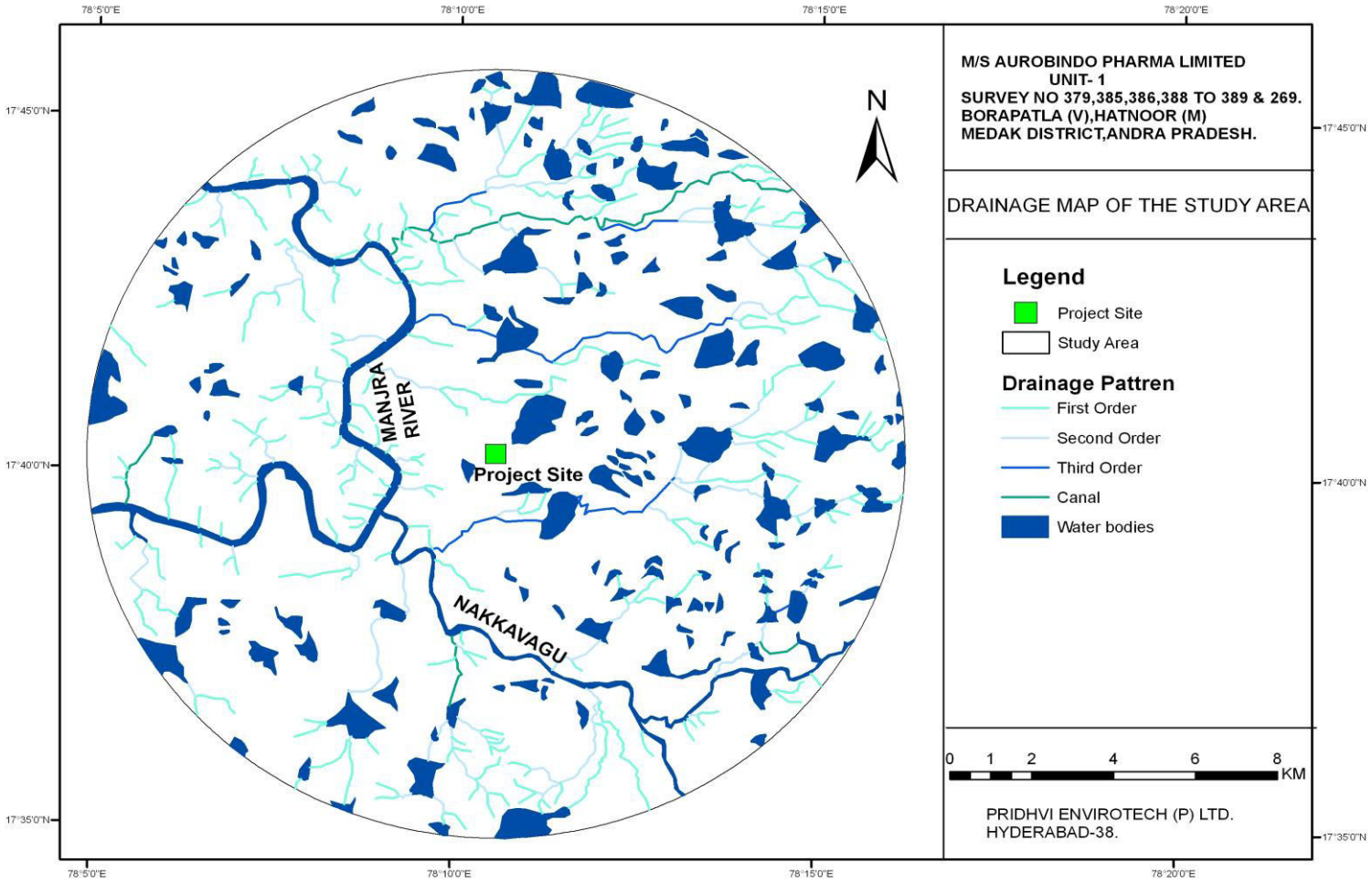


Figure 1.5

Drain network of the study area



CHAPTER I

LIST OF ANNEXURES

Annexure No.	Description
Annexure No.1	Copy of TOR & Compliance
Annexure No.2	Copy of GO.MS.No.120
Annexure No.3	Copy of Accreditation

ANNEXURE–I

TOR & TOR Compliance

F. No. J-11011/289/2012- IA II (I)
Government of India
Ministry of Environment and Forests
(I.A. Division)

Paryavaran Bhawan
CGO Complex, Lodhi Road
New Delhi – 110 003

E-mail : aditya.narayan@nic.in
Telefax : 011: 2436 0549
Dated 26th June, 2013

To,

Dr. J.V.N. Reddy
M/s Aurobindo Pharma Ltd. (Unit-1)
Associate Vice President-EHS
Plot No.2, matrivihar, Ameerpet,
Hyderabad- 500038 Andhra Pradesh

E-mail: info@aurobindo.com ; jvnreddy@aurobindo.com ; Fax No. : 040- 23746833

Subject: Expansion of Bulk Drugs Unit (from 96 TPM to 421.2 TPM) at Sy. No. 388 & 389, Village Borapatla, Mandal Hathnoor,District Medak, Andhra Pradesh by M/s Aurobindo Pharma Ltd. (Unit-1)– regarding TORs.

Ref. : Your letter no. nil dated 5th September, 2012.

Sir,

Kindly refer to your letter no. nil dated 5th September, 2012 alongwith project documents including Form-I, Pre-feasibility Report and draft 'Terms of Reference' as per the EIA Notification, 2006. It is noted that proposal is for expansion of Bulk Drugs Unit (from 96 TPM to 421.2 TPM) at Sy. No. 388 & 389, Village Borapatla, Mandal Hathnoor,District Medak, Andhra Pradesh by M/s Aurobindo Pharma Ltd. (Unit-1). Following products will be manufactured:

S.N.	Products	Production Quantity (TPM)
1	Metformin Hydrochloride	200.0
2	Gabapentin	40.0
3	Cefuroxime Axetil	23.5
4	Cephalexin Monohydrate	15.0
5	Gemfrozil	10.0
6	Metoprolol Tartrate	10.0
7	Simvastatin	7.0
8	Ciprofloxacin Hydrochloride	7.0
9	Nevirapine	5.0
10	Losartan Potassium	5.0
11	Irbesartan	5.0
12	Topiramate	5.0
13	Florfenicol	5.0
14	Atorvastatin	4.0
15	Cefprozil	3.0
16	Cefadroxil	3.0
17	Pantoprazole Sodium Sequihydrate	3.0
18	Paroxetine Hydrochloride	3.0
19	Entacapone	3.0
20	Cefazolin Sodium	3.0
21	Ceftiofur Hydrochloride	3.0
22	Ceftriaxone Disodium Hemiheptahydrate	3.0
23	Cefotaxime	3.0
24	Cefpodoxime Proxetil	3.0
25	Terbinafine Hydrochloride	3.0
26	Cefdinir	2.5
27	Citalopram Hydrobromide	2.5
28	Glyburide	2.5

29	Cefalothin Acid	2.0
30	Cefradin	2.0
31	Famcielovir	2.0
32	Mirtazapine	2.0
33	Metroprolol Succinate	2.0
34	Ceftibuten Dihydrate	2.0
35	Retanovir	2.0
36	Cefepime Hydrochloride	2.0
37	Ceftazidime Dihydrochloride	2.0
38	Escitaloprama Oxalate	2.0
39	Telmisartan	2.0
40	Cefixime Trihydrate	1.5
41	Cefaclor Monohydrate	1.0
42	Lamivudine	1.0
43	Stavudine	1.0
44	Lisinopril	1.0
45	Candesartan Cilexetil	1.0
46	Modafinil	1.0
47	Sevelamer Hydrochloride/Carbonate	1.0
48	Perindopril tert-Butylamine	0.5
49	BisoprololFumarate	0.5
50	Amisulpride	0.5
51	Donepezil Hydrochloride	0.5
52	Fluvastatin	0.5
53	Risperidone	0.5
54	Rabeprazole Sodium	0.5
55	Ribavirin	0.5
56	Bupropion Hydrochloride	0.5
57	DoxazosinMesylate	0.5
58	Aripiprazole	0.5
59	Cefoxitin Sodium	0.5
60	Cephapirin Benzathine	0.5
61	Ceftizomime Acid	0.5
62	CefditorenPivoxil	0.5
63	Cefsulodin Sodium	0.5
64	Terazosin Hydrochloride Dihydrate	0.3
65	Ondansetron	0.2
66	Cefpirome Dihydroiodide	0.2
	TOTAL	**421.2**

2.0 Draft Terms of Reference (TOR) have been discussed and finalized during the 9th Reconstituted Expert Appraisal Committee (Industry) held during 16-17th May, 2013 for preparation of EIA/EMP report. Following are the 'TORs':

1. A separate chapter on status of compliance of Environmental Conditions granted by State/Centre to be provided. As per circular dated 30th May, 2012 issued by MoEF, a certified report by RO, MoEF on status of compliance of conditions on existing unit to be provided in EIA/EMP report.
2. Executive summary of the project
3. Justification of the project.
4. Promoters and their back ground.
5. Regulatory framework.
6. Environment clearance for the existing unit issued by the Ministry (reasons, if not obtained), Consent to Operate and Authorization accorded by the APPCB.
7. Data for the stack emissions, fugitive emissions; water requirement and water balance chart; wastewater generation, treated effluent quality, re-utilization and disposal of solid/hazardous waste for the existing unit.
8. Project location and plant layout.
9. Infrastructure facilities including power sources.
10. Total cost of the project alongwith total capital cost and recurring cost/annum for environmental pollution control measures.

11. Project site location alongwith site map of 10 km area and site details providing various industries, surface water bodies, forests etc.
12. Present land use based on satellite imagery for the study area of 10 km radius. Details of land availability for the project alongwith supporting document.
13. Location of National Park/Wild life sanctuary/Reserve forest within 10 km radius of the project.
14. Permission from the State Forest Department regarding the impact of the proposed plant on the surrounding reserve forests.
15. Details of the total land and break-up of the land use for green belt and other uses.
16. List of products alongwith the production capacities.
17. Detailed list of raw material required and source, mode of storage.
18. Manufacturing process details alongwith the chemical reactions and process flow chart.
19. Action plan for the transportation of raw material and products.
20. Site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall is necessary.
21. Ambient air quality monitoring at 6 locations within the study area of 5 km., aerial coverage from project site as per NAAQES notified on 16th September, 2009. Location of one AAQMS in downwind direction.
22. One season site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall and AAQ data (except monsoon) for PM_{10}, SO_2, NOx, CO including VOCs shall be collected. The monitoring stations shall take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests. Data for water and noise monitoring shall also be included.
23. Air pollution control measures proposed for the effective control of gaseous/process emissions within permissible limits.
24. Name of all the solvents to be used in the process and details of solvent recovery system.
25. Design details of ETP, incinerator, if any alongwith boiler, scrubbers/bag filters etc.
26. Details of water and air pollution and its mitigation plan.
27. Action plan to control ambient air quality as per NAAQS Standards notified by the Ministry on 16th September, 2009.
28. An action plan prepared by SPCB to control and monitor secondary fugitive emissions from all the sources.
29. Determination of atmospheric inversion level at the project site and assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. Air quality modelling for proposed plant.
30. Source and Permission from competent Authority for the drawl of water. Water balance chart for existing and expansion project including quantity of effluent generated recycled and reused and effluent discharge.
31. Attempt to be made for reduction for usage of water.
32. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the standard.
33. Zero discharge effluent concepts to be adopted.
34. Ground water quality monitoring minimum at 6 locations shall be carried out. Geological features and Geo-hydrological status of the study area and ecological status (Terrestrial and Aquatic).
35. The details of solid and hazardous wastes generation, storage, utilization and disposal particularly related to the hazardous waste calorific value of hazardous waste and detailed characteristic of the hazardous waste. Action plan for the disposal of fly ash generated from boiler shall be included.
36. Precautions to be taken during storage and transportation of hazardous chemicals shall be clearly mentioned and incorporated.
37. Material Safety Data Sheet for all the Chemicals are being used/will be used. CAS No./RTECS No./DOT/UN etc to be mentioned against each chemicals.
38. Authorization/Membership for the disposal of solid/hazardous waste in TSDF.
39. Risk assessment for storage for chemicals/solvents. Action plan for handling & safety system.
40. An action plan to develop green belt in 33 % area. Layout plan for green belt shall be provided.
41. Action plan for rainwater harvesting measures at plant site shall be included to harvest rainwater from the roof tops and storm water drains to recharge the ground water.
42. Details of occupational health programme.

i) To which chemicals, workers are exposed directly or indirectly.

ii) Whether these chemicals are within Threshold Limit Values (TLV)/ Permissible Exposure Levels as per ACGIH recommendation.

iii) What measures company have taken to keep these chemicals within PEL/TLV.

iv). How the workers are evaluated concerning their exposure to chemicals during pre-placement and periodical medical monitoring.

v) What are onsite and offsite emergency plan during chemical disaster.

vi) Liver function tests (LFT) during pre-placement and periodical examination.

43. Details of occupational health surveillance programme.

44. Socio-economic development activities shall be in place.

45. Note on compliance to the recommendations mentioned in the CREP guidelines.

46. Detailed Environment management Plan (EMP) with specific reference to details of air pollution control system, water & wastewater management, monitoring frequency, responsibility and time bound implementation plan for mitigation measure shall be provided.

47. EMP shall include the concept of waste-minimization, recycle / reuse / recover techniques, Energy conservation, and natural resource conservation.

48. Total capital cost and recurring cost/annum for environmental pollution control measures.

49. **Corporate Environmental Responsibility**

(a) Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.

(b) Does the Environmental Policy prescribe for standard operating process/procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA report.

(c) What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the EC conditions. Details of this system may be given.

(d) Does the company have a system of reporting of non compliance / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism should be detailed in the EIA report.

50. Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof.

51. Public hearing issues raised and commitments made by the project proponent on the same should be included separately in EIA/EMP Report in the form of tabular chart.

52. A tabular chart with index for point wise compliance of above TORs.

The following general points shall be noted:

i. All documents shall be properly indexed, page numbered.

ii. Period/date of data collection shall be clearly indicated.

iii. Authenticated English translation of all material provided in Regional languages.

iv. The letter/application for EC shall quote the MOEF file No. and also attach a copy of the letter.

v. The copy of the letter received from the Ministry shall be also attached as an annexure to the final EIA-EMP Report.

vi. The final EIA-EMP report submitted to the Ministry must incorporate the issues in this letter. The index of the final EIA-EMP report must indicate the specific chapter and page no. of the EIA-EMP Report.

vii. Certificate of Accreditation issued by the QCI to the environmental consultant shall be included.

3.0 These 'TORs' should be considered for the preparation of EIA / EMP report for expansion of Bulk Drugs Unit (from 96 TPM to 421.2 TPM) at Sy. No. 388 & 389, Village Borapatla, Mandal Hathnoor,District Medak, Andhra Pradesh by M/s Aurobindo Pharma Ltd. (Unit-1) in addition to all the relevant information as per the 'General Structure of EIA' given in Appendix III and IIIA in the EIA Notification, 2006. The EIA/EMP as per TORs should be submitted to the Chairman, Andhra Pradesh Pollution Control Board, (APPCB) for public consultation. The SPCB shall conduct the public hearing/public consultation as per the provisions of EIA notification, 2006.

4.0 You are requested to kindly submit the final EIA/EMP prepared as per TORs and incorporating all the issues raised during Public Hearing / Public Consultation to the Ministry for considering the proposal for environmental clearance ***within 2 years as per the MoEF O.M. No. J-11013/41/2006-IA.II (I) dated 22nd March, 2010.***

5.0 The consultants involved in the preparation of EIA/EMP report after accreditation with Quality Council of India / National Accreditation Board of Education and Training (QCI/NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other Organization(s)/Laboratories including their status of approvals etc.

(A.N. Singh)
Dy. Director (S)

Copy to : The Chairman, Andhra Pradesh Pollution Control Board, Paryavaran Bhavan, A-3, Industrial Estate, Sanathnagar, Hyderabad 500 018, Andhra Pradesh (E-mail : aspcb@hd2.dot.net.in ; Fax No. : 040-23733261)

(A.N. Singh)
Dy. Director (S)

Compliance of Terms of Reference

TOR Letter No. **J-11011/289/2012-IA II(I)** Dated: June 26, 2013

S.No	Compliance of Terms or Reference	Response
	Project Description	
1	Separate chapter on compliance of Environmental conditions & certified report by RO, MoEF on status of compliance of conditions.	Chapter II of EIA report addressed the compliance to previous conditions of EC.
2	Executive Summary of the Project	Included in EIA report.
3	Justification of the Project.	Included in **chapter 1 of EIA report (Page No.1-11)**
4	Promoters and their background	Included in the **chapter I of EIA report (Page No.1-2)**
5	Regulatory Framework	The proposed expansion is a synthetic organic chemicals (Bulk drugs and Intermediates) manufacturing unit. The EIA notification SO 1533 dt 14.9.2006 classifies the same as a Category "A". Project mentioned in 5 f of Schedule vide list of projects requiring environmental clearance.
6	Environmental clearance for the existing unit & CFO accorded by the APPCB	Included as **Enclosure 1 of 2nd chapter**
7	Data for the stack emissions, fugitive emissions, water requirement and water balance chart, waste water generation, treated effluent quality, re-utilization and disposal of solids/ hazardous waste for the existing unit	Included in the **chapter 3 of EIA report**
8	Project location and plant layout	The layout is presented in **chapter 1 of EIA report. Page No 1-17**
9	Infrastructure facilities including power sources	Included in the **chapter 3 of EIA report (Page No.3-4)**
10	Total cost of the project along with total capital cost and recurring cost/ annum for environmental pollution control measures	Total cost of the project is Rs. 201.3 Cores (Current) & Rs.70.0 (proposed), **Chapter 1 pg. No 1-10**. Details of capital cost and recurring cost for environmental pollution control measures are given in **EMP para 13.0, page no 1-35**
11	Project site location along with site map of 10 km area and site details providing various industries, surface water bodies, forests etc	The 10Km radius topographical map is presented in **chapter 1 of EIA report. Page No 1-16.**

S.No	Compliance of Terms or Reference	Response
12	Present land use based on satellite imagery for the study area of 10 km radius. Details of land availabilty for the project along with supporting document.	The land use & land cover map of the study area is presented **chapter 4 of EIA report. Page No 4-69.**
13	Location of National Park/ wild life sanctuary/ Reserve forest within 10 km radius of the project	**Page No 1-16** showing location of National Park/wild life sanctuary /Reserve forest within 10 km radius of the Project.
14	Permission from the State Forest Department regarding the impact of the proposed plant on the surrounding reserve forests	As there are no reserve forests present within 10 KM radius of the site (Study Area), this is not applicable to this project
15	Details of the total land and breakup of the land use for green belt and other uses.	Land use table is given Chapter 3 **Page No 3-5**
16	List of products along with the production capacities	Presented in **Chapter 1** of EIA report. **Page No 1-7 to 1-9.**
17	Detailed list of raw material required and source, mode of storage	Enclosed separately as **Annexure I of Chapter 3**
18	Manufacturing process details along with the chemical reactions, Flow Diagram and Material Balance (stage wise)	Enclosed separately as **Annexure I of Chapter 3**
19	Action plan for the transportation of raw material and products	Presented in **chapter 7 of EIA report**
20	Site -specific micro -meteorological data using temperature, relative humidity , hourly wind speed and direction and rainfall is necessary	Presented in **Chapter 4 of EIA report at Page No 4-28 to 4-35.**
21	AAQM at 6 locations within study area of 5 km., aerial coverage from project site as per NAAQES notified on 16th September, 2009. Location of one AAQMS in down wind direction.	Presented in **Chapter 4 of EIA report at page 4-39**
22	One season site – specific micro-meteorological data using temperature, relative humidity , hourly wind speed and direction and rainfall and AAQ data (except monsoon) for PM10, SO2, Nox, CO including VOCs shall be collected. The monitoring stations shall take into account the pre- dominant wind direction, population zone and sensitive receptors including reserved forests. Data for water and noise monitoring shall also be included	The monitoring stations taken into account with pre-dominant wind direction, population zone and sensitive receptors including reserved forests.
23	Air pollution control measures proposed for the effective control of gaseous/ process emissions within the permissible	Presented in EMP of EIA report at **Page No 1-16**

S.No	Compliance of Terms or Reference	Response
	limits	
24	Name of all the solvents to be used in the process and details of solvent recovery system	Details about the solvent used (Chapter 5 , Pg. No.5-26) and recovery system is presented in **Environment Management Plan at Page No 1-18.**
25	Design details of ETP, incinerator, if any along with boiler, scrubbers/ bag filters etc.	Details about the ETP is presented in **Environment Management Plan at Page No 1-9.**
26	Details of water and air pollution and its mitigation plan	Discussed in **Chapter 5**
27	Action plan to control ambient air quality as per NAAQS Standards notified by the Ministry on 16th September, 2009	Presented in **Chapter 4 of EIA report at page 4-36**
28	Action plan prepared by SPCB to control and monitor secondary fugitive emissions from all the sources.	Discussed in **chapter 5 pg No. 5-26**
29	Determination of atmospheric inversion level at the project site and assessment of ground level concentration of pollutants from the stack emission based on site- specific meteorological features. Air quality modelling for proposed plant.	Details presented in **chapter 4 from Pg 4-31**
30	Source and permission from competent authority for the drawl of water. Water balance chart for the existing project including quantity of effluent generated recycled and reused and effluent discharge.	Details of water balance cycle data including quantity of effluent generated recycled and reused and discharged is presented in Chapter 3 of EIA report from **Page No. 3-6 to Page 3-7**
31	Attempt to be made for reduction for usage of water	Water usage is optimized. Co-generation plant is incorporated in the project for optimization of resources. ZLD plant is proposed to re-use the treated water
32	Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the standard.	Discussed in EMP of **EIA pg No.1-9**
33	Zero discharge effluent concepts to be adopted	The proposal is based on Zero Process liquid discharge concept. Design details of ETP are presented in **EMP Pg No. 1-10**
34	Ground water quality monitoring minimum at 6 locations shall be carried out. Geological features and geo-hydrological status of the study are and ecological status (Terrestrial and Aquatic)	Details submitted in **chapter 4 of EIA**
35	The details of the solid and hazardous wastes generation, storage, utilization and disposal particularly related to the hazardous waste calorific value of hazardous waste and	Details presented in **EMP table No 1.6 & 1.7. Pg 1-19**

S.No	Compliance of Terms or Reference	Response
	detailed characteristics of the hazardous waste. Action plan for the disposal of fly ash generated from boiler shall be included.	
36	Precautions to be taken during storage and transportation of hazardous chemicals shall be clearly mentioned and incorporated.	Presented in **chapter 7** on Risk assessment. List of hazardous chemicals are presented in table 7.3 Pg 7-8, Bulk storages are given in 7.4 Pg 7-9, Toxic chemicals details are given in table 7.17 of Pg No. 7.27
37	Material safety data sheet for all the chemicals are being used/ will be used. CAS No./ RTECS No./DOT/UN etc to be mentioned against each chemicals.	All hazardous chemicals based on MSDS were classified and addressed in the risk assessment in **chapter 7**
38	Authorization /Membership for the disposal of solid/ hazardous waste in TSDF	Authorization /membership with TSDF -yes
39	Risk assessment for storage for chemicals/solvents. Action plan for handling & safety system.	**Addressed in chapter 7**
40	An action plan to develop green belt in 33% area. Layout plan for green belt shall be provided.	Presented in Environment Management Plan of EIA report at **Page No 1-31 to 1-33**
41	Action plan for rain water harvesting measures at plant site shall be included to harvest rain water from the rooftops and storm water drains to recharge the ground water.	Rain water harvest potential is discussed in **EMP para No. 2.6 Pg 1-25**
42	Details of occupational health program me. i) To which chemicals, workers are exposed directly or indirectly. ii) Whether these chemicals are within Threshold Limit Values(TLV)/ Permissible Exposure Levels as per ACGIH recommendation. iii) What measures company have taken to keep these chemicals within PEL/TLV. iv) How the workers are evaluated concerning their exposure to chemicals during pre-placement and periodical medical monitoring. v) What are onsite and offsite emergency plan during chemical disaster vi) Liver function tests (LFT) during pre-placement and	Details are discussed in **EMP para 3.0 of pg 1-27**

S.No	Compliance of Terms or Reference	Response
	periodical examination.	
43	Details of occupational health surveillance programme.	Details are discussed in **3.0 in EMP, Pg – 1-27**
44	Socio-economic development activities shall be in place.	Details are discussed in **6.0 in EMP Pg – 1-29**
45	Note on compliance to the recommendations mentioned in the CREP guidelines.	Details are given in **Annexure II** of EIA report
46	Detailed Environmental Management plan (EMP) with specific reference to details of air pollution control system, water & waste water management, monitoring frequency, responsibility and time bound implementation plan for mitigation measure shall be provided.	Detailed EMP is prepared and presented in Part II of EIA report
47	EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, energy conservation, and natural resource conservation	Discussed in **EMP Ref Para 8.0 Pg 1-30**
48	Total capital cost and recurring cost/annum for environmental pollution control measures.	Details of capital cost and recurring cost for environmental pollution control measures are given **in EMP para 13.0, page no 1-35**
49	Corporate environmental responsibility	Discussed in EMP
50	Any Litigation pending against the project and /or any direction/order passed by any court of Law against the project, if so, details thereof	No, The area is covered under G.O MS No 120 of 2013
51	Public hearing issues raised and commitments made by the project proponent on the same should be included separately in EIA/EMP Report in the form of tabular Chart.	Public hearing minutes and replies to representations are addressed in **Chapter 8**
52	A Tabular chart with index for point wise compliance of above TORs.	This check list provides the compliance with references of EIA report

ANNXURE II (Tor No.45)

CREP Guideline and Compliance

CREP Guideline	Compliance
Segregation of waste streams	Segregation of waste streams done at source and treated separately
Detoxification and treatment of high COD waste streams	High COD waste streams are neutralized and detoxified as present practice
Management of solid waste	Hazardous waste is sent to CHWTSDF.
Minimum scale of production to afford cost of pollution control	Production capacities optimized.
Long term strategies for reduction in waste	Reduction of waste generation by increasing the yields is a major R&D activity.
Control of air pollution	Scrubbers provided to all vents and air emission of reactions apart from Bag filter to boiler.
Self – regulation by industry though regular monitoring and environmental auditing	Third party monitoring conducted quarterly
Optimizing the inventory of hazardous chemicals	Storage of chemicals optimized for one week.

ANNEXURE–II

G.O.Ms. No. 120

GOVERNMENT OF ANDHRA PRADESH
ABSTRACT

Promotion of Industries – Declaring Gaddapotharam (Kazipally), Bonthapally & Gundlamachnoor areas as Notified Industrial Areas – Orders Issued.

INDUSTRIES & COMMERCE (IP) DEPARTMENT

G.O.Ms. No. 120 Dated. 22.10.2013.

Read the following:

1. Letter No. Nil, dated 14/08/2012 of the President, Model Industrial Association, Hyderabad.
2. Letter No. Nil, dated 02/09/2013 of the President, Bulk Drug Manufacturers Association, Hyderabad.
3. Recommendation of the Committee constituted for this purpose
4. Single File No.29/1/2012/13884 of Commissioner of Industries, dated 11.10.2013
5. D.O.Lr.No.15/36/2013/EP (Engg./Pharma), Dated:30-04-2013 of the Commerce Secretary to Government of India
6. G.O.Ms.No.64,EFS&T(ENV),Dated:25/07/2013

***

ORDER:

1. In the reference 1st & 2nd read above, the President, Model Industrial Association, Hyderabad and President, Bulk Drug Manufacturers Association (BDMA) have submitted representations for declaration of Gaddapotharam (Kazipally), Bonthapally & Gundlamachnoor industrial areas as the notified industrial areas, informing that the members of their associations have set-up Chemical and Pharma industries in five industrial pockets in the area viz. Khazipally-Gaddapotharam, Bonthapally, Bonthapally-Domadugu, Borapatla and Gundlamachnoor, way back in 1990s after getting all the required permissions and approvals including Consent for Operations (CFO). He has requested the Government for notifying the said locations as industrial areas so as to facilitate the industries to avail various benefits being announced by the Central Government under the Industrial Infrastructure Up-gradation Scheme (IIUS) and also incentives announced, from time to time, by the State Government, as these areas have immense potential to develop further as a major manufacturing hub for pharmaceuticals and related chemical products.

2. It is further be noted that Andhra Pradesh, particularly Hyderabad, has emerged as a major player in the Bulk Drug Industry sector. There are about 266 bulk drug manufacturing companies in Andhra Pradesh, of which 90 per cent are located around Hyderabad. Hyderabad is contributing about 35% of the country's bulk drug production and has been labeled as Bulk Drug capital of India. The Commerce Secretary, Government of India, in the reference 5th cited has stated that the share in export of bulk drugs and pharmaceuticals from the state of Andhra Pradesh is about 30% of the total exports from the country and recommended for expansion of the existing units subject to compliance of Andhra Pradesh Pollution Control Board norms in order to give further boost to the exports from this sector.

3. In the reference 6th read above the Government permitted the existing Bulk Drug and Bulk Drug intermediates manufacturing units only subject to the installations of Zero Liquid Discharge (ZLD) facilities by such units to go for expansion duly complying with all extant environmental and other norms.

Metropolitan Development Authority and more than 140 industries are operating in these areas with all the required clearances including Consent for operations (CFO).

S.N	Location	Village	Survey Nos		Area in Ha.
			Full	Part	
1	**Kazipally-Gadda potharam Area**	Kazipally	---	180	99.41
		Gaddapotharam	12 to 16	7 to 10 , 25 , 28, 52	138.3
		Alinagar	5, 12 to 17,20 to 27,30, 31, 32, 36, 41 ,43 to 48	9,11,18,19,27/1,30, 32 to 34, 41, 42, 47, 52	97.71
2	**Bonthapally**	Bonthapally	3,4,631,632,634, 635	2,599,629,630, 633, 636, 637, 639,660	56.56
3	**Bonthapally - Domadugu Area**	Bonthapally	205-208,213-224, 227-229, 231, 232, 254, 256, 265, 272, 471, 472, 490/2	192,202,203, 204, 209, 225,226,233,235-238, 250-253,255,257-262, 264,266-271, 273, 274, 466-470, 473-475,487-489, 490/1,497, 626	40.76
		Domadugu	290, 347, 348, 351, 354, 355, 357-363, 365	289, 291, 292, 341 , 345, 346, 349, 350, 352, 353, 356 ,366, 367, 369, 371, 372	38.40
4	**Bodupatla**	Bodupatla	4 to 15, 24, 28, 29, 374, 375, 379/2, 388-390, 392-396	3,16,17,30,31,269 to 272, 373, 376 to 378, 385, 391,397	32.304

6. Further, it is noted that though the Industries located in Gundlamachanoor have converted their lands for industrial use, the same has not been reflected in the master plan of Hyderabad Metropolitan Development Authority as manufacturing zone. The Bulk Drug Manufacturers Association vide their Letter No. BDMA/Commissioner/MPDA/2013-14 dated. 21-09-2013 have requested the Commissioner, Hyderabad Metropolitan Development Authority to correct the anomaly by notifying the above location as Manufacturing Zone. Therefore, the following location is also notified as Industrial area subject to notification of the area as Manufacturing Zone by the Hyderabad Metropolitan Development Authority in their master plan.

1	**Gundla machnoor**	**Gundla machnoor**	374, 375, 376, 377, 378 & 379		44.51

7. The following conditions will apply:

   (a) All the industries coming within these locations must have a valid Consent for Operation (CFO) issued by A.P. Pollution Control Board as on the date of notifying as Industrial Area.
   (b) The location including the areas of different survey numbers shall be within the manufacturing zone of the Hyderabad Metropolitan Development Authority Master Plan.
   (c) All other clearances, approvals, approvals under various applicable laws, acts and rules of all relevant departments as required shall be applicable to all the industries coming within these notified locations; and
   (d) All new industrial units proposed in the proposed Industrial Areas to be notified and those attract the provisions of Water (Prevention and Control Pollution) Act, 1974 and Air (Prevention and Control Pollution) Act, 1981, shall invariably obtain prior Consent for Establishment (CFE) from A.P. Pollution Control Board.

8. The Commissioner of Industries, Hyderabad shall take necessary action, in the matter.

(BY ORDER AND IN THE NAME OF THE GOVERNOR OF ANDHRA PRADESH)

K.PRADEEP CHANDRA,
PRINCIPAL SECRETARY TO GOVERNMENT AND
COMMISSIONER FOR INDUSTRIAL PROMOTION

To
The Commissioner of Industries, A.P., Hyderabad.
The MA & UD Department
The EFS & T Department
The Member Secretary, Andhra Pradesh Pollution Control Board, Hyderabad
The Vice Chairman & Managing Director, APIIC, Hyderabad.
The PR & RD Department
The DT & CP Department
The Revenue (CT) Department.
The Energy Department.
The Irrigation (Reforms) Dept.
The Ind. & Com. (INF) Department.
The Chairman & Managing Director, APTRANSCO., Hyderabad
The Managing Director, APCPDC Ltd., Hyderabad
The District Collector, Medak District.

//FORWARDED::BY ORDER//

SECTION OFFICER

ANNEXURE–III

Copy of Accreditation & List of Team members

S. No.	Consultant Organization	Scope of Accreditation As per NABET Scheme			Project or activity as per Schedule of MoEF Notification dated September 14, 2006 and subsequent amendments
		Sector Number	Name of Sector	Category	
116	**Pridhvi Envirotech (P) Ltd.*** **Address:** 184/c,Lawn House, 4th Floor, Vengalraonagar, Hyderabad - 500 038 **E-mail:** pvr@pridhvienviro.com Tel.: 040-40179770, 9849023662 *Conditions apply*	4	Thermal power plants	B	1 (d)
		8	Metallurgical industries(ferrous and non ferrous) - both primary & secondary	B	3 (a)
		9	Cement plants	B	3 (b)
		21	Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediates excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates)	A	5 (f)
		31	Industrial estates/ parks/ complexes/ Areas, export processing zones(EPZs), Special economic zones (SEZs), Biotech parks, Leather complexes	A	7 (c)
117	**Project & Development India Limited*** **Address:** CIFT Building, PDIL, Sindri, Dhanbad, Jharkhand-828122 **E-mail:** Dhn_envpdil@bsnl.in , alav1sb@gmail.com	16	Chemical Fertilizers	A	5 (a)
		29	Oil & gas transportation pipeline (crude and refinery/ petrochemical products), passing through national parks/ sanctuaries/coral reefs /ecologically sensitive Areas	A	6 (a)

*denotes Provisionally Accredited Consultants

CONTRIBUTORS IN THE PROJECT

S.No	Name	Role
1	K.C.Kutumbarao	EIS Co-ordinator/FAE
2	P.V.Raju	EIA Co-ordinator/FAE
3	Dr.G.Paliavi	FAE
4	Dr. M.Veranna	FAE
5	V.Srinivas	FAE
6	K.Giridhar	FAE
7	I. Durga Prasad	FAE
8	K.RajiReddy	FAE
9	C.Chiranjeevi	FAE
10	I.Sivarama Krishna	FAE
11	G.Ramiswamy Reddy	FAE
12	P.Sivunnaidu	AFAE
13	V.Narender Reddy	AFAE
14	P.Aruna	AFAE
15	V.Ani Lochana	Team Member
16	B.Sri Phanitha	Team Member
17	G.Narasimharaju	Team Member
18	N.Sharma	Team Member
19	C.Anuradha	Lab Support and Team member
20	CH. Sharada	Senior chemist
21	P.Sri	Chemist
22	K.Lingareddy	Field executive
23	V.Parasuram	Field Assistant
24	R.Raju	Field Assistant

CHAPTER -2
COMPLIANCE TO CONDITIONS OF PREVIOUS ENVIRONMENTAL CLEARANCE

2.1 Brief History of the unit

M/s. AUROBINDO PHARMA LIMITED (APL) – UNIT-I, (formerly known as M/s. Sri Chakra Remedies Limited) was started in the year 1992 as M/s. Gold Star Remedies to produce Bulk Drugs & Intermediates. **Aurobindo Pharma Limited acquired this Unit** to manufacture Bulk Drugs & Intermediates. Sy. No. 379, 385, 386, 388 to 396 & 269, Borapatla(V), Hathnoora Mandal of Medak District in Telangana.

2.2 Previous Environmental clearance

M/s. Aurobindo Pharma limited, Unit I obtained Environmental Clearance from MOEF in the year 2005 under EIA Notification of 1995 (vide **No. J-11011/116/2005 – IA II (I)** June 23, 2005. Copy of the Environmental clearance is given as **Enclosure I** for this chapter

2.3 Compliance to conditions of Environmental clearance

M/s. Aurobindo Pharma limited, Unit I complying the conditions prescribed in environmental clearance. Compliance to the conditions prescribed was submitted to MOEF and same was verified and certified by the Officials of MOEF, Southern Zone, Bangalore. Certified copy of the report is enclosed at **Enclosure II** for this chapter

2.4 Issues raised during site visit by MOEF officials and compliance

Issues raised during the visit of MOEF officials were discussed actions taken report was submitted to MOEF on November 28th 2012, Bangalore. Below table provides the issues raised and clarifications provided by M/S Aurobindo Pharma Limited

Table 2.1

Compliance to the issues raised during Site visit of MOEF officials

S.NO	Issue raised by MoEF Visit report	Comments/ Actions by M/S Aurobindo
1	All the tanks of old ETP have to be upgraded and have to be above the ground	ETP inspected during the visit is new ETP and 3 years old. The tanks of ETP are on the ground tanks and there are no tanks below the ground tanks in ETP area. All the tanks are RCC tanks with double mat bottom. We wish to submit for your kind consideration that elevation of these tanks above ground level need changes in flow dynamics of entire integrated waste water treatment system. Hence, we request to kindly not to insist on converting existing on the ground tanks to above the ground level
2	The water body which is adjacent to the ETP but outside the premises spread over 4 to 5 acres shows distinct signs of deterioration and there is reason to believe that this degration is due to leakage/ over flow of effluents from the unit as there are no other industries near it . Leakages and overflow of effluents have to be controlled	We wish to submit for your kind consideration that the water body is a rain fed kunta (tank) which is dry for about 5-7 months in a year. As submitted above, the waste water treatment facilities are almost 3 years old. There were no signs of wetness in the tank during dry months in any of the last four years. Further, the water body, the shrubs around and the green patches in and around the water body houses variety of bird population, more particularly in winter season. Water body serves the agricultural needs, to some extent, of surrounding fields for one crop. Hence, farmers using the tank water are more vigilant on overflows and discharges from the unit of the tank. Having a water body adjacent to our unit is a pride for us and the presence of which made us to exercise extreme precaution to ensure there is no impact to the water body due to our operations. Photographs of the kunta and surroundings at present, subsequent to site inspection, are enclosed as **Enclosure - III.** Photographs presented are clear indication of the health of the water body. Presence of degraded vegetation in the water body might have led to misunderstanding the water body as signs of deterioration as due to leakages or

		overflows of effluents from the unit. However, We would review our systems and take all necessary steps as may be required to protect the water body. Analysis of water from water body and analysis of soil from water body are enclosed at **Enclosure IV**
3	The effluent in ETP tanks should not stored up to the brim to avoid over flows	Two feet gap from the top in all the waste water storage tanks are maintained. Photographs are given at **Enclosure V**
4	The solids are to be collected from the ATFD in closed manner and taken to the storage area.	Made provision to ATFD by way of filter cloth to arrest free falling of solids from ATFD from height and that is no dust emanation. Photographs of collection of solids and storage are given at **Enclosure VI**
5	The permission from State Ground Department for the operating bore wells is yet to be obtained	We have obtained permission from State Ground Department for drawl of 270 KLD of water from 3 existing bore wells. Copy of approval obtained is given at **Enclosure VII**
6	Reportedly for some products manufactured the use of methylene dichloride is continuing due to lack of alternative solvents	Use of Methylene Di Chloride in manufacturing processes is due to synthesis compulsions as there is no alternative to MDC in manufacturing of some of the products. Use of MDC is optimized through R & D efforts and use of MDC is minimal.
7	The products which are not consented by PCB were manufactured	We have obtained CFE for change of Product Mix for the products being manufactured. Copy of CFE is enclosed at **Enclosure-VIII**
8	In some cases they have exceeded the permitted quantity limits of some Drugs	It is a fact that there are variations in the quantity manufactured against consented quantity for individual products. On the overall increase in manufacturing quantities, we have approached APPCB and Appellate Authority and represented to APPCB for addressing local regulations concerning total production capacity through BDMA. APPCB, while considering the request of BDMA, constituted an expert committee. Simultaneously, we have already filed applications for grant of EC for expansion.

9	The water consumption is beyond what is permitted by the Pollution Control Board.	We submitted this application for enhancement of water consumption for our expansion activity
10	At present, both High TDS & low TDS treatment systems are used to the full capacity. No additional effluents shall be generated.	We submitted this application for enhancement of waste water discharge. We proposed additional treatment facilities to take care of expansion activity
11	The ZPLD unit biological treatment system is not working to the designed standards. The DO levels & MLVSS of the unit have to be continuously checked/monitored.	We would like to submit for kind consideration that: a) Our unit achieved ZPLD compliance. Entire wastewater generated at the Unit is treated in- house and treated water is reused in- house. There is no wastewater disposal to PETL (CETP).b) As witnessed at site during the inspection, the Unit is equipped with Stripper, MEE, ATFD, Bio-ETP and RO systems. C) As per treatment protocol, high strength wastewater streams (High TDS/High COD, Low TDS/High COD, High TDS/ Low TDS) are subjected to Stripper, MEE and ATFD. d) Only low TDS/Low COD, i,e domestic and part of utilities wastewater stream only is disposed off to PETL(CETP).e) Accordingly, TDS<10,000 ppm and COD<15,000 ppm are maintained in the in-let of Bio- ETP (for all combined streams, vz., MEE and ATFD condensate and low strength streams). f) Characteristics monitored at different unit operations for the month of September and October, 2012 are enclosed for kind reference **(Enclosure-IX).** g) As can be seen from the data COD of in-let to Bio-etp is less than 8000 ppm and outlet is around 2000 ppm. Hence, it is evident that the bio-ETP system is functioning satisfactorily. however, we would revisit the characteristics and operations of the bio-ETP and take necessary steps to further improve performance. Monitoring of pH, TDS, COD,SVI,MLSS in the biological ETP is a continuous process. the Bio- ETP is equipped with on-line DO meter. Photograph of DO meter is presented in **Enclosure-X**. Now we have initiated monitoring of MLVSS also on a regular basis. Copy of report is enclosed at **Enclosure XI**

12	There is a need for employing experience people for operating all the Units of ZLD.	The ZLD Treatment System, comprising of Stripper, MEE, ATFD, Bio-ETP and RO systems are manned by a team of 25 qualified and experienced personnel. The operations team has been trained on operations and troubleshooting aspects of the systems. Profile of personnel working on ZLD is enclosed **(Enclosure-XII)**
13	The maximum GLC Points are not marked on the ground and hence it is not known if, the AAQ is monitored at these points	We Would approach APPCB for guidance and conduct AAQ accordingly.

CHAPTER II

LIST OF ENCLOSURES

Enclosure No.	Description
Enclosure No.1	Copy of the Environmental clearance
Enclosure No.2	Certified copy of EC
Enclosure No.3	Photographs of the Kunta & Surroundings
Enclosure No.4	Analysis reports of soil & water from water body
Enclosure No.5	Photographs showing Two feet gap from top of waste water storage tank
Enclosure No. 6	Photographs of collection of solids and storage
Enclosure No. 7	Copy of approval from State Ground Department for drawl of water
Enclosure No.8	Copy of CFE
Enclosure No.9	Characteristics monitored at different unit operations for the month of September and October, 2012
Enclosure No. 10	Photograph of DO meter
Enclosure No.11	Copy of monitoring of MLVSS
Enclosure No.12	Profile of personnel working on ZLD

Enclosure - I

No. J-11011/116/2005 – IA II (I)
Government of India
Ministry of Environment & Forests
I. A. Division

Plahujarai@yahoo.com
Tel : 2436 3973
Paryavaran Bhawan,
CGO Complex, Lodi Road,
New Delhi – 110 003

Dated the 23rd June, 2005

To

The Authorized Signatory,
M/s Aurobindo Pharma Limited, Unit-VII
Plot no.2, Maitrivihar, Ameerpet
Hyderabad- 500038
Andhra Pradesh

Sub: Bulk drug Unit by M/s. Aurobindo Pharma Limited, Unit-I at Borapatla, Hatnoor Mandal, District Medak, Andhra Pradesh.

Sir,

This has reference to your letter no. nil dated 5th May 2005, on the above subject along with EIA /EMP report , questionnaire seeking environmental clearance for the above project under the Environmental Impact Assessment Notification,1994.

2.0. The Ministry of Environment and Forests has examined your application along with EIA / EMP report. It is noted that the proposal is for environmental clearance of bulk drug unit for manufacture of Nalidixic Acid (2.0 TPA) and Diclofenac Sodium (24 TPA). The unit is located in an area of 6.87 ha. in District, Medak in Andhra Pradesh. Water requirement of 52.5 m3/d will be met from the ground water source. About 6.15 TPD of solid waste will be generated (400kgs of process waste and 0.11TPD of evaporation salt). The organic waste will be burnt in the incinerator of Aurobindo Group and inorganic waste and the salt from the evaporator will be sent to TSDF of Hyderabad Waste Management Project at Dundigal. The Andhra Pradesh Pollution Control Board granted original consent in April, 1997. Subsequently consents under the Water and Air Act were granted on 28th December, 2001. Public Hearing of the project was held on 13.4.2005. Cost of the Project is Rs. 41.40 crore.

3.0. The Ministry of Environment and Forests hereby accords environmental clearance to the above project under EIA Notification dated 27th January, 1994 as amended subsequently, subject to strict compliance of the following conditions:

A SPECIFIC CONDITIONS

i. The gaseous emissions (Sox, NOx and HCl) particulate matter from various process units shall conform to the standards prescribed by the concerned authorities from time to time. At no time, the emission levels shall go beyond the stipulated standards. In the event of failure of pollution control system(s) adopted by the unit, the respective unit shall not be restarted until the control measures are rectified to achieve the desired efficiency.

ii. Ambient air quality monitoring stations shall be set up in the downwind direction as well as where maximum ground level concentration are anticipated in consultation with the SPCB.

iii. For control of air emissions, the reactors shall be provided with scrubbers and vent condensers. Stack of 30m height shall be provided to control the emissions from the boilers.

iv. Spent solvents shall be recovered as far as possible & recovery shall not be less than 95 percent. During purification process, solvent vapours are emitted from purification tanks as fugitive emissions. Action shall be taken to reduce the emission as far as possible. Use of toxic solvents like Methylene Chloride (M.C.) etc. shall be minimum. All venting equipment shall have vapour recovery system.

v. Industry shall switch over to aqueous based coating film in place of use of Methylene Chloride in coating operation and to non-halogenated solvents in place of halogenated solvents in a phased manner.

vi. Hazardous and toxic waste generated during process like distillation residue, spent carbon, spent mixture solvents, process organic residue should be incinerated in a properly designed incinerator with energy recovery facility. The incinerator shall meet the CPCB standards and guidelines.

vii Industry shall switch over to use of non halogenated solvents in place of halogenated solvents in a phased manner.

viii. The company shall undertake following Waste Minimization measures :-

- Metering and control of quantities of active ingredients to minimize waste.
- Reuse of by-products from the process as raw materials or as raw material substitutes in other processes.

- Use of automated filling to minimize spillage.
- Use of "Close Feed" system into batch reactors.
- Venting equipment through vapour recovery system.
- Use of high pressure hoses for equipment clearing to reduce wastewater generation.

ix. Fugitive emissions in the work zone environment, product, raw material storage area shall be regularly monitored. The emissions shall conform to the limits imposed by SPCB.

x. It is noted that while granting consents to establish in April, 1997, APPCB permitted discharge of 63.3m3/d of effluent. However , subsequently while granting consents under the Air and Water Acts on 28th December, 2001, permission was granted for discharge of treated effluent of 12.0m3/d. In view of the above, effluent generation shall not increase 12m3/d (7.0m3/d of high TDS effluent, 3.5m3/d of low TDS and 1.5m3/d of domestic effluent). The high TDS effluent shall be subjected to forced evaporation. The low TDS effluent after primary treatment shall be discharged into CETP of Patancheru Enviro Tech for further treatment and disposal. The domestic waste water shall be sent to the septic tank followed by the soak pit.

xi. Organic waste shall be incinerated in the common incinerator of Aurobindo Group. Forced evaporation salts shall be sent to TSDF of Hyderabad Waste Management Project at Dundigal. Boiler ash shall be sold to the brick manufacturers.

xii. The company shall develop rainwater harvesting structures to harvest the run off water for recharge of ground water.

xiii. The company shall obtain permission from state government authorities to draw ground water.

xiv. Ground water quality in the surrounding villages shall be monitored regularly and data furnished to the regional offices of the Ministry of Environment and Forests and the SPCB

xv. Green belt shall be provided in an area of 1.61 ha. to mitigate the effects of fugitive emission all around the plant. Development of green belt shall be as per the Central Pollution Control Board guidelines.

xvi. Occupational health surveillance of the workers shall be done on a regular basis and records maintained as per the Factories Act.

xvii. The Company shall undertake eco-development measures including community welfare measures in the project area for the overall improvement of the environment. The eco-development plan should be submitted to the APPCB within three months of receipt of this letter for approval.

B. GENERAL CONDITIONS

i. The project authorities shall strictly adhere to the stipulations made by the Andhra Pradesh State Pollution Control Board.

ii. At no time, the emissions shall exceed the prescribed limits. In the event of failure of any pollution control system adopted by the unit, the unit shall be immediately put out of operation and shall not be restarted until the desired efficiency has been achieved.

iii. No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment and Forests. In case of deviations or alterations in the project proposal from those submitted to this Ministry for clearance, a fresh reference shall be made to the Ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.

iv. The project authorities shall strictly comply with the rules and regulations under Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 as amended in October, 1994 and January, 2000. Authorization from the SPCB shall be obtained for collection, treatment, storage, disposal of hazardous wastes.

v. The project authorities must strictly comply with the rules and regulations with regard to handling and disposal of hazardous wastes in accordance with the Hazardous Wastes (Management and Handling) Rules, 2003. Authorization from the State Pollution Control Board must be obtained for collections/treatment/storage/disposal of hazardous wastes.

vi. The overall noise levels in and around the plant area shall be kept well within the standards (85 dBA) by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels shall conform to the standards prescribed under Environment (Protection) Act, 1986 Rules 1989 viz. DBA (day time) and 70 dBA (night time).

vii. The project proponent shall also comply with all the environmental protection measures and safeguards recommended in the Environmental Impact Assessment Notification,1994 report .

viii. A separate Environmental Management Cell equipped with full fledged laboratory facilities shall be set up to carry out the Environmental Management and Monitoring functions.

ix. The project authorities shall earmark separate funds to implement the conditions stipulated by the Ministry of Environment and Forests as well as the State Government along with the implementation schedule for all the conditions stipulated herein. The funds so provided shall not be diverted for any other purpose.

x. The implementation of the project vis-à-vis environmental action plans shall be monitored by Ministry's Regional Office at Bangalore/ SPCB/Central Pollution Control Board . A six monthly compliance status report shall be submitted to monitoring agencies.

xi. The project proponent shall inform the public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the SPCB/Committee and may also be seen at Website of the Ministry at http://envfor.nic.in. This shall be advertised within seven days from the date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned and a copy of the same shall be forwarded to the Ministry's Regional Office at Bangalore.

4.0. The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.

5.0. The Ministry reserves the right to stipulate additional conditions, if found necessary. The company in a time bound manner will implement these conditions.

6.0. The above conditions will be enforced, inter alia under the provisions of the Water(Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 Hazardous Wastes (Management and Handling) Rules, 2003 and the Public Liability Insurance Act, 1991 along with their amendments and rules.

(Dr. P. L. Ahujaral)
Director

Copy to :-

1. The Secretary, State Deptt. of Environment, Government of Andhra Pradesh, Mantralaya, Hyderabad.
2. The Chairman, Central Pollution Control Board, Parivesh Bhavan, CBD-cum-Office Complex, East Arjun Nagar, Delhi-110032.
3. The Chairman, Andhra Pradesh State Pollution Control Board, 2nd Floor, HUDA Complex, Maitrivaram , S.R.Nagar, Hyderabad- 500 038.
4. The Chief Conservator of Forests (Central), Regional Office (SZ), Kendriya Sadan, IVth Floor, E&F Wing, 17th Main Road, Koramangala, Bangalore-560034.
5. JS(CCI-I), Ministry of Environment and Forests, Paryavaran Bhavan, CGO Complex, New Delhi.- 110003.
6. Monitoring Cell, Ministry of Environment and Forests, Paryavaran Bhavan, CGO Complex, New Delhi- 110003.
7. Guard file.
8. Record file.
9. Monitoring file.

(Dr. P. L. Ahujarai)
Director

Enclosure - II

EP/12.1/895/AP
Date: 29.10.2012

Sub :- Bulk drug unit by M/s.Aurobindo Pharma Limited, Unit-I, at Borapatla, Hatnoor Mandal, District Medak, Andhra Pradesh. – Reg.,

Ref :- MoEF lr.No. J-11011/116/2005-IA.II(I), Dt:23.06.2005.

The unit was established in 1992. All the old units, like the present one were directed to obtain MoEF clearance. In June, 2003 M/s. Aurobindo Pharma Limited has applied for EC for all their existing units. The EC was granted in 2005. However, in the meanwhile the products, which were mentioned in the application of 2003 were changed with the consent of PCB. Hence, the drugs mentioned in the EC were not in production at the time of clearance.

There is a proposal for expansion which reportedly involves increasing the size of the existing reactor vessels, installation of additional reactors and related utility services.

List of the products currently under manufacturing and the quantities manufactured are given in Annexure-I.

List of the products proposed for manufacturing and the quantities to be manufactured are given in Annexure-II.

During April 2012 to September 2012, 70 types of products were manufactured of which, for 20 products, the PCB consent was not obtained. Annexure-III. During October 2011 March 2012, 73 products were manufactured of which for 23 products, PCB consent was not obtained Annexure-IV.

The other issue related generally to the bulk drug units is related to VOC emissions If, the VOC emissions in the work zone are considered as part of AAQ the levels are high, in comparison with levels found in ambient air. However, the project authorities contend that, the work place VOC levels have to be considered under thresholds limits / exposure limits. Ministry may look into the matter. Annexure-V

The unit has achieved the zero process liquid discharge status in May, 2011. The waste water from utilities and domestic usage are disposed to CETP.

There are 13 process blocks. There are no process stacks. The process emissions are passed through scrubbers, blowers and vented out. There are 20 scrubbers/blowers in the unit. There are 3 boiler and 11 DG sets. The DG sets are operated intermittently.

Reportedly, at present, there are no alternative solvents for some of the products and hence, use of Methylene chloride is continuing.

Pollution Control Board has issued show cause cum hearing notice to the unit on 03.07.2012 (Annexure-VI) and the project authorities have replied to the notice (Annexure VII).

Pollution Control Board has issued closure orders to the unit on 10.07.2012 (Annexure-VIII).

The unit is operating 3 bore wells, which are metered. The permission for operating the wells was obtained from MRO. They have applied for permission from State Ground Water Department on 21.09.2012.

At present, there is a State Government imposed ban on the expansion and the new projects in Medak District. Aggrieved by the APPCB orders based on the ban and other related issues, 18 Bulk Drug Manufacturing Units including two Bulk Drug Units of Aurobindo Pharma Limited approached Appellate. The Appellate Authority in its judgement advised Government to relook into the ban imposed in the light improvements / arrangements made by the Industry to control pollution. It was gathered that, the State Government has constituted an expert committee for looking at the various related aspects.

The issues specific to the Unit-I :-

1. All the tanks of old ETP have to be upgraded and have to be above the ground.
2. The water body, which is adjacent to the ETP, but out side the premises spread over 4 to 5 acres shows distinct signs of deterioration and there is reason to believe that this degradation is due to leakage/over flow of effluents from the unit as there are no other industries near it.
3. The effluent in ETP tanks should not be stored up to the brim to avoid overflows.
4. The solids are to be collected from the ATFD in closed manner and taken to the storage area.
5. The permission from State Ground Water Department for the operating bore wells is yet to be obtained.
6. Reportedly, for some products manufactured the use of Methylene Di Chloride is continuing due to lack of alternative solvents.
7. The products which are not consented by PCB were manufactured.
8. In some cases they have exceeded the permitted quantity limits of some drugs.
9. The water consumption is beyond what is permitted by the Pollution Control Board.
10. At present, both High TDS and Low TDS treatment systems are used to the full capacity. No additional effluents should be generated.
11. The ZPLD unit biological treatment system is not working to the designed standards. The DO levels and MLVSS of the unit have to be continuously checked / monitored.

12. There is a need for employing experienced people for operating all the units of ZPLD.
13. The maximum GLC points are not marked on the ground and hence, it is not known if, the AAQ is monitored at these points.
14. No plan was submitted to PCB regarding eco development measures and community welfare activities.

A. Specific Conditions

i) Gaseous emissions (Sox, NOx and HCl) and particulate matter to conform stipulated standards.

There is a 27.5 TPH coal fired boiler used regularly, with continuous on-line dust monitoring system and 8.0 TPH (coal fired) & 1 x 6.0 TPH (oil fired) boilers used sparingly. The coal fired boilers are equipped with bag filters with stack height of 42 m and 30 m respectively. Boilers stacks are monitored on monthly basis for SPM, SO2 and NOx. Manufacturing blocks are equipped with scrubber systems, to mitigate process emissions. Appropriate scrubbing media is used for scrubbing the process emissions. Timely replenishment/ replacement of spent scrubbing media are carried out

ii) Ambient Air Quality monitoring.

Ambient Air Quality monitoring at three identified monitoring locations (F&G security gate, K Block security gate and MEE plant) is being carried out through MoEF recognized third party twice a week. The results show that, all the parameters monitored (PM 10, PM_{25}, SO_2, NOx) are within stipulated limits. The maximum GLC points were not marked on the ground.

iii) For control of air emissions, the reactors shall be provided with scrubbers, and vent condensers. Stack of 30m height shall be provided to control the emissions from the boilers.

There are 13 manufacturing blocks. Manufacturing blocks are equipped with scrubbers. Reactors are equipped with primary and secondary condensers with chilled brine (in circulation) to control fugitive losses of solvents. Solvents are transferred to reactors through closed pipeline. Reactors are provided with scrubbers. There are no process stacks only vents are provided after scrubbers. The 27.5 & 8.0 TPH fluidized bed coal fired boilers are equipped with bag filters and stacks of 42 and 30 m height respectively. The 6.0 TPH oil fired boiler is equipped with 30 m stack. The 27.5 TPH boiler is with continuous on-line dust monitoring system.

iv) Spent solvents shall be recovered as far as possible & recovery shall not be less than 95 percent. During purification process, solvent vapours are emitted from purification tanks as fugitive emissions; Action shall be taken to reduce the emission as far as possible. Use of toxic solvents like Methylene Di

Chloride (M.C.) etc. shall be minimum. All venting equipment shall have vapour recovery system.

The Unit is equipped with one Solvent Recovery Plant (SRP) with fractionation columns. Solvents are reportedly recovered to an extent of 95% (on in-put to in-put basis). Recovered solvents are reused as far as possible without effecting the quality of the product. Recovered solvents (mixed or individual) which cannot be reused are sold to down stream industries.

Solvent recovery systems are equipped with primary and secondary condensers with chilled brine (circulation) to control fugitive losses. List of solvents used in the plant at present is enclosed as Annexure-IX.

Wherever required manufacturing blocks are equipped with dry vacuum pumps for enhanced solvent recovery.

Bulk storage tanks of solvents are equipped with nitrogen blanketing and transfer of solvents from bulk storage tanks is done through closed pipe line network.

At present, due to lack of alternative solvents for some of the products MDC is being used as solvent.

v) Industry shall switch over to aqueous based coating film in place of use of Methylene Chloride in coating operation and to non-halogenated solvents in place of halogenated solvents in a phased manner

There are no coating operations involved in the manufacturing processes.

vi) Hazardous and toxic waste generated during process like distillation residue, spent carbon, spent mixture solvents, process organic residue should be incinerated in a properly designed incinerator with energy recovery facility. The incinerator shall meet the CPCB standards and guidelines.

As per regulations in vogue, organic hazardous wastes (solids and liquids) are being disposed off to cement plants. Details of wastes disposed off from April to September, 2012 are as follows :-

April	149.18 Tons
May	88.3 Tons
June	115.295 Tons
July	70.36 Tons
August	74.385 Tons
September	48.33 Tons

Hazardous wastes are not incinerated.

vii) Industry shall switch over to use of non halogenated solvents in place of halogenated solvents in a phased manner.

Majority of solvents used in the processes are non-halogenated solvents. Halogenated solvents are used where there is no replacement. The list of solvents used is enclosed as **Annexure IX.**

viii) The company shall undertake following Waste Minimization measures- a)Metering and control of quantities of active ingredients to minimize waste. b)Reuse of by-products from the process as raw materials or as raw material substitutes in other processes. c)Use of automated filling to minimize spillage. d)Use of close feed system into batch reactors. e)Venting equipment through vapour recovery system. f)Use of high pressure hoses for equipment cleaning to reduce wastewater generation.

a) All processes are reportedly regulated through Batch Process Control systems and monitored. Data pertaining to all active ingredients (raw materials) is processed on-line though (ERP) computing systems for continuous assessment and review.

b) All organic hazardous wastes (solid and liquid) are incinerated in cement plants. Spent catalysts are returned to suppliers for recovery of precious metals/ regeneration of catalysts.

c) Solvents from bulk storage and recovery units are transferred through automated systems in some of the blocks. Reactors are equipped with receivers and rotameters.

d) Solvents from bulk storage and recovery plants are transferred through closed pipe line to the manufacturing blocks. Manual handling of solvent is minimized.

e) Reactors are equipped with vent condensers for recovery of solvents.

f) Reactors and other process equipment are cleaned with high pressure jets. Wet mopping of floors is practiced to minimize wastewater generation.

ix) Fugitive emissions in the work zone environment, product, raw material storage area shall be regularly monitored. The emissions shall conform to the limits imposed by SPCB.

M/s. Aurobindo Pharma Limited has occupational hygienist for identifying and control of work place hazards. Portable VOC monitoring equipment is used to monitor work place VOC. Fugitive emissions in the work zone

environment/manufacturing blocks/SRPs/raw material storage area are being monitored and the results are shown in Annexure-V.

x) It is noted that while granting consents to establish in April, 1997, APPCB permitted discharge of 63.3 m3/d of effluent. However subsequently while granting consents under the Air and Water Acts on 28th December, 2001, permission was granted for discharge of treated effluent of 12.0m3/d. In view of the above, effluent generation shall not increase 12 m3/d (7.0m3/d of high TDS effluent, 3.5m3/d of low TDS and 1.5m3/d of domestic effluent). The high TDS effluent shall be subjected to forced evaporation. The low TDS effluent after primary treatment shall be discharged into CETP of Patancheru Enviro. Tech for further treatment and disposal. The domestic waste water shall be sent to septic tank followed by the soak pit.

The unit achieved zero process liquid discharge.

Wastewater generation is 51.3 KLD as per CFE accorded by APPCB in December, 2010. Wastewater generation as per existing CFO accorded by APPCB is 53 KLD. Integrated wastewater system comprising of Stripper, Multi Effect Evaporator (MEE), Agitated Thin Film Drier systems (ATFD), Bio-ETP and (RO) Plant exists.

Wastewater generated from utility services and domestic use is disposed off to CETP (PETL). Entire process wastewater is treated at site and reused in utility applications.

xi) Organic waste shall be incinerated in the common incinerator of Aurobindo Group. Forced evaporation salts shall be sent to TSDF of Hyderabad Waste Management Project at Dundigal. Boiler ash shall be sold to the brick manufacturers.

Organic wastes are disposed off to Cement Units. The quantities disposed are as given under condition no. (vi) above. Boiler ash is disposed off to brick manufacturers.

xii) The company shall develop rainwater harvesting structures to harvest the run off water for recharge of ground water

Rainwater harvesting structures have been constructed on the site near the administration building. However, how much rain water is harvested is not known.

xiii) The company shall obtain permission from state government authorities to draw ground water.

The unit is operating 3 borewells, which are metered. The permission for operating the wells is obtained from MRO. They have applied for permission from State Ground Water Department on 21.09.2012. The permission is yet to be granted. At present 185 KLD water is drawn from the borewells.

xiv) Ground water quality in the surrounding villages shall be monitored regularly and data furnished to the regional offices of the Ministry of Environment and Forests and the SPCB

Ground water quality is being monitored. Copy of the analysis report is enclosed as Annexure-X.

xv) Green belt shall be provided in an area of 1.61 ha, to mitigate the effects of fugitive emission all around the plant. Development of green belt shall be as per the Central Pollution Control Board guidelines.

Complied with. Green belt details are as follows :-
The total area is 57 acres. The built up area is 38 acres. The greenbelt is developed in 19 acres.

xvi) Occupational health surveillance of the workers shall be done on a regular basis and records to be maintained as per the Factories Act.

There are 2922 people including 1100 staff. Periodical Medical Check up is conducted for all employees and records are maintained as per the Factories Act. Medical facilities are provided for all.

xvii) The Company shall undertake eco-development measures including community welfare measures in the project area for the overall improvement of the environment. The eco-development plan should be submitted to the APPCB within three months of receipt of this letter for approval.

Community development activities and eco development activities undertaken in the project area are as follows.
As part of eco-developmental activities, project authorities have donated 14,000 plants and constructed CC roads in villages and arranged for a bore well and donated for manjeera water pipeline (approximately Rs.51 Lakhs and for eco-developmental activates. As part of community development measures they have donated to construction of temple, eye hospital, street lights, sports items and electric wiring to school, fencing of the police ground and police training centre, water storage system to school, paid salaries of volunteers and school teachers and watchman (approximately Rs.14 Lakhs). However, no plan was submitted to PCB.

B. General Conditions

i) The project authorities shall strictly adhere to the stipulations made by the Andhra Pradesh State Pollution Control Board.

Pollution Control Board has issued closure orders to the unit on 10.07.2012 (Annexure-VI) and the directions of Appellate Authority on the same is enclosed as Annexure-VII.

ii) At no time, the emissions shall exceed the prescribed limits. In the event of failure of pollution control system adopted by the unit, the unit shall be immediately put out operation and shall not be restarted until the desired efficiency has been achieved.

The boilers are maintained regularly and it is ensured that the emissions are within the limits. The emissions are monitored on a monthly basis and the results of SPM, NOx & SO_2 are within limits.

iii) No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment and Forests. In case of deviations or alterations in the project proposal from those submitted to this Ministry for clearance, a fresh reference shall be made to the Ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.

The project authorities have changed the products with the consent of the PCB and in some cases they have manufactured products not consented.

iv) The project authorities shall strictly comply with the rules and regulations under Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 as amended in October, 1994 and January, 2000. Authorization from the SPCB shall be obtained for collection, treatment, storage, disposal of hazardous wastes.

MSIHC rules are implemented.

v) The project authorities must strictly comply with the rules and regulations with regard to handling and disposal of hazardous wastes in accordance with the Hazardous Wastes (Management and Handling) Rules, 2003. Authorization from the State Pollution Control Board must be obtained for collections/treatments/storage/disposal of hazardous waste.

The wastes are being collected and stored securely on site. Inorganic solid wastes are disposed off to TSDF (HWMP), Dundigal and Organic wastes,

solid and liquids are disposed off to cement units. Details of hazardous wastes disposed off to TSDF and Cement Units
APPCB has accorded Authorization to the Unit for collection, treatment, storage and disposal of hazardous wastes.

vi) The overall noise levels in and around the plant area shall be kept well within the standards (85 dBA) by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels shall conform to the standards prescribed under Environment (Protection) Act, 1986 Rules ,1989 viz. DBA (day time) and 70 dBA (night time)

Noise levels are being monitored in house and through third party laboratories. The noise levels are within the limits. Noise does not seem to be a problem.

vii) The project proponent shall also comply with all the environmental protection measures and safeguards recommended in the Environmental Impact Assessment Notification,1994 report.

Project authorities are putting in efforts to comply with the environmental protection measures and safeguards recommended by PCB and MoEF

viii) A separate Environmental Management Cell equipped with full fledged laboratory facilities shall be set up to carry out the Environmental Management and Monitoring functions.

A team of 25 trained and qualified Environment, Health and Safety professionals are in-charge of the Environment related matters. The team is trained in the operations of the integrated environmental treatment infrastructure installed on the site, collection, storage, handling and disposal of wastes to common facilities, viz., CETP (PETL), TSDF (HWMP, Dundigal), Cement Units, related documentation requirements, viz., manifests and records, log sheets, etc. A full fledged laboratory is set-up for monitoring and assessment of treatment facilities and characteristics of wastes. pH, TDS, COD, MLSS and SVI are monitored regularly in-house. However, it is felt that, there is a need for having people experienced in operating the zero process liquid discharge units.

ix) The project authorities shall earmark separate funds to implement the conditions stipulated by the Ministry of Environment and Forests as well as the State Government along with the implementation schedule for all the conditions stipulated herein. The funds so provided shall not be diverted for any other purpose.

An amount of Rs. 27.5 Cr. has been invested for development of environmental management infrastructure for implementation of conditions of EC and directions from APPCB from time to time. The facilities include Stripper, Multi Effect Evaporator (MEE), Agitated Thin Film Drier (ATFD), Bio ETP and Reverse Osmosis (RO) Plant, Hazardous Waste Storage Area, Solvent Recovery Plant, etc.

x) The implementation of the project vis-a-vis environmental action plans shall be monitored by Ministry's Regional Office at Bangalore/ SPCS/Central Pollution Control Board. A six monthly compliance status report shall be submitted to monitoring agencies.

Implementation of environment action plans are monitored by RO. Six monthly reports are submitted to RO.

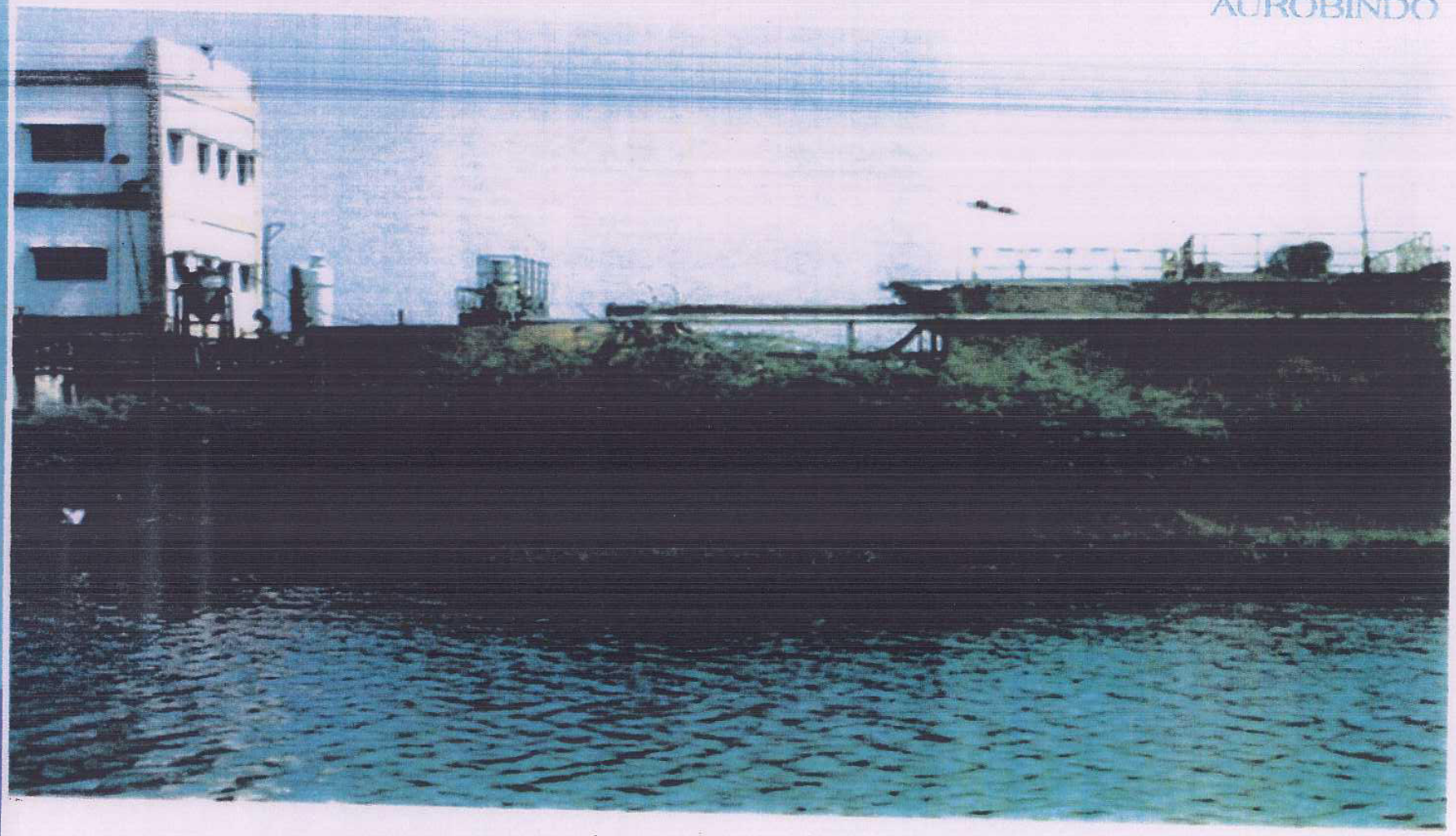
xi) The project proponent shall inform the public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the SPCS/Committee and may also be seen at Website of the Ministry at http://envfor.nic.in. This shall be advertised within seven days from the date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned and a copy of the same shall be forwarded to the Ministry's Regional Office at Bangalore.

The project proponents have reportedly informed the public regarding the accordance of Environmental Clearance. They have advertised through leading newspapers on 1st July, 2005 in Eenadu and on 2nd July, 2005 in Deccan Chronicle.

Dr. S.K.SUSARLA
Director

AUROBINDO PHARMA LIMITED, UNIT I

AUROBINDO



Another View of Water Body showing the ecosystem

Enclosure - III

AUROBINDO PHARMA LIMITED, UNIT I

AUROBINDO

Another View of Water Body showing the ecosystem on the other side of Units Compound Wall near Bio-ETP of the Unit

Enclosure - III

AUROBINDO PHARMA LIMITED, UNIT I

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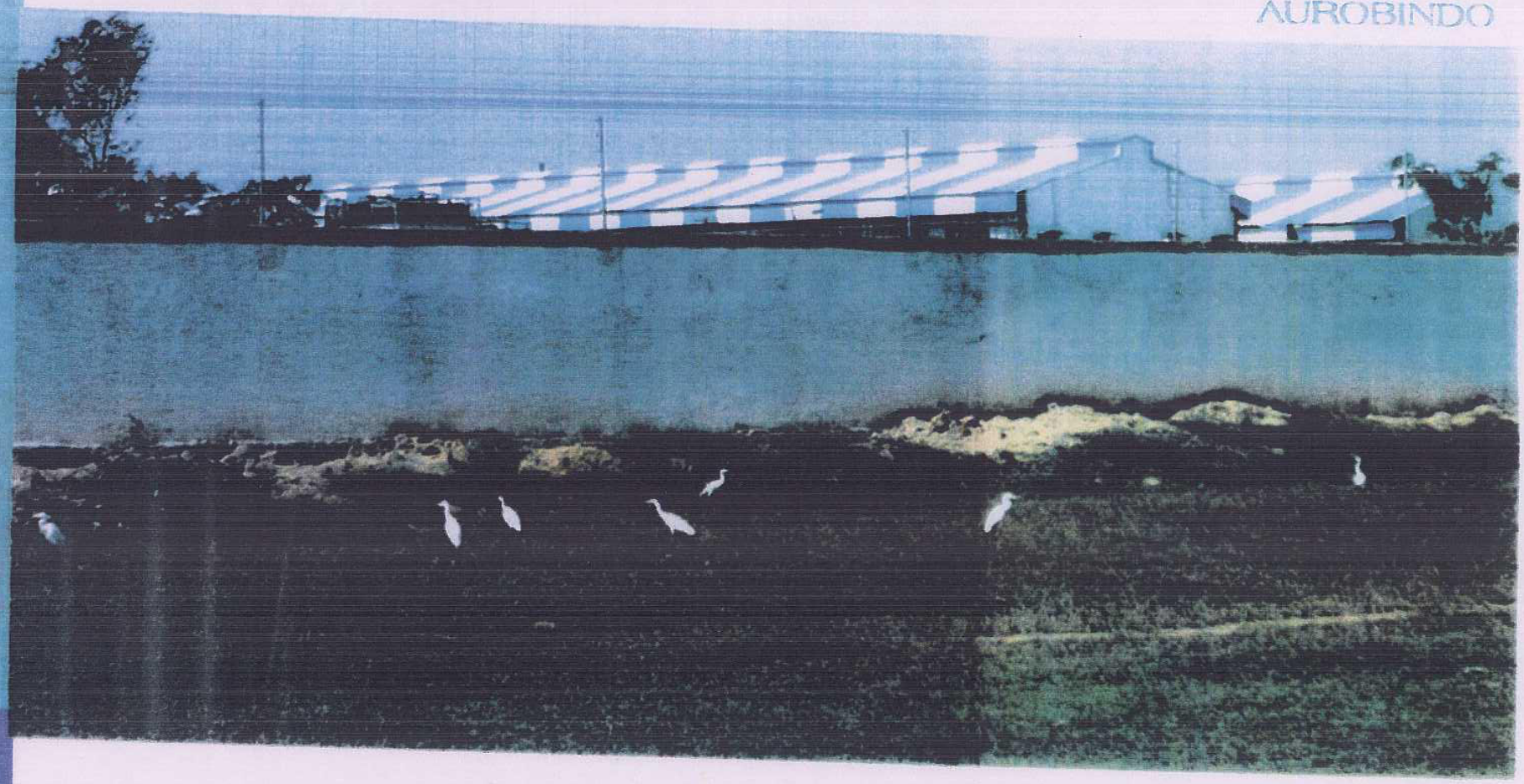


Another view of Cranes resting on the banks of Water Body

AUROBINDO PHARMA LIMITED, UNIT I

AUROBINDO

Greenery in between Kunta and the Unit's compound wall

AUROBINDO PHARMA LIMITED, UNIT I

AUROBINDO

View of Paddy Fields adjacent to Kunta

SURFACE WATER ANALYSIS REPORT OF NERATIVANI KUNTA & KAMASANI KUNTA

S.No.	PARAMETER	Units	Nerativani Kunta	Kamasani Kunta
1	Color	Hazen Units	05	06
2	Odour	-	Disagreeable	Disagreeable
3	Turbidity	NTU	1.20	0.95
4	pH		7.21	7.6
5	E.C	micromhos/cm	1250	1125
6	Total dissolved solids	mg/lit	890	790
7	Phenolphthalein alkalinity as CaCo3	mg/lit	Nil	Nil
8	Methyl orange alkalinity as CaCo3	mg/lit	485	461
9	Total alkalinity as CaCo3	mg/lit	485	461
10	Total hardnes as CaCo3	mg/lit	575	546
11	Calcium as Ca	mg/lit	148	163
12	Magnesium as Mg	mg/lit	49.82	33.66
13	Sodium as Na	mg/lit	133	126
14	Potassium as K	mg/lit	8.35	7.93
15	Copper as Cu	mg/lit	0.29	0.32
16	Iron as Fe	mg/lit	0.51	0.70
17	Manganese as Mn	mg/lit	0.08	0.12
18	Chlorides as Cl	mg/lit	176	167
19	Sulphates as SO4	mg/lit	110	104
20	Nitrates as NO3	mg/lit	35.3	33.6
21	Flourides as F	mg/lit	1.42	1.65
22	Phenolic compounds as C6H5OH	mg/lit	0.03	0.05
23	Mercury as Hg	mg/lit	0.004	0.008
24	Cadmium as Cd	mg/lit	0.15	<0.01

ENCLOSURE - IV

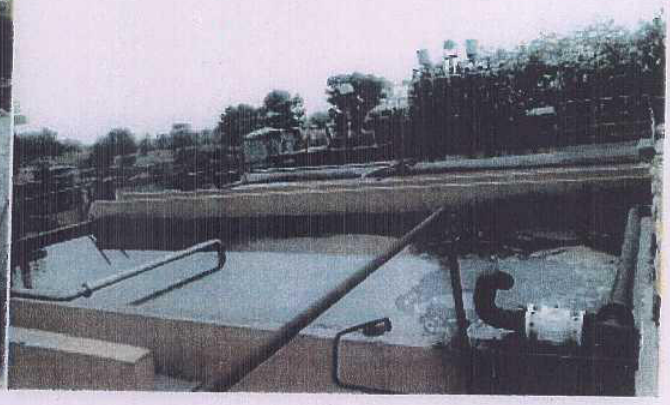
M/s. AUROBINDO UNIT - I (SOIL ANALYSIS DATA)

S.No.	Parameters	Unit	Nerati vani Kunta	Kamasani Kunta
1	*pH (Soil water extract)*		7.15	7.79
2	*E.C (Soil water extract)*	*µmhos/cm*	529	585
3	Nitrogen (as N)	Mg/Kg	214	188
4	Bulk Density	g/cc	1.5	1.36
5	Infiltration rate	mm/hour	28	35
6	Porosity	%	0.20	0.31
7	Moisture	%	10.2	9.8
8	Cation-Exchange capacity(CEC)	Meq/100gm	6.9	1.7
9	Organic Matter	%	2.22	1.81
10	Phosphorous (as P)	mg/kg	38.3	41.8
11	Carbonates	%	Nil	Nil
12	Potassium (As K+)	mg/kg	33.16	27.8
13	Sodium (as Na)	Ppm	33.63	62.88
14	Calcium (as Ca)	Ppm	236	192
15	Magnesium (as Mg^{2+})	ppm	82.4	78.9
16	Chlorides(as Cl)	ppm	275	310
17	Organic Carbon	%	1.66	1.25
18	Texture		Sandy loam	Sandy loam
	a) Sand %	%	56.2	41.5
	b) Silt %	%	28.3	14.6
	c) Clay %	%	15.50	43.90
19	Sodium Absorption ratio		0.48	0.96
20	Aluminium(as Al)	Mg/Kg	<0.01	<0.01
21	Arsenic(as As)	Mg/Kg	<0.001	<0.001
22	Boron(as B)	Mg/Kg	<0.2	<0.2
23	Cadmium(as Cd)	Mg/Kg	<0.001	<0.001
24	Chromium(as Cr)	Mg/Kg	3.26	4.48
25	Copper(as Cu)	Mg/Kg	40.41	37.95
26	Iron (as Fe)	Mg/Kg	12.65	13.82
27	Lead (as pb)	Mg/Kg	4.82	5.69
28	Manganese(as Mn)	Mg/Kg	<0.05	<0.05
29	Mercury (as Hg)	Mg/Kg	<0.001	<0.001
30	Nickel (as Ni)	Mg/Kg	0.26	0.38
31	Selenium(as Se)	Mg/Kg	<0.001	<0.001
32	Silver (as Ag)	Mg/Kg	<0.01	<0.01
33	Zinc (as Zn)	Mg/Kg	14.4	18.7
34	Available Phosphorous as P_2O_5	Mg/Kg	39.61	42.82
35	Available Potassium K_2O	Mg/Kg	39.94	33.49
36	Base Saturation		0.9	3.33
37	Ca/mg Ratio		2.8	2.43

Enclosure - V

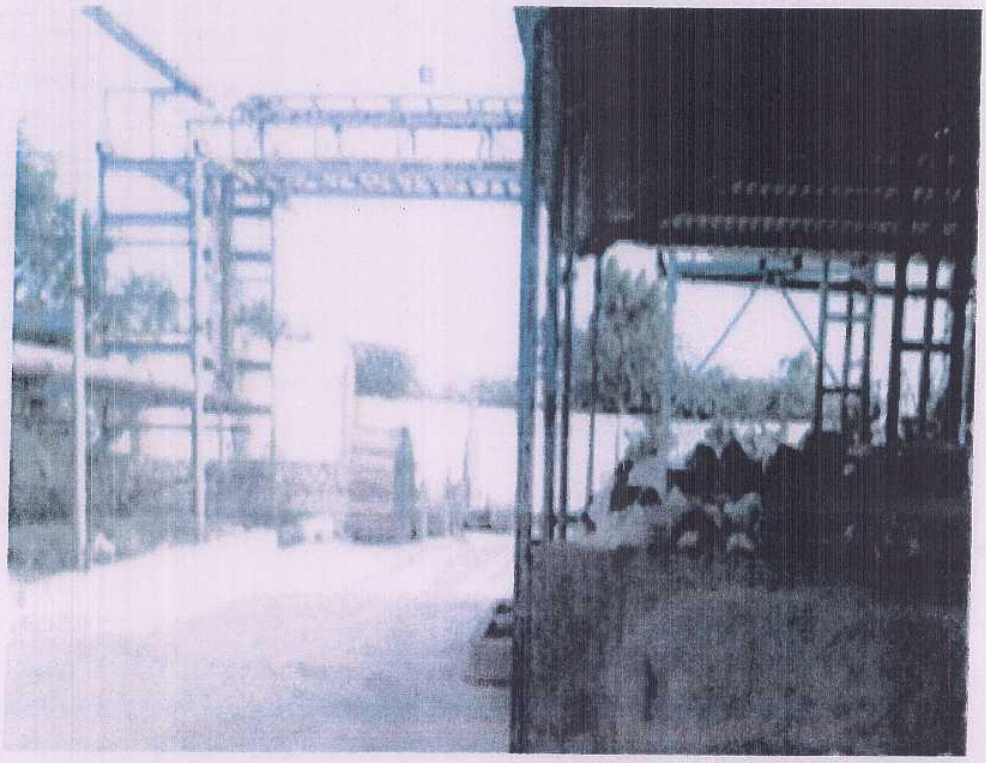
PHOTOGRAPHS SHOWING TWO FEET GAP FROM TOP OF WASTE WATER STORAGE TANK

HTDS TANKS- AUROBINDO, UNIT-1



Enclosure - VI

MEE-EVAPORATION SALT STORAGE/DISPOSAL YARD- AUROBINDO, UNIT-1



Enclosure - VII

GOVERNMENT OF ANDHRA PRADESH
GROUND WATER DEPARTMENT

Memo No. HgII/7820/2012. **Dated:18.01.2013.**

Sub: APGWD – SLSWCC – Aurobindo Pharma Limited – Borapatla (V), Hatnoora (M) – Medak district – Report approved – Communicated – Reg.

Ref:- Lr.No.3364/GWD/T/2012-13, dt:15.01.2013 from Deputy Director, Ground Water Department, Sangareddy.

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Attention of Deputy Director, Ground Water Department, Sangareddy (Medak) is invited to the subject and reference cited, it is informed that the above report is approved and the firm is permitted to draw 270 kld of water from existing 3 borewells for 7 hours of pumping per day as recommunicated by Deputy Director, Ground Water Department, Medak.

The Deputy Director, Ground Water Department, Medak is advised to communicate the same to the firm under intimation to Commissioner of Industries and Head Office, Ground Water Department.

Sd/-B.M.MURALI KRISHNA RAO,
DIRECTOR.

To,
The Deputy Director, Ground Water Department, Medak.

///t.c.f.b.o///

9180 Kumar
SUPERINTENDENT.

Enclosure - VI
Annex - 4

ANDHRA PRADESH POLLUTION CONTROL BOARD
PARYAVARAN BHAVAN, A - 3, INDUSTRIAL ESTATE,
SANATHNAGAR, HYDERABAD - 500 018.

Phone: 23887500
040 - 23815631
Telex: Kalushya Nivarana
Website :www.appcb.ap.nic.in

REGD POST WITH ACK.DUE

CONSENT ORDER FOR ESTABLISHMENT

Order No.APPCB/PTN/PTN/264/CFE/HO/2012 3466 Dt.31.10.2012

Sub: PCB – CFE - **M/s. Aurobindo Pharma Ltd (Unit – I), Sy. No. 388/389, Borapatla (V), Hatnoora (M), Medak District** – Consent for Establishment of the Board for change of product mix with no increase in pollution load and no increase in production capacity under Sec.25 of Water (P & C of P) Act, 1974 and Under Sec.21 of Air (P&C of P) Act, 1981 - Issued - Reg.

Ref: 1) Industry's application received on 27.07.2012 & Online application submitted on 09.08.2012.
2) R.O's inspection report dt. 30.7.2012 & 13.8.2012
3) CFE Committee meeting held on 04.09.2012
4) T.O. Lr.dt. 07.09.2012
5) Industry's lr.dt.26.9.2012
6) CFE Committee meeting held on 04.10.2012

1. In the reference 1st cited, an application was submitted to the Board seeking Consent for Establishment (CFE) for change of product mix with no increase in pollution load and no increase in production capacity to produce the following products with installed capacities as mentioned below.

Existing Products:

Sl. No.	Product	Quantity (In Kg/day)
Regular Products:		
1.	Metaformin	833.33
2.	Cephalexin	333.33
3.	Amoxy Dane Salt (only for final stage)	1666.67
Group A (Campaign products):		
1	Ciftioufut Acid	16.67
2	Cefuroxime Acid	133.36
3	Cefuroxime Axetil	33.34
4	Cefachlor	66.67
5	Cefpodoxime Proxetil	16.67
6	Cefixime	16.67
7	Cefotaxime	33.34
Group B (Campaign products):		
1	Cefprozil	16.67
2	Cefridine	66.67
3	Cefdinir	10.0
4	Cefoxitine	8.33
5	Cefadroxil	66.67
6	Ceftrioxone disodium	16.67
Group C (Campaign products):		
1	Mirtazapine	8.33
2	Citalopram	8.33
3	Simvastatin	3.33
4	Amiodarone HCl	3.33
5	Losartan	40.0

6	Pentoxyfilline	166.67
7	Glibendamide	33.33
8	Terbinafine HCl	16.67
9	Gabapentine	33.33
10	Diltiazem	66.67

After change of product mix:

The industry shall not manufacture more than six products i.e., 3 regular products + One campaign product from each Group A, Group B and Group C and individual capacities mentioned therein at any point of time.

Sl. No.	Products	Capacity (Kg/day)	No. of Stages to be manu factured	Starting Raw Material & Molecular Formula for product	Quantity of Starting Raw Material (Kg/day)
	Regular Products				
1.	Metformin Hydrochloride	2733.33	2	Cyano Guanidine	41.00
2.	Simvastatin	16.67	5	Lovastatin	47.60
3.	Cefuroxime Axetil	16.67	4	7-ACA	60.90
	Group A - Campaign Products				
1.	Cephalexin Monohydrate	133.33	1	7-ADCA	166.30
2.	Cefadroxil	40.00	1	7-ADCA	170.00
3.	Cefdinir	8.33	4	ATHAET	100.00
4.	Cefixime Trihydrate	6.67	3	GCLE	125.00
5.	Lamivudine	33.33	2	Lamivudine Coupled Ester	200.00
6.	Stavudine	6.67	2	3',5'-Anhydrothymidine	65.00
7.	Citalopram Hydrobromide	3.33	2	1-[3-(Dimethylamino)propyl]-1-(4-Fluorophenyl)-1,3-Dihydroiso benzofuran-5-carbonitrile	9.68
8.	Perindopril tert-Butylamine	1.67	1	Benzyl-(2S,3a,7aS)-Octahydro-1H-indole-2-carboxylate P-Toluene sulfonic acid	13.00
9.	Amiodarone Hydrochloride	3.33	3	2-Butyl benzofuran	10.00
10.	Cefradin	58.33	1	7-ADCA	100.00
11.	Bisoprolol Fumarate	3.33	3	4-[[2-(1-Methylethoxy) ethoxy]methyl]Phenol	45.00
12.	Losartan Potassium	13.33	5	2-Cyano-4-methyl biphenyl	150.00
13.	Terazosin Hydrochloride Dihydrate	6.67	2	4-Amino-2-chloro-6,7-dimethyl quinazoline	18.00

14.	Glyburide	33.33	2	4-[2-(5-Chloro-2-methoxy benzamido)ethyl] benzene sulfonamide	50.00
15.	Pantoprazole Sodium Sesquihydrate	6.67	3	2-Chloromethyl-3,4-dimethoxy pyridine Hydrochloride	38.00
16.	Gemfrozil	20.00	1	Methyl 5-Chloro-2,2' dimethyl pentonate	206.90
17.	Irbesartan	20.00	2	2-(4'-Bromomethyl phenyl) benzonitrile	115.90
18.	Amisulpride	50.00	1	4-Amino-5-(Ethylsulfonyl)-2-Methoxybenzoic Acid	70.00
19.	Atorvastatin	13.33	2	Acetodenitrile	35.00
20.	Donepezil Hydrochloride	25.00	2	5,6-Dimethoxy-1-Indanone	24.00
21.	Famciclovir	33.33	1	Desacetyl Famciclovir	95.00
22.	Fluvastatin	11.66	1	Fluvastatin tert-butyl ester	20.00
23.	Ondansetron	13.33	4	N-Methyl Carbazolone	100.00
	Group B - Campaign Products				
1.	Cefaclor Monohydrate	150.00	1	7-Amino-3-chloro Cephalosporanic acid	7.00
2.	Pentoxifylline	63.33	2	Bromo Chloropropane	200.00
3.	Lisinopril	2.50	2	(-) L-Lysyl-L-Proline	82.00
4.	Risperidone	6.67	2	6-Fluoro-3-(4-piperidinyl)-1,2-benzisoxazole Hydrochloride	21.00
5.	Paroxetine Hydrochloride	1.67	8	Malonamide	200.00
6.	Mirtazapine	15.00	4	1-Methyl-3-phenyl piperazine	175.00
7.	Metoprolol Succinate	16.67	1	Metoprolol	46.00
8.	Metoprolol Tartrate	16.67	1	Metoprolol	44.00
9.	Ciprofloxacin Hydrochloride	16.67	1	Q-Acid	45.00
10.	Gabapentin	5.00	2	1-Isocyanatomethyl-1-cyclohexane acetate	124.80
11.	Rabeprazole Sodium	6.67	3	2-Chlomethyl-4-(3-methoxypropoxy)-3-methyl pyridine Hydrochloride	26.00
12.	Ribavirin	6.67	3	1,2,3,5-Tetra-O-Acetyl-β-D-Ribofuranose	50.00
13.	Bupropion Hydrochloride	6.67	3	3-Chloro benzonitrile	42.00
14.	Topiramate	6.67	1	2,3:4,5-Bis-O-(1-Methyl ethylidene)-β-D-fructopyranose	48.00
15.	Doxazosin Mesylate	6.67	2	4-Amino-2-chloro-6,7-dimethoxy quinazoline	14.00

16.	Ceftibuten Dihydrate	2.50	2	7-Amino-3-Norcephem	65.00
17.	Retanovir	20.00	1	ATADA-Ritonavir Intermediate-'E'/II	50.00
18.	Citalopram Hydrobromide (PC Route)	20.00	4	5-Cyanopthalide	100.00
19.	Aripiprazole	46.66	3	7-Hydroxy-3,4 dihydro-2(1H)-Quinolinone(7-Hydroxy-3,4-Dihydro Carbostyril	25.00
20.	Entacapone	50.00	1	3,4-Dihydroxy-5-nitrobenzaldehyde	100.00
21.	Florfenicol	91.66	1	Fluoro amine(1R,2S)-1-[4-(Methylsulfonyl)phenyl]-2-Amino-3-Fluoro-1-P	150.00
	Group C - Campaign Products				
1.	Cefazolin Sodium	3.33	1	7-ACA	45.00
2.	Ceftiofur Hydrochloride	16.67	3	2-Furoyl Chloride	23.28
3.	Ceftriaxone Disodium Hemiheptahydrate	16.67	2	7-ACA	50.00
4.	Cefepime Hydrochloride	10.00	1	NMPCA Hydrochloride	38.00
5.	Cefuroxime	20.00	2	MIFA Ammonium	51.71
6.	Cefotaxime	16.67	1	7-ACA	100.00
7.	Cefpodoxime Proxetil	19.17	3	7-Amino cephalosporanic acid	33.40
8.	Cefoxitin Sodium	5.00	5	7-ACA	556.00
9.	Cephapirin Benzathine	6.67	2	7-ACA	35.00
10.	Ceftazidime Dihydrochloride	10.00	2	PYCA	50.00
11.	Cefpirome Dihydroiodide	116.67	1	Cefotaxime	40.00
12.	Cefprozil	10.83	3	GCLE	200.00
13.	Terbinafine Hydrochloride	13.33	6	Pinacolone	200.00
14.	Nevirapine	3.33	2	N-(2-Chloro-4-methyl-3-pyridinyl)-2-(Cyclopropylamino)-3-Pyridine carboxamide	160.00
15.	Escitalopram Oxalate	20.00	3	5-Cyanophthalide	78.00
16.	Candesartan Cilexetil	20.00	5	BEC Methyl Ester	50.00
17.	Modafinil	106.66	1	2-[(Diphenylmethyl) sulfinyl]	85.00
18.	Telmisartan	60.00	1	4-Methyl-6-(1-methybenzimidazole-2-yl)-2-propylbenzimidazole	90.00
19.	Ceftizoxime Acid	32.87	1	7 - ANCA	19.00
20.	Cefalothin Acid	32.87	1	7-ACA	25.90

21.	Cefditoren Pivoxil	3.28	2	7-ATCA	2.70
22.	Cefsulodin Sodium	24.65	2	Cefsulodin Sodium Stage I	62.50
23.	Sevelamer Hydrochloride/ Carbonate	3.28	2	Allylamine	3.50
	Total production capacity (i.e. 3 regular products and 1 product each from Group – A, B & C	**3166.67 Kg/day**			

2. As per the application, the above activity is to be located within the existing plant premises located at Sy. No. 388/389, Borapatla (V), Hatnoora (M), Medak District in an area of 60.23 Acres.

3. The above site was inspected by the Environmental Engineer, Regional office-I, Sangareddy , A.P Pollution Control Board on 30.7.2012 and observed that the site is surrounded by

North	:	Road to Borapatla(V), Open land
South	:	Agriculture lands
East	:	Barren Land & Z.P. High School, Borapatla
West	:	Garden followed by Borapatla Village – 0.5 km

4. The Board, after careful scrutiny of the application and verification report of Regional Officer, hereby issues **CONSENT FOR ESTABLISHMENT FOR CHANGE OF PRODCUT MIX With No Increase In Pollution Load and no increase in production capacity** to your unit Under Section 25 of Water (Prevention & Control of Pollution) Act 1974 and Section 21 of Air (Prevention & Control of Pollution) Act, 1981 and the rules made there under. **This order is issued to manufacture the products as mentioned at para (1) only.**

5. This Consent Order now issued is subject to the conditions mentioned in Schedule 'A' and Schedule 'B'.

6. This order is issued from pollution control point of view only. Zoning and other regulations are not considered.

Encl: Schedule 'A'
Schedule 'B'

Sd/-
MEMBER SECRETARY

To,
M/s. Aurobindo Pharma Ltd (Unit – I),
(Change of Product mix)
Sy. No. 388/389, Borapatla (V),
Hatnoora (M), Medak District

/// T.C.F.B.O///

JOINT CHIEF ENVIRONMENTAL ENGINEER(CFE)

SCHEDULE - A

1. Progress on implementation of the project shall be reported to the concerned Regional Office, A.P. Pollution Control Board once in six months.

2. Separate energy meters shall be provided for Effluent Treatment Plant (ETP) and Air pollution Control equipments to record energy consumed.

3. The proponent shall obtain Consents for Operation (CFO) from APPCB, as required Under Sec.25/26 of the Water (P&C of P) Act, 1974 and under sec. 21/22 of the Air (P&C of P) Act, 1981, before commencement of the activity.

4. Notwithstanding anything contained in this conditional letter or consent, the Board hereby reserves its right and power Under Sec.27(2) of Water (Prevention and Control of Pollution) Act, 1974 and Under Sec.21(4) of Air (Prevention and Control of Pollution) Act, 1981 to review any or all the conditions imposed herein and to make such alternation as deemed fit and stipulate any additional conditions by the Board.

5. The consent of the Board shall be exhibited in the factory premises at a conspicuous place for the information of the Inspecting officers of different departments.

6. Compensation is to be paid for any environmental damage caused by it, as fixed by the Collector and District Magistrate as civil liability.

7. Floor washing shall be admitted into the effluent collection system only and shall not be allowed to find their way in storm drains or open areas. The industry shall maintain a good housekeeping. All pipe valves, sewers, drains shall be leak-proof. Dyke walls shall be constructed around storage of chemicals.

8. Rain Water Harvesting (RWH) structure (s) shall be established on the plant site. The proponent shall ensure that effluent shall not enter the Rain Water harvesting structure.

9. The rules and regulations notified by Ministry of Law and Justice, GOI, regarding the Public Liability Insurance Act, 1991 shall be followed.

10. **This order is valid for period of 5 years from the date of issue.**

SCHEDULE – B

Water:

1. The source of water is borewell. The maximum permitted water consumption for worst combination of product mix after implementation of change of product mix on no increase in pollution load and no increase in production capacity is 141.1 KLD.

S. No.	Purpose	Quantity (KLD)
1.	Process	26.2 KLD
2.	Reactor & floor washing	4.9 KLD
3.	Scrubber	2.0 KLD
4.	R & D	2.5 KLD
5.	Cooling & Boiler	78.0 KLD
6.	DM Plant	3.0 KLD
7.	Domestic	6.5 KLD
8.	Gardening	18.0 KLD
	Total	141.1 KLD

2. The maximum Waste Water Generation (KLD) from the worst combination of product mix after implementation of change of product mix on no increase in pollution load and no increase in production capacity shall not exceed the following:

S. No.	Source	Quantity (KLD)
1.	Process	HTDS – 30.6 KLD, LTDS – 16.5 KLD
2.	Reactor & floor washing	
3.	Scrubber	
4.	R & D	
5.	Cooling & Boiler	
6.	DM Plant	
7.	Domestic	5.5 KLD
	Total	52.6 KLD

Treatment & Disposal:

Source of Effluent	Treatment	Mode of Final disposal
High TDS Process effluents	Primary treatment plant, Stripper, MEE & ATFD	• Shall be stripped off for organics recovery. • Stripper condensate to distillate for separation of organic compounds followed by disposal to cement plants for co-processing & distilled effluents shall be recycled. • Stripped effluents for forced evaporation in MEE followed by ATFD. • Condensate from MEE & ATFD shall be routed to RO system. • ATFD salts to TSDF.
Low TDS Process Utilities along with domestic effluents	ETP consists of Collection tank, Bar Screen, grit chamber, oil & grease, Equalization & Neutralization tank, Aeration tanks, Clarifier, sludge drying beds.	• Treated effluent from ETP shall be filtered in the RO Plant. • RO Permeate water to boiler / cooling tower makeup • RO rejects to ATFD.

3. The Zero Liquid Discharge (ZLD) system consisting of stripper, MEE & ATFD and RO plant and Effluent Treatment Plant (ETP) shall be adopted. All the units of the ZLD system shall be impervious to prevent ground water pollution. The ZLD system shall be operated regularly. The industry shall achieve zero liquid discharge.

4. The industry shall segregate the cyanide bearing and heavy metal bearing effluent separately at source and provision shall be made for adopting treatment of these effluent streams. They shall not mix either in the LTDS effluent and HTDS effluents.

5. Effluents shall not be discharged onland or into any water bodies under any circumstances and zero liquid discharge system shall be adopted and maintained. Provisions shall be made for storage of primary treated trade effluents (HTDS & LTDS) for one day in separate collection tanks constructed above ground level in case of any emergency. The same shall be treated within one day. The collection tank shall be impervious with proper lining to prevent ground water pollution.

6. During transfer of materials, spillages shall be avoided and garland drains shall be constructed to avoid mixing of accidental spillages with domestic waste and storm drains.

7. Separate meters with necessary pipe-line shall be provided for assessing the quantity of water used for each of the purposes mentioned below.

a) Industrial cooling, boiler feed.
b) Domestic purposes.
c) Processing, whereby water gets polluted and pollutants are easily bio-degradable.
d) Processing, whereby water gets polluted and the pollutants are not easily bio-degradable.

8. **The industry shall provide digital flow meters with totalisers at inlet of collection tank, Stripper feed, MEE feed, RO feed and RO flux separately for measuring effluent generation, treatment and recycled.**

Air:

9. The proponent shall comply with the following for controlling air pollution after implementation of change of product mix.

Sl. No.	Details of Stack	Stack 1	Stack 2	Stack 3	Stack 4	Stack – 5
a.	Attached to:	Boiler (standby)	Boiler (standby)	Thermic Fluid Heater (Existing)	FBC Coal / Husk fired boiler (existing)	DG set
b.	Capacity	6 TPH	6 TPH	2 Lakh K.Cal/Hr	27.5 TPH	6 x 750 KVA, 1 X 1010 KVA, 1 X 1000 KVA & 3 X 1500 KVA
c.	Fuel	Coal – 25 TPD	Oil – 1.5 KL/day		119 TPD	Diesel
d.	Stack Height:	30 m	30 m		42 m	6 x 5.5m , 6.5m, 6.5 m & 8 m (above roof)
e.	Diameter	0.7 m	0.7 m	–	2.5 m	–
f.	Control Equipment:	Bag filters	–	–	Multi Clone Dust Collector followed by Pulse jet bag filter house	Accoustic enclosures
g.	Conc. of Particulate matter	<115 mg/Nm3	<115 mg/Nm3			

10. The industry shall comply with directions to be issued by the Board wi re rd to standby boilers as committed during the CFE committe meeting held on 04.10.2012.

11. Under any circumstances, the industry shall not operate the standby boilers without prior intimation to the concerned Regional Officer.

12. The proponent shall ensure compliance of the National Ambient Air quality standards notified by MoE&F, GoI vide notification No. GSR 826(E), dated. 16.11.2009 during construction and regular operational phase of the project.

13. The proponent shall provide dedicated scrubbers to the process vents to control the process emissions. The industry shall provide online pH monitoring system with auto recording facility to scrubbers to treat the process emissions.

14. The industry shall install multi-stage scrubbers for control of NH_3,SO_2, HCl, Bromine and other gaseous emissions. The scrubbed solutions shall be reused to the possible extent. The industry shall keep the record of disposal of all such by-products and shall submit the record to concerned Regional Officer.

15. The industry shall provide the monitoring system to all the stacks / vents in the plant. Regular monitoring shall be carried out and report shall be submitted to the Regional officer.

16. Industry shall control fugitive emissions by providing chilled brine circulation, closed room operations and condensers with receivers.

17. Regular monitoring of vents of the storage tanks and work room concentration shall be carried out using sensors.

18. The proponent shall not use odour causing substances or Mercaptans and cause odour nuisance in the surroundings.

19. The proponent shall not send the spent/mixed solvents to the recyclers. They shall process the same at solvent recovery plant within the plant premises. Solvents shall be recovered to the maximum extent possible and shall be reused.

20. The evaporation losses in solvents shall be controlled by taking the following measures:

    i) Chilled brine circulation shall be carried out to effectively reduce the solvent losses into the atmosphere.

    ii) Transfer of solvents shall be done by using pumps instead of manual handling.

    iii) Closed centrifuges shall be used due to which solvent losses will be reduced drastically.

    iv) The reactor vents shall be connected with primary & secondary condensers to catch the solvent vapours.

    v) All the solvent storage tanks shall be connected with vent condensers to prevent solvent vapours.

21. Solvent shall be taken from under ground storage tanks to reactors through closed pipeline. Storage tanks shall be vented through trap receiver and condenser operated on chilled water.

22. Proper earthing shall be provided in all the electrical equipment wh ever solvent handling is done.

Solid Waste:

23. The proponent shall comply with the following from the worst combination of product mix after implementation of change of product mix and no increase in production capacity.

S. No	Solid Waste generated	Quantity (kg/day)	Method of Disposal
1	Organic Residue	480	Shall be sent to cement plants for co-incineration / to TSDF.
2	Inorganics & Evaperation salts	566.3	Shall be sent to TSDF for land filling after stablisation.
3	Spent Carbon	244.16	Shall be sent to cement plants for co-incineration / to TSDF.

24. The proponent shall place the chemical drums and / any drums in the concrete platform only. The Platform shall be provided with sufficient dyke wall and effluent collection system.

25. Container & Container liners shall be detoxified at the specified covered platform with dyke walls and the wash wastewater shall be routed to effluent collection tank.

26. The following rules and regulations notified by the MoE&F, GoI shall be implemented.

a) Hazardous waste (Management, Handling and Transboundary Movement) Rules, 2008.

b) Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989.

c) Batteries (Management & Handling) Rules, 2010.

d) E-Waste (Management & Handling) Rules, 2012.

Other Conditions:

27. The industry shall allocate a minimum of 0.20 % of the project cost i.e. Rs. 280.49 crores per year during operational period towards CSR activities.

28. Existing green belt shall be augmented to cover minimum area of 33% of total project area. Existing Green belt shall not be disturbed in the proposed activity for change of product mix on no increase of pollution load.

29. System of leak detection and repair of pump / pipeline shall be installed in the plant and immediate response team shall be identified for preventive maintenance.

30. The industry shall provide continuous online VOC monitoring system and shall be networked to APPCB for website display.

31. The industry shall ensure that there shall not be any violation to the circular dt. 31.7.2007 issued by MOE&F, GOI for change of product mix on no increase of pollution load.

32. The proponent shall communicate a copy of this order and other relevant documents to the MOE&F, GOI, New Delhi for record.

33. The proponent shall ensure that there shall not be any change in the process technology, source of raw material and scope of working without prior approval from the Board.

34. The proponent shall comply with all the directions issued by the Board from time to time.

35. Concealing the factual data or submission of false information / fabricated data and failure to comply with any of the conditions mentioned in this order may result in withdrawal of this order and attract action under the provisions of relevant pollution control Acts.

36. The Board reserves its right to modify above conditions or stipulate new / additional conditions and to take action including revoke of this order in the interest of environment protection.

37. Any person aggrieved by an order made by the State Board under Section 25, Section 26, Section 27 of Water Act, 1974 or Section 21 of Air Act, 1981 may within thirty days from the date on which the order is communicated to him, prefer an appeal as per Andhra Pradesh Water Rules, 1976 and Air Rules,1982, to such authority (hereinafter referred to as the Appellate Authority) constituted under Section 28 of Water (Prevention and Control of Pollution)Act,1974 and Section 31 of the Air (Prevention and Control of Pollution) Act, 1981.

Sd/-
MEMBER SECRETARY

To,
M/s. Aurobindo Pharma Ltd (Unit – I),
(Change of Product mix)
Sy. No. 388/389, Borapatla (V),
Hatnoora (M), Medak District

/// T.C.F.B.O///

JOINT CHIEF ENVIRONMENTAL ENGINEER(CFE)

Annex - 2

Aurobindo Pharma Limited, Unit I

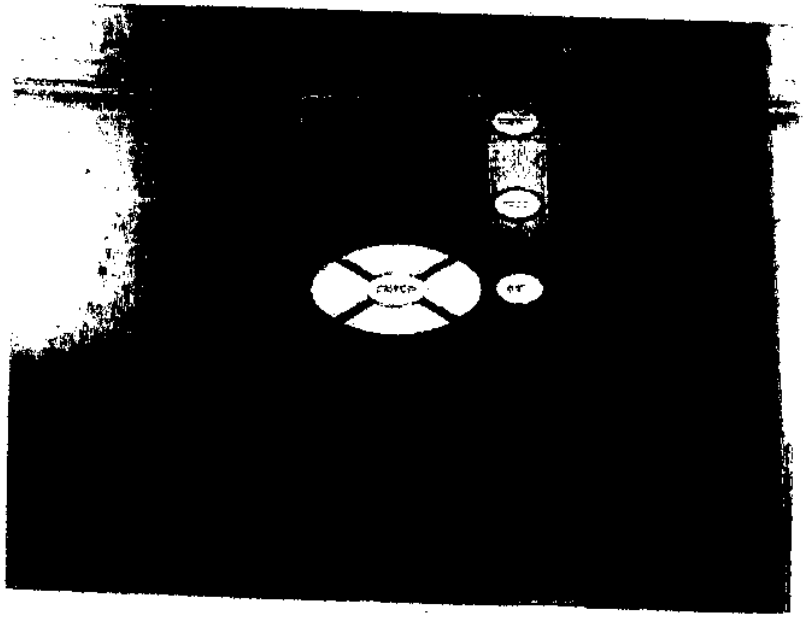
Characteristics of Wastewater at different Unit Operations - October, 2012

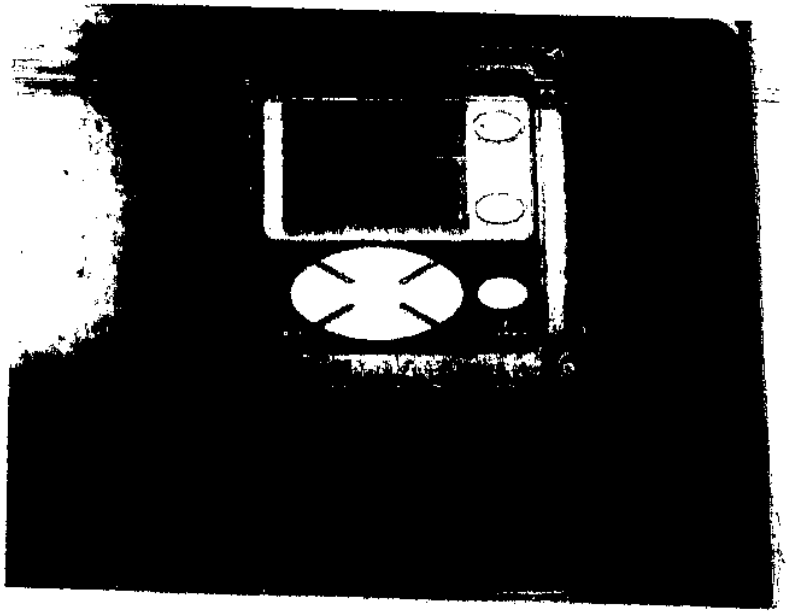
S.No	Date	High TDS effluent			Stripper Top	MEE condensate			ATFD condensate			Low TDS effluent			Bio ETP (In-let)					Bio ETT (out-let)		
		pH	TDS	COD	COD (mg/L)	pH	TDS (mg/L)	COD	pH	TDS (mg/L)	COD (mg/L)	pH	TDS	COD	pH	TDS	COD	MLSS	MLVSS	pH	TDS	COD
1	1-Oct	4.53	49000	135000	280000	8.01	2600	20400				7.92	6800	16000								
2	2-Oct	7.47	52600	110000								7.69	6200	16000	8.54	5600				7.9	5600	1600
3	3-Oct	1.29	54600			8.53	1900		8.68	6700	64000	7.4	5800	12800	7.48	5400	7400					
4	4-Oct					8.21						7.53	5200	10800	7.62	4800						
5	5-Oct	3.51	58100	124000	280000	8.17	2200	22400				7.73	5600		7.62			3200	2500	7.8	5800	2800
6	6-Oct	8.32	51000	116000		7.84						7.06		12000	7.29	5400	6900					
7	7-Oct	7.52	42500			8.19	1900	18600	8.86	7800	72000	6.85	5200	12000								
8	8-Oct	8.52	52500	108000	270000	8.25	2200	12400				8.25	5800	18000	7.36	5300						
9	9-Oct	6.13	30500	112000				14000	8.54			8.12	6200	18000	7.54	5600						
10	10-Oct	6.24	42700			8.28	2300					8.19	5700									
11	11-Oct	4.39	48690	120000	320000			18000	9.12	7400	68000	7.71	6400	12000	7.19	5800	7300					
12	12-Oct	3.39	41900			8.57	2600					8.17	5800		6.86	5400		2600		7.3	4900	2301
13	13-Oct	4.03	41500	90400		8.25		22000	8.92			8.06	5400	16000								
14	14-Oct	5.91	47100			8.39	2000					8.61	5200	14400	7.18	4900	7200					
15	15-Oct	4.88	44200					18200				8.33	5600	12000	7.58	5600						
16	16-Oct	5.11	46400	114000	260000	8.49	1900		8.59	6900	740000	7.99	5100	10800								
17	17-Oct	5.39	55200					18200				7.89	5600	16400	7.42	5200	6800			7.8	5000	1900
18	18-Oct	4.91	48200	124000	240000	8.15	1600					8	5800	13360								
19	19-Oct	5.47	45300					30400	8.72	7400		8.12	5600	10400		4800		3000	2400			
20	20-Oct	5	46100	97200								8	5000		7.54	5000	6400					
21	21-Oct					7.96	1600															
22	22-Oct	4.6	49600	136000	280000	8.48	2600	27000	8.64	6800	76000	7.2	6200	17200	7.85	5700						
23	23-Oct	4.3	45100	130000		8.25	2300	27000				8.02	5600									
24	24-Oct	4.12	52100			8.68	2000	28000	8.54	7200	72000	7.05	6100	11680	7.14	6200	7200			7.5	5200	2360
25	25-Oct	4.4	48200									7	5200	12560	7.16	5300		3400				
26	26-Oct	4.02	52000	120000		8.59	1900	24000					4800	13440								
27	27-Oct								8.76	8200	76000				7.23	5700	7600					
28	28-Oct				280000	8.14	1600	32000				7.8	5600									
29	29-Oct	5.99	47600																			
30	30-Oct	5.46	47900	110000					9.12	6800	72000		5100	18200	7.78	5200	6800	3000	2200	7.9	4600	1900
31	31-Oct	4.16	43500		260000	7.96	1400					7.52	4800									

Enclosure - IX

AUROBINDO PHARMA LIMITED, UNIT I

AUROBINDO





On-line DO Measurement System installed on Biological ETP

Enclosure - X

Date: 25/12/2013
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S. No	Sample Name	DN	TDS	T.V	Col	Dilution (100)	TSS (mg/lit)	MLSS 73
STP ①	Inlet tank (A)	6.27	19320	14.0	95000	1 ml - 250 ml (sed)		
②	Eq. tank (B)	10.27	2460	11.4	24200	2 ml - 100 ml (sed)		
③	Aeration/clarifier	7.12	2480	11.7	23600	2 ml - 100 ml (sed)		$\frac{1.88-1.56}{100} \times 10^6 \times 3200$ mg/lit
④	Aeration							
⑤	secondary clarifier	7.05	2480	10.0	10800	5 ml - 100 ml (sed)	$\frac{1.53-1.49}{100} \times 10^6 \times 400$	
⑥	Holding tank							
⑦	MEE condensate	9.17	2720	11.4	24200	2 ml - 100 ml (sed)		
STP ①	STP inlet	8.52	1030	20.9	104	20 ml		
②	STP outlet	8.96	830	23.7	32	20 ml		
RO								
①	Aeration tank							$\frac{1.84-1.48}{100} \times 10^6 \times 3600$
②	Acidified outlet	8.95	2480	17.6	4720	5 ml - 100 ml (sed)	$\frac{1.54-1.52}{100} \times 10^6 \times 300$	
③	Feed	6.58	2420	17.7	4640	11		
④	Permeate	6.71	1960	20.5	1200	10 ml - 100 ml (sed)		
⑤	Reject	7.56	6200	18.6	9800	2 ml - 100 ml (sed)		
MEE								
①	Col. tank (A)	6.63	26600	11.8	117000	1 ml - 250 ml (sed)		
②	Col. tank (B)							
③	Treated	7.28	21700	17.8	99000	11		
④	Health drum	7.73	17950	15.5	80000	11		
⑤	Stripper top	7.94	700	8.0	31000	1 ml - 500 ml (sed)		
⑥	Stripper bottom	7.90	19800	17.0	65000	1 ml - 250 ml (sed)		
⑦	Group (A) Con	10.09	1360					
⑧	Group (B) Con	8.56	1700					
⑨	ACC	9.20	2700	11.4	24200	2 ml - 100 ml (sed)		
⑩	CT: (2)	7.43	5740	20.2	35000	1 ml - 250 ml (sed)		
⑪	CT: (1)	7.48	5850					
⑫	MEE condensate	9.96	5480	19.6	41000	1 ml - 250 ml (sed)		
⑬	Group (B) feed	6.67	45000	2.1	214000	1 ml - 250 ml (sed)		

Enclosure - XI

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S.NO	Sample Name	PH	TDS	T.Y	COD	Dilution (COD)
LYDS						
(1)	D - Block	6.80	4010	20.8	10800	1ml-100ml(soml)
(2)	E	9.54	10.50	21.9	6400	"
(3)	2/M - Pit water	7.81	2100	20.0	14000	"
(4)	A.d solution(soml)	12.47	1610	19.6	15600	"
(5)	Ad solution(soml)	13.38	2460	20.0	2000	
(6)	Combined solution	8.93	10.30	19.4	16400	"
HYDS (1)	A - Block	9.48	7580	15.9	78000	1ml-25ml(soml)
(2)	B	9.09	16550	16.0	77000	"
(3)	C	10.43	9200	20.0	37000	"
(4)	D	3.41	5020	17.4	63000	"
(5)	E	2.61	7160	19.9	38000	"
(6)	F (I)	1.72	3670	21.1	26000	"
(7)	F (II)	6.81	750	22.0	15000	"
(8)	F (III)	3.02	16430	20.3	32800	"
(9)	F (IV)	6.48	2540	20.0	37000	"
(10)	G (I)	4.50	3870	19.4	41000	"
(11)	G (II)	7.67	2680	20.4	31000	"
(12)	G (III)	9.70	680	18.8	47000	"
(13)	I	10.03	1560	21.4	21000	"
(14)	K	7.41	10850	17.1	64000	"
(15)	L - (I)	7.15	1850	17.8	57000	"
(16)	L - (II)	0.01	31800	16.9	66000	"
(17)	M - (I)	9.86	27100	16.7	68000	"
(18)	A.d solution HYDS	13.61	37400	21.4	21000	"
(19)	SKP - (I)	9.80	2150	10.8	184000	"
(20)	SKP - (II)	8.06	5340	12.9	106000	"
(21)	SKP - (III)	7.81	28000	9.7	138000	"

Annex - 3

Aurobindo Pharma Limited, Unit I

Details of EHS Personnel associated with ZPLD Unit Operations

S. No.	Name of the Employee	Qualification	Designation	Area where services are deployed	Experience in operations (At Aurobindo)	Experience in operations (Other companies)	Total experience	Specific experience/training received, in operations
1	P. Chandrappa	M.Sc., DIS	Dy. Manager	In-Charge, Environment	13.0 Years	2.0 Years	15.0 Years	Bio ETP, RO, Incinerator, MEE and ATFD.
2	B.Nagendra Babu	M.Sc.	Asst. Manager	MEE, ATFD, Bio ETP and RO	2.4 Years	8.0 Years	10.4 Years	MEE, ATFD, Bio ETP and RO
3	Y Vijaya Bhaskar	M.Sc., Ph.D.	Executive	Bio ETP, Documentation	2.4 years	3.0 years	5.4 years	Bio ETP, MEE, ATFD and Incinerator
4	H.S. Jadhav	M.Sc.	Executive	Bio ETP and Lab	2.4 years	7.5 years	10 years	Bio ETP ,MEE, ATFD and Incinerator etc.
5	N. Madana Chary	B.Sc.	Executive	MEE, ATFD and RO	2.0 Years	10.0 Years	12.0 Years	MEE, ATFD, Bio ETP and RO
6	D. Hari	B.A, I.T.I	Executive	RO and Bio ETP	2.6 Years	13 Years	15.6	RO
7	P. Sampath Reddy	B.Sc.	Executive	MEE	10.8 Years	10.0 Years	20.8 Years	Production
8	P Janardhan	B.Sc.	Assistant	MEE	2.0 Years	3.0 Years	5.0 Years	MEE
9	K Nagaraju	B.Sc.	Assistant	MEE	1.4 Years	5.0 Years	6.4 Years	MEE

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10	O. Pichaiah	B.Sc.	Assistant	MEE	1.5 Years	4.4 Years	5.9 Years	MEE
11	Y. Ameer Basha	M.Sc.	Assistant	RO	1.5 Years	3.0 Years	4.5 Years	RO, Bio ETP
12	P. Viswanath Nayudu	B.Sc.	Assistant	RO	2.0 Years	3.0 Years	5.0 Years	RO
13	V. Rambabau	B.Sc.	Assistant	Bio ETP and Lab	0.6 Years	3.8 Years	4.2 Years	RO, Bio ETP
14	G. Ramaiah	B.Sc.	Assistant	MEE	5.8 Years	8.0 Years	13.8 Years	Bio ETP & Production
15	G. Ramesh Chandran	D.E.E.E	Assistant	MEE	11.7 v	1.0 Years	12.7 Years	Maintenance(Electrical)
16	N. Jankiramulu	B.Sc.	Assistant		2 month	5 years	5.2 years	MEE, ETP ATFD,
17	M. Sravan Kumar	B.Sc.	Assistant	MEE	2.2 Years	4.0 Years	6.2 Years	Lab and MEE
18	D. Ravi Teja	M.Sc.	Assistant	MEE	2.2 Years	1.6 Years	3.8 Years	Lab
19	K. Shankar	B.Sc.	Assistant	MEE	2.1 Years	0	2.1 Years	-
20	G. Sridhar	B.Sc., M.B.A	Assistant	MEE	2.1 Yearsc	0	2.1 Years	-
21	C. Praveen	B.Sc.	Assistant	MEE	2.1 Years	0	2.1 Years	-
22	M. Bhoomaiah	Intermediate	Assistant	Bio ETP and Lab	1.8 Years	8.0 Years	9.8 Years	Bio ETP and Lab Support (Field Sample Collection, etc)
23	T. Saidulu	B.Sc.	Assistant	MEE	0.8 Years	2.10 Years	3.6 Years	MEE
24	P. Veeraabhadra Chary	B.Sc.	Assistant	RO	0.6 Years	1.8 Years	2.2 Years	RO
25	G.Ganesh	M.Sc.,	Assistant	Bio ETP and Lab	0.6 Years	3.0 Years	3.6 Years	Bio ETP and Lab
26	L. Shiva	B.Sc	Assistant	MEE	6 month	1.3 years	1.9 years	MEE and Bio ETP

CHAPTER -3:

PROJECT IN DETIAL, RESOURCE REQUIREMENTS & POLLUTION LOADS

3.1 Project in detail

M/s. Aurobindo Pharma Limited, Unit I is an existing Bulk Drugs and Drug Intermediates manufacturing unit located at Sy. No. 379, 385, 386, 388 to 396 & 269, Borapatla(V), Hathnoora Mandal of Medak District in Telangana. As the existing sanctioned production capacity is low and the plant is having enough spare capacity to manufacture higher quantity of products, it is proposed to enhance the production capacity from current level of 96.0 TPM to 421.2 TPM. Also it is proposed to establish co-generation power unit with 3.95 MW power generation. It is proposed to add few utilities and environmental infrastructure facilities to enhance the capacity of the plant.

3.2 Proposed products and capacities

It is proposed to manufacture 66 API's (Bulk Drugs) after expansion with total production level of 421.2 TPM. **Table 3.1** gives list of products proposed with quantity of production per month.

Table 3.1

List of Products Proposed With Quantity of Production per Month

S. No.	Name of the Product	Production Capacity	
		Kgs/Month	Kgs/Day
1	Amisulpride	500.00	16.67
2	Aripiprazole	500.00	16.67
3	Atorvastatin	4000.00	133.33
4	Bisprolol Fumarate	500.00	16.67
5	Bupropion HCl	500.00	16.67
6	Candesartan Cilexetil	1000.00	33.33
7	Cefaclor Monohydrate	1000.00	33.33
8	Cefadroxil	3000.00	100.00

9	Cefalothin Acid	2000.00	66.67
10	Cefazolin Sodium	3000.00	100.00
11	Cefdinir	2500.00	83.33
12	Cefditoren Pivoxil	500.00	16.67
13	Cefepime HCl	2000.00	66.67
14	Cefixime Trihydrate	1500.00	50.00
15	Cefotaxime	3000.00	100.00
16	Cefoxitin Sodium	500.00	16.67
17	Cefpirome Dihydroiodide	200.00	6.67
18	Cefpodoxime Proxetil	3000.00	100.00
19	Cefprozil	3000.00	100.00
20	Cefradin	2000.00	66.67
21	Cefsulodin Sodium	500.00	16.67
22	Ceftazidime DiHydrochloride	2000.00	66.67
23	Ceftibuten Dihydrate	2000.00	66.67
24	Ceftiofur HCl	3000.00	100.00
25	Ceftizoxime Acid	500.00	16.67
26	Ceftriaxone Disodium Hemiheptahydrate	3000.00	100.00
27	Cefuroxime Axetil	23500.00	783.33
28	Cephalexin Monohydrate	15000.00	500.00
29	Cephapirin Benzathine	500.00	16.67
30	Ciprofloxacin HCl	7000.00	233.33
31	Citalopram Hydrobromide	2500.00	83.33
32	Donepezil Hydrochloride	500.00	16.67
33	Doxazosin Mesylate	500.00	16.67
34	Entacapone	3000.00	100.00
35	Escitalopram Oxalate	2000.00	66.67
36	Famciclovir	2000.00	66.67
37	Florfenicol	5000.00	166.67
38	Fluvastatin	500.00	16.67
39	Gabapentin	40000.00	1333.33

40	Gemfrozil	10000.00	333.33
41	Glyburide	2500.00	83.33
42	Irbesartan	5000.00	166.67
43	Lamivudine	1000.00	33.33
44	Lisinopril	1000.00	33.33
45	Losartan Potassium	5000.00	166.67
46	Metformin HCl	200000.00	6666.67
47	Metoprolol Succinate	2000.00	66.67
48	Metoprolol Tartrate	10000.00	333.33
49	Mirtazapine	2000.00	66.67
50	Modafinil	1000.00	33.33
51	Nevirapine	5000.00	166.67
52	Ondansetron	200.00	6.67
53	Pantoprazole Sodium Sesquihydrate	3000.00	100.00
54	Paroxetine HCl	3000.00	100.00
55	Perindopril tert-Butylamine	500.00	16.67
56	Rabeprazole Sodium	500.00	16.67
57	Ritonavir	2000.00	66.67
58	Ribavirin	500.00	16.67
59	Risperidone	500.00	16.67
60	Sevelamer HCl/Carbonate	1000.00	33.33
61	Simvastatin	7000.00	233.33
62	Stavudine	1000.00	33.33
63	Telmisartan	2000.00	66.67
64	Terazosin HCl Dihydrate	300.00	10.00
65	Terbinafine HCl	3000.00	100.00
66	Topiramate	5000.00	166.67
Total Monthly production (TPM)		**412.2**	
Daily production Kgs			**14040.00**

3.3 Details of Infrastructure proposed

It is proposed to add few utility services and environment infrastructure facilities to enhance the capacity of the plant. It is proposed to add 2 production blocks to the existing manufacturing blocks. Following table summarizes the list of facilities proposed in the project

Table 3.2

Utilities & Effluent handling facilities – Proposed

Utilities & Effluent handling facilities – Current		
S.NO	**Utility**	**Capacity**
Existing		
1	Boilers	27.5 TPH (Coal Fired) and 8 TPH (Coal Fired)
2	Diesel Generator sets (backup power)	1x1000 KVA and 3 x 750 KVA, 2 X 500 KVA
3	Process Ro Plants	3 No's with a capacity of 1000 KLD
4	Cooling Towers	Total 17000 TR (52 Nos)
5	Waste Water treatment facilities	1) Stripper, Multiple Effect Evaporator and ATFD Systems –1x300 + 1X120 KLD 2)1x300 KLD and 1 X250 KLD Bio ETP 3) 1 x 300 KLD RO Plant 4) Detoxification facility for containers and container liners. 5) Dedicated fractionation column for enrichment of stripper distillate wastewater treatment 6) 100 KLD STP for Domestic waste water treatment
Utilities & Effluent handling facilities – Proposed (Additional)		
S.NO	**Utility**	**Capacity**
1	Coal/ Husk fired Boiler	39 TPH*
2	Turbine And Generator	3.95 MW

3	DG Sets	3 x 750; 4 x 1010 KVA
4	DM/Softner	10 KL
5	Cooling Towers	2000 TR
6	Waste Water Treatment plant	1. Stripper, Multiple Effect Evaporator and ATFD System 1 x 500 KLD 2. RO System for Effluents –1X500 KLD 3. Up-gradation of existing 200 KLD Bio-ETP

- Existing boilers will be kept as stand by
- DG sets are used only during load shutdown by APTRANSCO.

* Used for co-generation of 3.95 MW power

3.4 Resource Requirements

3.4.1 Land Requirement

A total of 71.0 Acres of land available for the plant at No. 379, 385, 386, 388 to 396 & 269, Borapatla(V), Hathnoora Mandal of Medak District in Telangana. Out of this, total area utilized for current plant, utilities and roads is 17.5 Acres. Green belt is developed in an area of 24.5 Acres. Below table gives land use table of the site

Table 3.3

Land statement

S. No.	Description of Land Use	Area (Acres)	
		Existing	**Proposed**
1.	Built Up Area (Manufacturing Blocks, Utility Services and Wastewater Treatment)	14.9	17.5
2.	Roads and Cart Tracks	6.6	8.0
3.	Green Belt	18.4	24.5
4.	Lawns and other open area	25.6	21.0
	Total	**65.5**	**71.0**

The current land use is industrial land.

3.4.2 Water requirement

The requirement for water will be for process, utilities and domestic purpose. Efforts are made to optimize the water consumption. The water balance for the expansion is presented below.

Table 3.4

Water Balance of the proposed expansion

S. No	Stream	Water Consumption in KLD	Waste Generation
1	Process	310.7	343.8
2	Reactor & Floor Washings	25.0	20.0
3	Scrubber	25.0	25.0
4	QC and R&D	20.0	15.0
5	DM/Softner (Regeneration)	25.0	25.0
6	Solvent Recovery plant	25.0	20.0
7	Boiler	325.0	32.5
8	Cooling Towers	350.0	25.0
9	RO Back Wash	35.0	35.0
10	Domestic	65.0	60.0
11	Garment washings	10.0	10.0
12	Gardening	50.0	Nil
13	Ash handling (Water sprinklers)	15.0	Nil
	Total	**1280.7**	**611.3**

It is proposed to treat the effluents in ZLD (Zero Liquid Discharge) plant and re-use to the maximum extent. It is proposed to recycle 394.3 KLD of water from Effluent treatment facilities and fresh water requirement will be 886.4

KLD. It is proposed to utilize the existing Sewage Treatment Plant (STP) of capacity 100 KLD to treat domestic effluents and garment washings and treated wastewater will be utilized for gardening.

Table 3.5

Water Re-use and Fresh water requirement

Streams	Total Quantity of Effluents KLD	Treatment	Re-used/ Recycling
Domestic& Garment washings	70	STP	70 KLD for gardening
Process	343.8	Stripper, MEE and ATFD, Biological treatment and RO	Permeate For re-use 206.3 KLD
washings, Scrubber , QC R&D & Solvent recovery units Utilities – Back washes and blow downs	197.5	Biological treatment and RO	Permeate for Re-use 118 KLD

3.4.2.1 Source of Water

Source of water is ground water and purchased from outside parties. The unit got permission to utilize 370 KLD of ground water through its existing bore wells. Rest of the water would be purchased from local parties. Permission from state ground water department for operating bore wells is given at **Enclosure I** of this chapter

3.4.3 Power requirement

The requirement of power will be 10 MW. Currently the power is procured from Central Distribution Company of A.P Electricity Board. As a part of this proposal, it is proposed to establish a co-gen plant with a capacity of 3.95 MW. Steam after generation of power will be used for process plant. Further, due to

the nature of the reactions and requirement of continuous power, the management proposes to put in place 100% self-generation of power by DG sets.

3.4.4 Fuel Requirement

Currently the unit established one 27.5 TPH coal fired boiler and one 8 TPH Coal fired boiler and one 8 TPH Oil fired boiler. It is now proposed to install 39 TPH Coal/Husk fired Boiler and use it for co-generation of 3.95 MW power. Existing boilers will be kept as stand by. Total fuel requirement will be around 195 TPD.

3.4.5 Raw Material Requirement

Raw materials used in products are various chemicals, chemical intermediates, solvents, purification agents like activated carbon and catalysts. Product wise raw material requirement is given in process chemistry in this chapter as **Annexure I** (Given in separate volume).

3.4.6 Solvent requirement

Table 3.6

Solvent Balance

S.NO	Details	Quantity in (TPD)
1	Total solvent requirement	346.43
2	Solvents used in process reactions	Nil
	Fugitive Loss	15.07
	Losses in Waste Water & Residues	4.69
3	Recovered solvents	326.66
Solvent re-use and disposal		
1	Re-usable solvents in process	196.0
2	Recovered solvents send to downstream industries	130.6
3	Fresh solvents requirement	346.43-196.0 =150.43

3.4.7 Man power requirement

M/s. Aurobindo Pharma Limited, Unit I is providing employment currently to 1988 (1238 on rolls and 700 as casual work force).An additional employment of 50 people on rolls and 100 as casual work men is expected to be generated from the proposed expansion.

3.5 Manufacturing process

The process with chemical reaction and flow chart with material balance for each of the product is given below product wise. Also consolidated pollution load generated from each product is given for each product is given at **Annexure I** (Given in separate volume).

3.6 Power Generation

As a part of the project it is proposed to establish high pressure boiler with 39 TPH capacity and use it for co-generation of 3.95 MW power. Steam after power generation would be used for plant and utilities

In a coal based co-generation plant, the heat of combustion is first converted into mechanical and then to electrical energy. The main units of a thermal power plant are steam generator, steam turbine and electrical generator. Steam generator is a combination of heating surfaces in which super-heated steam is generated at high pressure (67 kg/cm2) and temperature (490^0 C) by utilizing the heat liberated from combustion of fuel. The steam so generated is fed into a turbine, which converts the thermal energy of steam into mechanical energy and drives the generator for producing electricity.

Exhaust steam from the turbine is condensed by means of an Air cooled condenser. Thus, the water evaporated in the boiler is conserved in a closed cycle. To meet the minor water shortfall of the cycle, due to leakages, blow down and popping of safety valves, a small quantity of de-mineralized water is continuously fed into the De-aerator.

The condensate of exhaust steam is heated by steam extracted from the turbine at several stages for improving thermal efficiency of the cycle. The fuel

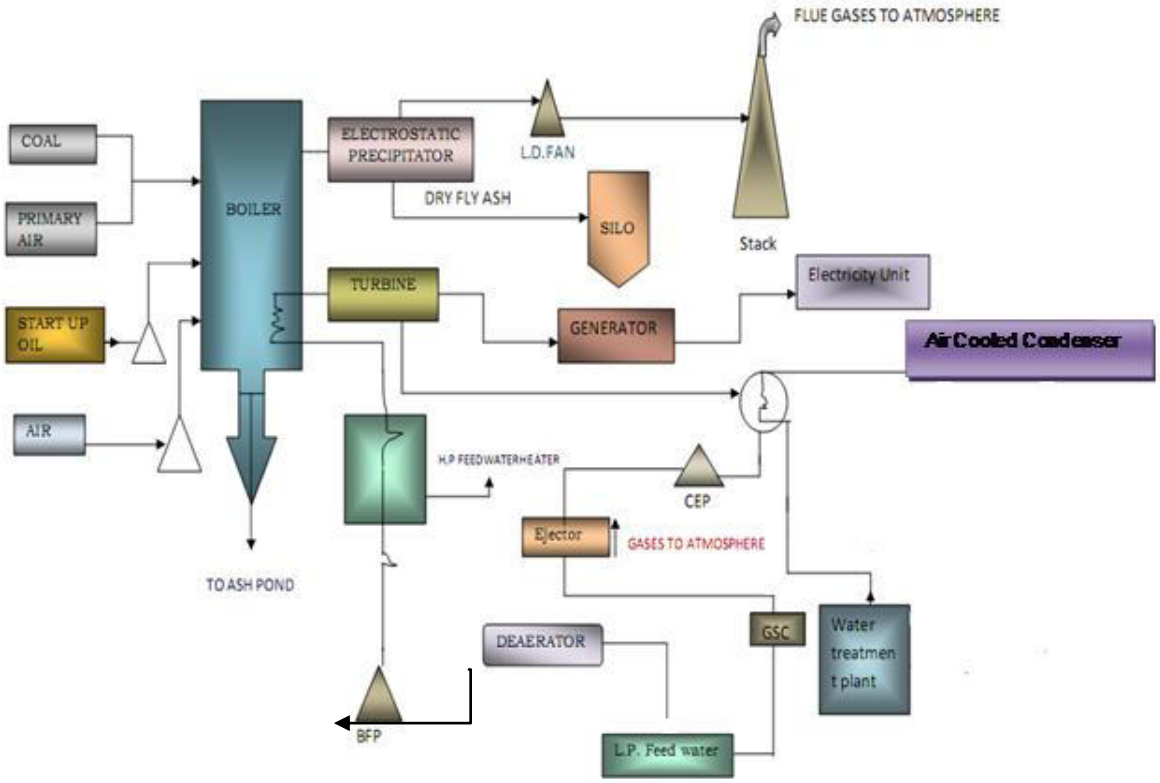
is supplied into the boiler furnace together with the combustion air. The emissions from combustion are cooled to a relatively low temperature and exhausted from the boiler through a stack or chimney into the atmosphere after cleaning. Ash is disposed off to ash silo from the boiler furnace bottom by means of dry disposal system. The fly ash is arrested in Electrostatic Precipitators and disposed off in such a manner that it can be utilized in dry form to the maximum extent possible and unutilized fly ash is disposed to the ash disposal area.

The Steam after power generation would be used for main plant, effluents treatment facilities and solvent distillation. The hot condensate would be recycled back to boiler

It is proposed to establish cooling tower of 500 TR capacity for power plant

The typical flow diagram for power generation is give at **Figure 3.1** below

FIGURE 3.1: TYPICAL PROCESS FLOW DIAGRAM OF POWER GENERATION



3.6.1 Mechanical Equipment and Auxiliaries

3.6.2 Steam Generator

a) Two steam generators of 130 TPH each per unit are proposed to ensure continuous supply of steam to the APL. The steam generators would be Bubbling (Atmospheric) Fluidized Bed Combustion, Natural circulation, balanced draft type of unit rated to deliver superheated steam at around 89 kg/cm2 (abs.), 515^0c when supplied with feed water at a temperature of about 200^0C at the economizer inlet. The steam generator shall be designed to operate with blend of Indian and imported coal.

b) The steam generator would be designed in accordance with the latest provisions of Indian Boiler Regulations (IBR).

c) Capacity of steam generating units would be so selected as to ensure adequate margin over the requirement of Turbine at 100% MCR in order to cater to auxiliary steam requirement for soot-blowing operation, and also for start-up of the adjacent unit, and de-rating of the steam generating units after prolonged use. The steam generators would be designed to operate with "the HP Heaters out of service" condition (resulting in lower feed water temperature at Economizer inlet) and deliver steam to meet the turbo-generator requirement at base load. Economizer section of the boiler would be non-steaming type with provision for re-circulation during start-up, chemical cleaning etc. Super heater section would be designed so as to maintain rated steam temperature of 515^0C (+/-5^0C) at outlet over the range of 60% to 100% MCR load. Main steam de-superheating stations with provision for spraying water tapped off from feed water piping would be provided. Tubular air pre-heaters would be provided with a set of soot-blowers of automatic sequential electrically operated type, arranged for on-load cleaning of the heat transfer surfaces.

d) Draft system of each boiler would be provided with two (2) Primary Air Fans; two (2) Secondary Air Fans and two (2) Induced Draft Fans with suitable capacity and control arrangement. Each how path will be independently capable of meeting the requirement at 60% boiler MCR load. Each unit will be equipped with suitable coal firing system comprising coal feeding system selected for the SG is of Pneumatic under bed type.

e) The steam generating units are provided with an arrangement for start up using HSD/LDO assisted charcoal firing system.

f) Based on the percentage of sulphur content in the final coal, provision for Lime injection shall be provided to limit SO_X and NO_X emission.

3.6.3 Electrostatic Precipitator

Each steam-generating unit would be provided with an electrostatic precipitates. Precipitator will have five parallel gas paths, any of which can be isolated for maintenance when required, keeping the other paths in operation. Each path will have n+1 field in series for collection of fly ash, of which, "n" fields will be in service and the other one will remain as a standby. The ESP will be such that the outlet dust burden does not exceed 50 mg/Nm3 at 100% MCR.

3.6.4 Steam Turbine and Accessories

3.6.4.1 Steam Turbine

a) The steam turbine would be a 3000 rpm, tandem compound, regenerative, condensing, single cylinder machine with six (6) or seven (7) uncontrolled extractions for regenerative feed heating. The turbine shall be designed for main steam parameter of around 83 kg/cm2 (abs) at 510^0C before emergency stop valves of HP turbine.

b) A fully automatic gland sealing system will be provided for the turbine, which will have provision for receiving steam from auxiliary steam header during start-up and low load operation. The turbo-

generator will be equipped with electro-hydraulic governing system ensuring stable operation under any grid fluctuation and load throw off condition. The turbo-generator will be equipped with an electric motor driven turning gear. The unit will also be provided with self contained lubricating oil system for supplying oil to turbine and generator bearings. The lubricating oil will be cooled by Closed Circuit Cooling Water System.

c) Each generator will be connected to its own unit step up transformer to the switch yard. The auxiliary power requirement of the unit will be drawn from its unit auxiliary transformer tapped off from the generator bus duct. The steam turbine generator will be suitable for tropical climate prevailing in India and indoor installations on reinforced concrete top deck.

d) The generator excitation system will be of static type and capable of maintaining steady generator terminal voltage under variable load conditions. The excitation system will be complete with automatic voltage regulator and all necessary metering and supervision equipment.

e) All auxiliaries like turbine oil purification system, generator seal oil system etc., as well as necessary protective and supervisory system will be provided to ensure trouble-free, safe and efficient operation of the turbo-generator. The unit will generate 30 MW at generator terminals continuously at cooling water inlet temperature of 33. It shall also be capable of operating continuously under the HP feed water heaters out of service and full load. The turbine will be suitable for wet steam washing for which one set of auxiliary equipment necessary for the unit comprising pumps, de-super heaters, associated piping, valves instruments will be provided. Stub connections will be provided for each unit for connecting wet steam washing system as and when required with steam supply from

auxiliary steam headers of the station.

3.6.4.2 Condensing Equipment

Water Cooled Condenser (WCC) is a wet cooling system where the steam is condensed inside finned tubes, and the cooling media water is circulated outside the finned tubes. The WCC is made of modules arranged in parallel rows. Each module contains a number of fin tube bundles.

3.6.5 Boiler Feed Pumps and Drive

a) Two (2) 100% capacity, horizontal, multistage, barrel casing, centrifugal type motor driven boiler feed pumps will be provided. The main pump will take suction from moderator feed water storage tank and discharge into the boiler through the high pressure heaters and feed control station. A variable frequency drive or control valve shall be is provided to regulate feed water flow to the boiler. All the feed pumps will be provided with minimum now re-circulation controls arrangement to protect the pump under low load operation.

b) Each pump will be provided with mechanical seals with proper seal cooling arrangement, self-'contained forced lubricating oil system for supplying oil to the bearings, couplings etc. The lubricating oil and sealing arrangement of the feed pumps shall be cooled by closed water systems utilizing de-mineralized water as cooling medium. All necessary protective and supervisory system will be provided to ensure safe and trouble-free operation of the feed pumps.

3.6.6 De-aerating Heater and Closed Heaters

a) Each unit will be provided with a variable pressure type de-aerating heater with a feed water tank of adequate capacity. Vent condenser will be provided with the moderator to minimize wastage of steam. The moderator will be spray-cum-tray type and will be designed to de-aerate all the incoming condensate and drain flow to keep the oxygen content of the condensate below the permissible limit.

b) Deaerator will normally operate by taking extraction steam from turbine casing. However, during low load operation and start-up, the moderator pressure will be pegged with steam drawn from auxiliary header / Continuous Blow Down (CBD) tank vent. The moderator will be placed at a suitable elevation to provide sufficient NPSH for the boiler feed pumps and considering the head available for the drip of the preceding HP heater to flow to the moderator.

c) The feed water heaters will have both drain cooling and de-superheating zones in addition to the normal condensing zone as necessary. High pressure heaters will be provided with bypass as well as low pressure heaters will have individual bypassing arrangement in order to allow isolation and maintenance. The recommendations of ASME standard TOPS-I will be followed for prevention of water damage to the turbine.

3.6.7 Condensate Extraction Pumps

The condensate extraction pumps shall be of centrifugal horizontal type with flanged connection. Between the condenser and the condensate extraction pumps, each line will include a manual shut-off block valve and a strainer. Connections for condensate supply to the following major services will be tapped off from this condensate discharge header.

The condensate will then pass in series through the air ejector condenser and the gland steam condenser before being supplied to the feed water heaters.

3.6.8 Fuel Requirement & Handling System

It is proposed to use coal or Rice Husk as fuel depending on availability and cost

3.6.8.1 Coal Requirement & Quality

The estimated maximum daily coal consumption for the power generation would be as below table

Table 3.7

Fuel Requirement for the project

	Unit	
Coal requirement (Indigenous Coal)	TPH	8.125
	TPD	195
	TPA	58,500
Husk Requirement	TPH	12.18
	TPD	292.5
	TPA	87,750

Notes:

1. Calorific value of coal considered is 3800 kcal/kWh.
2. Calorific value of Husk considered is 2800 Kcal/KWh

Typical composition of indigenous coal and husk is as given below table 3.8 & 3.9

Table 3.8

Typical Coal Composition

	Unit	**Indigenous coal**
Fixed Carbon	% by wt.	32-45
Volatile Matter		26-45
Moisture		7-10
Sulphur		0.40-0.80
Ash Content		35-40
Gross Calorific value	kcal/kg	3800

Table 3.9

Typical Rice Husk Composition

	Unit	Husk
Fixed Carbon	% by wt.	14-16
Volatile Matter		20-30
Moisture		7-10
Sulphur		0.20-0.30
Ash Content		14-15
Gross Calorific value	kcal/kg	2800-3000

3.6.8.2 Brief Details of Fuel Handling and Transportation

Coal:

Coal is procured from local sources and transported to the site through trucks

In-plant coal handling system consists of uncrushed coal stock pile/reclaim system, crushing/screening system, bunker feeding systems and control system. The scope includes the junction towers and up-to feeding of bunkers by mobile trippers or over conveyor plough system over bunker floor.

3.6.8.3 Crushed coal Stockpile

(-) 50 mm size coal as received into the plant shall be stock piled within the plant. The coal stack capacity is to cater to needs of boiler at 90% PLF rating for 10 days. Necessary base with drainage facility shall be considered for stocking the coal. The coal is fed to the bunkers through underground hopper, underground conveyors using dozer s and tippers. The capacity of the conveyors shall be adequate to fill the bunkers in two shift operation.

3.6.8.4 Dust Extraction / Dust Suppression/ Ventilation System:

Dust extraction system shall be provided at all the transfer towers (and crusher house, if applicable) to minimize the air pollution problem.

Dust suppression system shall be provided to the crushed coal stock pile

and also loading and unloading points of conveyors. Necessary spray system and compacting arrangement shall be provided in the stock pile.

3.6.8.5 Husk Handling System

Husk is procured from Rice mills in the state and transported through covered trucks. It is proposed to construct covered shed for husk storage to avoid air dispersal of husk in the surroundings

3.6.8.6 Fire protection System

The coal stock area in the yard as well as transfer houses (and crusher house, if applicable) including conveyors are protected against fire by the hydrant network system connected to the plant hydrant system network. Fire detection provision is made for the screens with an alarm in the coal plant & main plant control rooms.

3.6.9 Ash Handling System

As the Worst case scenario for ash generation is coal, ash handling system designed for coal handling

Total quantity of ash generated is as follows.

Coal ash percentage = 40%

Total coal consumption = 195 TPD

Total Ash generation = 78 TPD

It is targeted to dispose majority of ash generated for land filling/road construction/cement industry/ brick making. However, land area is estimated as per the existing fly ash utilization programme (progressive utilization of Fly Ash as per the directive of MoEF)

3.6.9.1 Bottom Ash Handling System

Bottom ash is about 15-20% of the total ash generated in the FBC boilers. The bottom ash is removed continuously by over flow pipes to maintain constant height of the bed and then cooled in ash coolers and conveyed to ash silos

3.6.9.2 Fly Ash Handling System

Pneumatic conveying system (either vacuum system or pressure system) shall be employed for extraction of fly ash from the electrostatic precipitator hoppers in dry form. This dry ash shall either be taken to buffer hopper or to the wetting head/collector tank units. The dry ash buffer hoppers and wetting head/collector tank units shall be located adjacent to the ESP. Dry ash from buffer hoppers shall be transported to main storage silos located strategically for onward shipment through trucks or wagons. There shall be one or two as required, ash silo per one unit. The storage capacity of the silos shall cater to 16 hrs normal production of fly ash from each unit. For wet disposal of dry ash extracted from various ESP hoppers, the same shall be diverted to wetting head/collector tank units (by-passing buffer hoppers meant for handling ash in dry form).

3.7 Pollution Loads

3.7.1 Waste water generation

The waste water generation is from process utilities and domestic purposes. Below table summarizes section wise generation of waste and mode of treatment

Table 3.10

Waste water generation and mode of treatment

S. No	Stream	Discharge in KLD	Mode of treatment proposed
1	Process	343.8	Stripper, MEE with ATFD - Condensates to Bio ETP and RO RO Rejects to MEE**(ZLD)**
2	Reactor & Floor Washings	20.0	Stripper, MEE with ATFD - Condensates to Bio ETP and RO RO Rejects to MEE**(ZLD)**
3	Scrubber	25.0	Stripper, MEE with ATFD - Condensates to Bio ETP and RO RO Rejects to MEE (**ZLD)**

4	QC and R&D	15.0	Stripper, MEE with ATFD - Condensates to Bio ETP and RO RO Rejects to MEE (**ZLD)**
5	DM/Softner (Regeneration)	25.0	Stripper, MEE with ATFD - Condensates to Bio ETP and RO RO Rejects to MEE (**ZLD)**
6	Solvent Recovery plant	20.0	Stripper, MEE with ATFD - Condensates to Bio ETP and RO RO Rejects to MEE (**ZLD)**
7	Boiler	32.5	Stripper, MEE with ATFD - Condensates to Bio ETP and RO
8	Cooling Towers	25.0	RO Rejects to MEE (**ZLD)**
9	Ro Back Wash	35.0	Stripper, MEE with ATFD - Condensates to Bio ETP and RO RO Rejects to MEE (**ZLD)**
10	Domestic	60.0	STP and used for gardening
11	Garment washings	10.0	STP and used for gardening
12	Gardening	Nil	--
13	Ash handling(Water sprinklers)	Nil	--
Total		**611.3**	

Effluents after treatment will be re-used for Ash handling, Cooling towers and for gardening

Characterization of industrial effluents from various sources is given below **Table 3.11**. Individual loads of products and consolidated loads are given at **Annexure I** (Given in separate volume) along with product information.

Table 3.11

Characterization of Loads

S.No	Sources	Wastewater (KL/day)	TDS (mg/l)	COD (mg/l)
1	Process	343.8	33450	33950
2	Reactor & Floor Washings	20.0	10,000	4500
3	Scrubber	25.0	10,000	4500
4	QC and R&D	15.0	8,000	3,500
5	DM/Softner (Regeneration)	25.0	15,000	2500
6	Solvent Recovery plant	20.0	25,000	10,000
7	Boiler	32.5	3,000	450
8	Cooling Towers	25.0	2,500	350
9	Ro Back Wash	35.0	1500	150
10	Domestic	60.0	1500	450
11	Garment washings	10.0	2600	600
	Total	**611.3**		

3.7.2 Emission sources

The point sources of emissions from the project are boilers, DG sets and Process reactors. Fugitive emission sources are from material handling systems. **Table 3.12** below quantifies emissions different sources and **Table 3.13** below quantifies emission from process.

Table 3.12

Quantities Emissions Different Sources

EXISTING SOURCES								
S. No	**Stack attached to**	**Stack**	**Dia of stack at top (m)**	**Temp.of exhaust gases ^oC**	**Exit velocity m/S**	**Pollutant Emission Rate gm/Sec**		
						PM	**SO2**	**NOx**
1*	27.5 TPH CFB	30	1.4	169	8.26	1.32	2.67	1.106
2*	8 TPH Coal Fired Boiler	30	1.0	121	4.05	0.6	0.48	0.29
3*	6 TPH Oil fired boiler	30	0.8	138	5.21	0.16	2.8	3.2
3**	1 x 1000 KVA DG Set	6.3	0.3	350	14.5	0.165	0.25	0.40
	6 x 750 KVA DG Set	5.5	0.3	350	7.5	0.125	0.21	0.38
	1 X 1010 KVA DG Set	6.3	0.3	380	15.1	0.175	0.28	0.45
PROPOSED EMISSION SOURCES								
1	39 TPH Husk/CFB	50	1.4	175	10.45	1.84	4.82	1.607
2**	3 x 750KVA DG Set	5.5	0.3	350	7.5	0.125	0.21	0.38
	4 x 1010 KVA DG Set	6.4	0.3	380	15.1	0.175	0.28	0.45

** shall be kept as standby*

*** DG set will be used during load shut down.*

Table 3.13

Process Emissions

S.No	Emissions	Qty Kgs/day	Control system
1	CO2	1071.05	Safely let out into environment
2	H2	159.2	Safely let into environment with suitable safety precautions
3	HCl	92.93	Scrubber
4	Butane	132.87	Scrubber
	Total	**1456.05**	

3.7.3 Solid wastes & Hazardous wastes

Following table summarises solid wastes are anticipated from the project. This includes hazardous and non-hazardous solid wastes and the proposed disposal mode

Table 3.14

Hazardous and Non-hazardous wastes & Disposal

S. No	Description of Waste	HW Category No. as per rules	Unit	Quantities		Disposal Option
				Current	After Expansion	
Disposal option						
1.	Forced Evaporation Salts	34.3	TPD	0.563	18.7	TSDF, HWMP, Dundigal
2.	Process Inorganic Salts	28.1	TPD	Not specified	2.82	TSDF, HWMP, Dundigal
3.	Sludge from waste water pre-treatment	34.3	TPD	Not specified	5.4	TSDF, HWMP, Dundigal

4	Process organic residues	28.3	TPD	0.480	10.59	Cement Units/TSDF, HWMP
5	Spent Carbon	28.2	TPD	0.244	1.06	Cement Units /TSDF, HWMP
6	Inorganic residue from solvent recovery	21.1	TPD	Not specified	2.0	TSDF, HWMP, Dundigal
7	Evaporation salts (Low TDS)	34.3	TPD	Not specified	0.5	TSDF, HWMP, Dundigal
8	Stripper waste	--	TPD	Not specified	1.2	TSDF, HWMP, Dundigal
9	Mixed Spent Solvents & Stripper Distillate	28.5	KLM	Not specified	80.0	Cement Unit
10	Solvents recovered from stripper & lab instruments	--	KLM	Not specified	20.0	Cement Unit/TSDF, HWMP, Dundigal
11	Detoxified Containers and Container Liners	33.3	TPM	Not specified	14.4	Sale after detoxification
12	Miscellaneous Wastes--Sparkler Filter Pads, Centrifuge Bags, FBD Bags, Nose Masks, Shoe Covers, Head Caps, Hand Gloves	--	TPM	Not specified	8.5	TSDF, HWMP and/or sale as scrap after decontamination
13	Miscellaneous Wastes Discarded Molecular Sieves/Ion-exchange resin	34.2	TPM	Not specified	2.5	TSDF, HWMP
14	Off specification raw materials/products	28.3	TPM	Not specified	2.0	TSDF, HWMP, Dundigal/ Cement Units
15	Used glass bottles from laboratories	--	TPM	Not specified	0.5	Recyclers after de-contamination

16	Garbage from premises	--	TPM	1.2	1.2	Composted
17	Packing material	--	TPM	1.0	1.0	Sold to recyclers
18	Used PPE	--	TPM	Not specified	0.6	Disposal to re-cyclers
19	Bio medical waste microbial culture	--	Kgs/ month	Not specified	300.0	After autoclaving disposed to authorized CBWMTF
20	Waste from first aid centre	--	Kgs/ month	Not specified	5.0	After autoclaving disposed to authorized CBWMTF
RECYCLING OPTION						
S.No	**Description of waste**	**Category**	**Units**	**Quantities**		Disposal
				Current	**Proposed**	
21	Used Oil/Waste Lubricating Oil	5.1	LPA	500.0	1000.0	Agencies authorized by APPCB
22	Used Lead Acid Batteries	--	Nos./ annum	5	50	Returned back to dealer/ Supplier
23	Boiler Fly Ash	--	TPD	25.0	78.0	Brick Manufacturers

3.8 Bulk Storages of chemicals

Storage of various chemicals for process requirement is required. Tank forms are currently established in the plant. Adequate storage facilities are in place for storage of raw materials, solvents, intermediates. Details are presented in the following table.

Table 3.15

Bulk Chemicals Storages

S.No	Name of the solvent/ chemical	No. Of tanks	Tank Capacity, KL	MOC	Total Capacity(KL)
1	Acetone	6	30	MS	170
			60.0	MS	
			60.0	MS	
			20.0	MS	
2	Chloroform	1	30.0	MS	30
3	Cyclohexane	3	60.0	MS	150
			30.0	MS	
			60.0	MS	
4	Dimethyl Formamide	2	60.0	MS	90
			30.0	MS	
5	Ethanol	2	30.0	MS	90
			60.0	MS	
6	Ethyl acetate	5	30.0	MS	180
			60.0	MS	
			30.0	MS	
			60.0	MS	
7	Hexanes	1	30.0	MS	30
8	Isopropyl Alcohol	3	30.0	MS	75
			30.0	MS	
			15.0	MS	
9	Methanol	5	20.0	MS	170
			30.0	MS	
			30.0	MS	
			30.0	MS	
			60.0	MS	

10	Methylene Chloride	5	60.0	MS	210
			30.0	MS	
			30.0	MS	
			30.0	MS	
			60.0	MS	
11	N-Butanol	2	30.0	MS	50
			20.0	MS	
12	Othoxylene	1	30.0	MS	30
13	Tetrahydrofuran	1	60.0	MS	60
14	Toluene	3	30.0	MS	60
			20.0	MS	
			10.0	MS	
15	Butyl acetate	1	15.0	MS	15
16	Tetrahydrofuran	1	30.0	MS	30

Chapter 4 : BASELINE ENVIORNMENT STATUS

4.1 Preamble

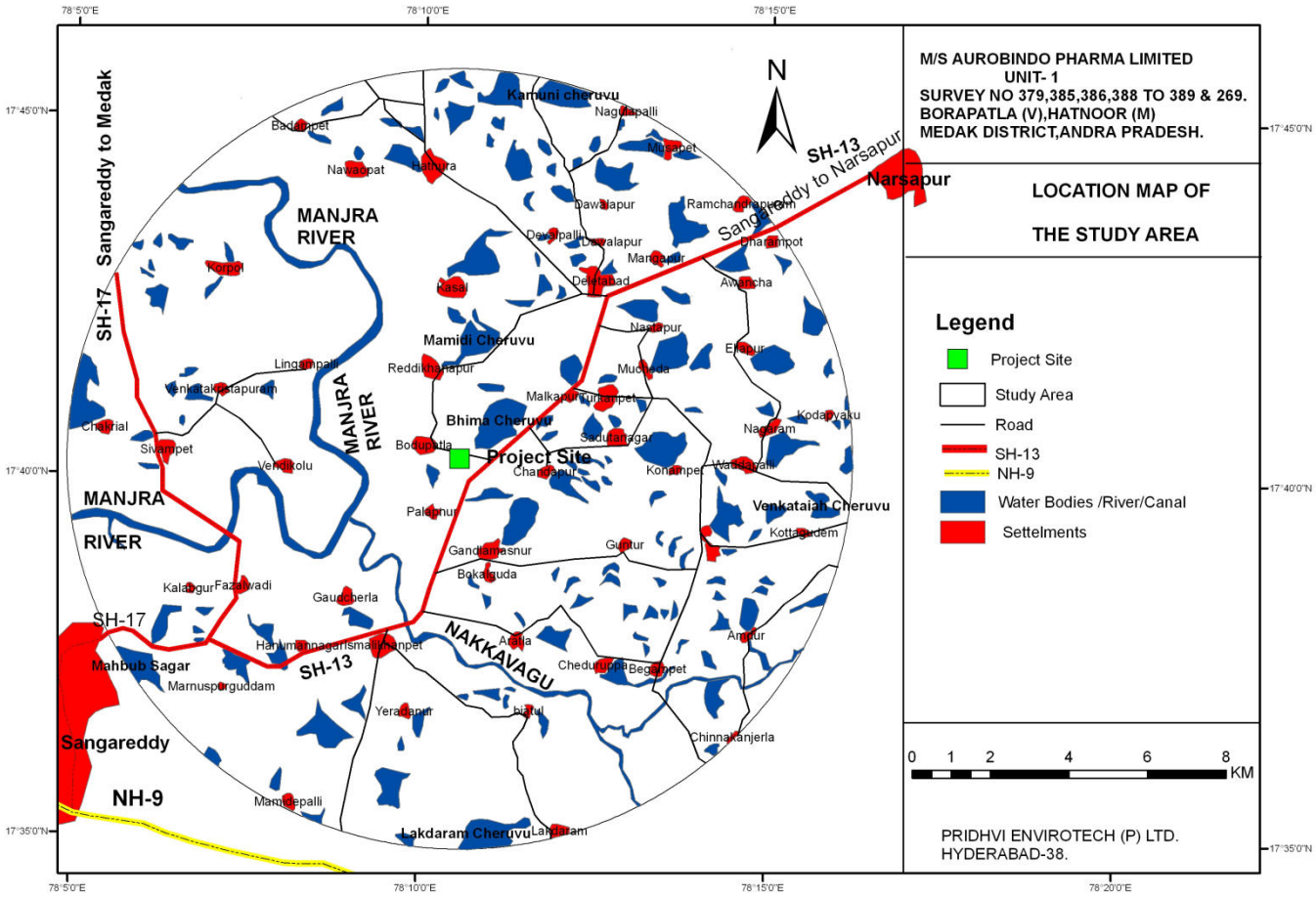
Collection of base line data is an integral aspect of the preparation of environmental impact assessment report. Baseline data reflects the present status of environment before the initiation of any activity of the proposed project. The possible effects due to the expansion of capacity of**M/s. Aurobindo Pharma Limited, Unit I** project are estimated and superimposed on the compiled baseline data subsequently to assess environmental impacts.

Baseline environment assessment was conducted in the impact zone of 10 km surrounding the site area during the months of October 2013 - December 2013. Studies were undertaken to generate baseline data of micrometeorology, air quality, water quality, noise levels, flora and fauna, land use, soil quality, and socio-economic status of the community were collected in a study area of 10 km radius surrounding the project site.

Base map of the area is given at **figure 4.1**

Figure 4.1

Base map of the Study Area



4.2 Land Environment

Land and soil constitute the basic components of the physical environment. The location of a pharma industry may cause changes in land, land use, soil and denudation processes in different intensities depending on the distance involved between the industry and the area. Land and soil may get intensely altered within the vicinity of 5 km radius and to a lesser extent up to 10 km radial distance.

4.2.1 Physiography

M/s. Aurobindo Pharma Limited is located at Sy. No. 379, 385, 386, 388 to 396 & 269, Borapatla(V), Hathnoora Mandal of Medak District in Telangana. The plant is about 0.56 Km away from the State Highway 13 between Sangareddy and Narsapur and the plant is about 0.5 Km away from the Borapatla Village. The Base map of the study area is given at **Figure 4.1.**

4.2.2 Geology &Geo-graphical set-up:

Aurobindo Pharma Limited Unit-I is situated to the East of Bodupatla village and to the South of Bhima Cheruvu tank bund and falls in Hathnura Part of Nakka Vagu watershed area, in the Manjira River Sub-basin of the Major River Godavari Basin**.** The projectsite is in the shape of a perfect rectangle with its longer side extending in East West direction bordering to the South of Borapatla village approach road. It is between Geographical coordinates of N17^{0}40'01" & N 17^{0}40'21" North Latitudes and 78^{0}10'19.8" E & 78^{0}10'43.8" East Longitudes and falls in the Survey of India Topographical Maps Nos 56/K/2/NE, 56/K/2/NW, 56 K/2/SW & 56/K/2/SE

4.2.3 Geological Features

The project site and its watershed area are underlain by the oldest geological formations of the Archaean Group Comprising the Granites. They are of igneous in origin crystalline in nature, coarse grained, comprising Quartz, Feldspar and Ferro-magnesium minerals. They are

hard and massive and generally resistant for weathering processes of mass denudation and destruction and stand out prominently on the surface as boulder, hills, raised grounds and inselbergs. Such boulder hills are at Ellapur village in the North Eastern part of watershed and dark colored huge grey granite blocks are found as surface out crops to the West of Borupatla village.

4.2.4 Topography and Surface Slope

The project site watershed area has gently undulating terrain with a series of natural wide depressions and raised grounds all sloping from East to West, towards the stream Nakka Vagu. The highest surface elevation in the East is about 530 meters Above Mean Sea Level (m AMSL) and lowest land elevation is about 500 m AMSL to the west near Nakka Vagu. The surface slope is about 30 meters in a distance of 20 km.

4.3 Hydrogeology

4.3.1 Drainage and Surface Hydrology

The drainage courses originating on the Eastern high grounds travel towards east following the surface slope and merge to form streams of higher order and thereafter, to move fast to reach the major drain Nakka Vagu. All the drainage courses are ephemeral in nature and carry large volumes storm water during rains. They are intercepted to store rainfall run-off in large and small irrigation ponds presenting a system of chain tanks of different dimensions covering entire watershed area. Large tanks of about 1.5 to 2 sq. km. in extent are at Villages Mucherla, Mamidi Cheruvu at Reddi Khanapur and Bhim Cheruvu at Bodupatla. All these tanks support irrigation during monsoon season.

4.3.2 General Factors influence hydro geological conditions:

Geomorphic features, Climate and Rainfall, Topography and Land Slope, Drainage pattern, Soils and Agricultural activities and ultimately the nature, thickness, distribution and structures of different geological formations, independently or collectively or in association with each other play a distinct role in the occurrence, movement, quality and availability of ground water.

Geographical set-up and Geomorphic features control, in a large measure the amount of precipitation that contributes to run off and ground water recharge. Dry conditions in arid and semi-arid climatic conditions results in large scale evaporation losses, promotes oxidation processes and results in the deep ground water level.

High rainfall contributes higher amounts of infiltration and deep percolation to recharge ground water. Development of land forms mainly depends upon the nature of the rocks, their resistance to erosion and the geologic structure, climatic conditions and vegetative cover.

Morpho-metric parameters such as drainage density and slope characteristics provide a basis for evaluation of run-off and ground water potentials of a drainage basin. Total drainage basin areal extent determines the total quantity of water available in a basin. A low network of drainage courses is indicative of the presence of highly resistant or highly permeable rocks on the surface. High drainage density characterizes hilly terrain and areas underlain by weak or impermeable rocks result in more run-off than infiltration. Low network drainage density corresponds to high infiltration rates.

Surface gradient has dominant effect on the contribution of rainfall to stream flows and to the ground water reservoir, in as much as, it controls the duration of overland flow, infiltration and sub surface flow. Slope condition controls the depth to water table, distribution of head and artesian pressures in aquifers.

Steep slope gives rise to coarse textured and permeable detrital materials, generally deposited in the form of alluvial cones, talus fans in foot hill zones. Highly permeable material in the steep may absorb and transmit as much water as poorly permeable formations in the plains.

Nature and thickness of soil directly influences the infiltration rate. Larger thickness enhances the deep percolation to recharge ground water and reduces evaporation losses from the zone of aeration. Vegetative cover and agricultural activities retard the overland flow rate and provides more

infiltration. Agricultural activities associated with furrowing, tilling and crop growth shall eventually bring change in the soil texture and the land surface. A part of water applied for crop growth reaches to ground water as return seepage.

From the ground water occurrence point of view the formations are categorized as hard rocks. Since the geological formations are of Igneous in origin, they lack primary porosity.

Secondary porosity is developed during physical disintegration and chemical decomposition from the different geological agents of weathering. Depth to weathered zone varies from place to place and situation to situation depending on several factors. They show large variation in short distances and are heterogeneous in nature.

4.3.3 GEO-HYDROLOGICAL STATUS OF THE AREA

Field investigation was undertaken to assess ground water situation in the Project Site and Water shed area. Rock out-crops were observed, Bore Wells were inventoried, water quality was determined. Shallow Water levels were measured using Embossed Steel Measuring Tape and deep water levels were measured using an Electrical Water Level Indicator. Quality of ground water in terms of its Specific Electrical Conductance values was measured by using a sensitive pocket type Electrical Conductivity Meter. The hydro-geological data of wells inventoried is shown in **Table–4.1** and location of wells is shown in the **Figure–4.2**

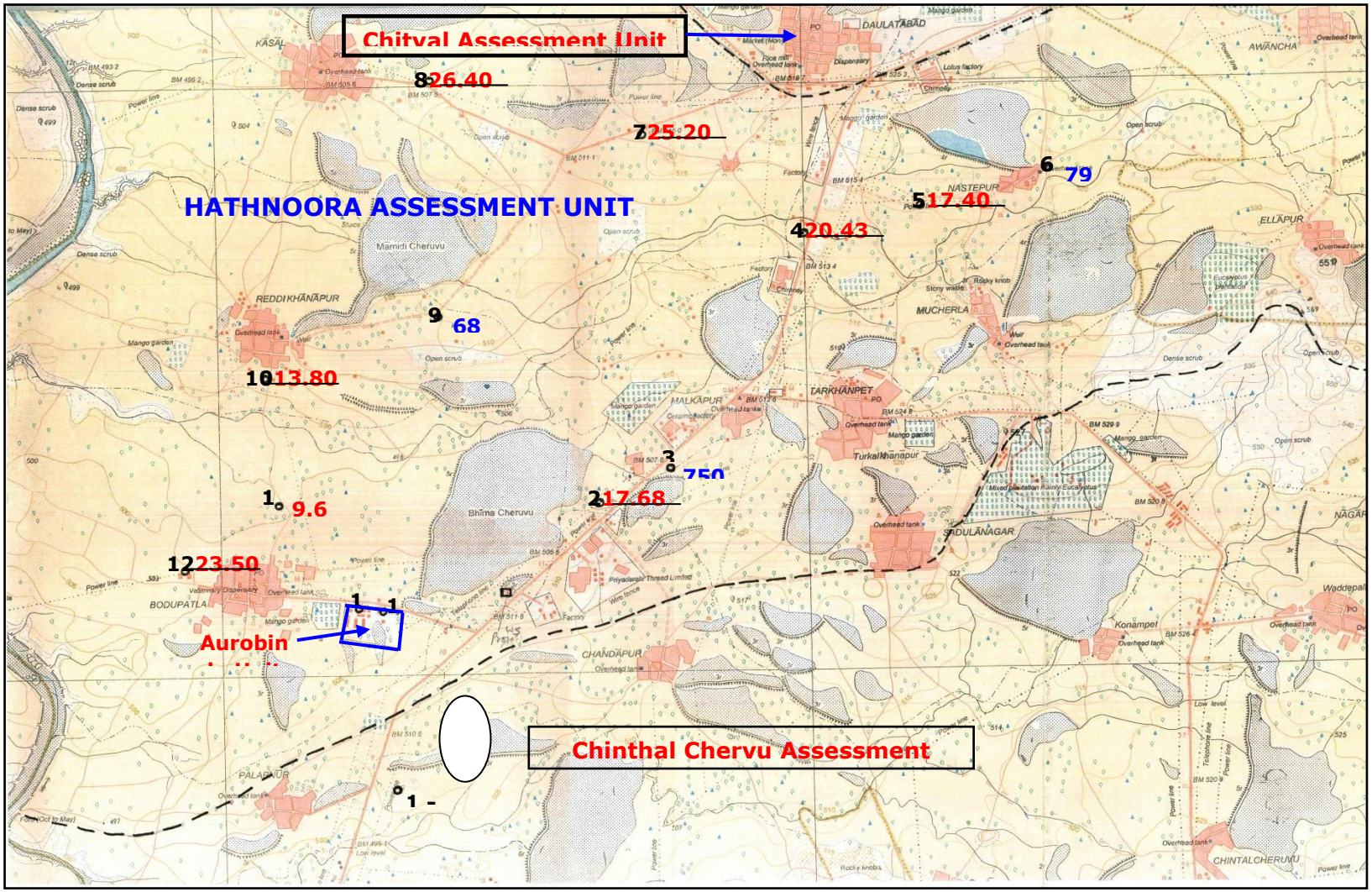
TABLE-4.1: HYDRO-GEOLOGICAL DATA OF BORE-WELLS IN HATHNURA WATERSHED PART OF AUROBINDO PHARMA LTD. UNIT-1,MEDAK DISTRICT TELANGANA

Sl. No.	Village	Location Details	Owner	Total depth (m)	Depth to water (m)	Pump dia & lowered depth	Water struck depth	Crops grown	E.C. micro-Siemens / cm at 25°c	Yield	Geology	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1.	Palpanur	100m E of main road at the village approach road.	Golla Kistaiah	80	Under opera-tion	2" dia 76 m	55	Two crops sugarcane & Paddy	800	Good yield	Coarse grained grey granite	Dug-wells are dry bore wells depth range 36-45 m in low ground
2.	Chandapur	50 m West of main road	Agarwal of Hyd.	60	17.68	2" dia 43	40	Mango and Chico	750	Good yield	Grey granite	Saline soil, compact poor growth of plants
3.	Malkapur	50 m East of main road	Narsimhu lu of Malkapur	70	Under pumping PWL 29 m	2" dia 55	55	Paddy two crops	690	Poor yield	Grey granite Massivat at Bottom	8 borewells dry in the western part.
4.	Malkapur	15 m West of main road near Laxmi Om Nursery	Private	80	--	2" dia 60	--	Paddy one crop	--	Low yield	Grey granite	Not in use at present
5.	Nastepur	Along approach road to village at road curve	Ramulam ma of Nastepur	91	17.40	2" dia 49	40	Paddy crop	720	Good yield	Grey granite	More no. of borewells in the tank Ayacut area
6.	Nastepur	Adj. to village to the east near overhead tank	R. Manik Reddy LIC	107	Under pumping	2" dia 55	80	Paddy two crops	790	Good yield	Grey granite Massivat at Bottom	Not decreases the yield

7.	Kasal	On way to Daulatabad near Rizwan Baba Darga	Shahbuddin	100	25.20	2" dia 43	37	Paddy	720	Low yield	Grey granite coarse grained	Recently drilled
8.	Kasal	500 m East of main road	Madhav Bala-krishna	86	26.40	2" dia 49	35	Paddy	460	Low yield	Grey granite	Another close borewell Motar struck-up
9.	Reddikhanapur	On the Daulatabad Road 3 km. from Kasal	Vadde Venkata Swamy & Swana-latha	91	Under pumping break in flow	2" dia 70	49	Paddy	680	Low yield	Grey granite	Drilled 6 bore-holes and are dry.
10.	Reddi Khanapur	South of village and West of approach road.	Hanumanthu Balappa	66	13.80	2" dia 50	45	Onion ID Crop	820	Poor yield	Grey granite	High ground low yield.
11.	Borupatla	West of approach road to village from Reddi khanapur	Srinivas Reddy	61	7.60	2" dia 45	35	Paddy two crops	--	Good yield	Grey granite	Ayacut area of Bhim Cheru
12.	Borupatla	West of village near Shivalayam	Private PCB 14	85.0	Under pumping PWL 23.8 m	2" dia 55	40	Vegetable on high ground	1990	Good yield	Grey granite	Rock out crops as boulders on Reddi Khanapur Road.
13.	Borupatla	Aurobindo Pharma Site Main Gate-2	Aurobindo Pharma PCB-I	N A	16.20	2" dia	N A	Industrial use	1330	Good yield	Grey granite	
14.	Borupatla	Aurobindo Pharma Site Main Gate-1	Aurobindo Pharma PCB-II	N A		2" dia	N A	Industrial use	-----	Good yield	Grey granite	

Fig 4.2

Location of wells in the study area



4.3.4 Ground Water Occurrence

Different de-gradational processes of physical disintegration and chemical decomposition of mass removal, continuously acting over millions of years on the rock formations, have brought out the present day land configuration in the area. The formations are coarse to medium grained, hard, and compact and lack original porosity to form potential aquifer zones at depth. They are heterogeneous and possess large variation in the mineralogical composition, degree of compaction with depth. So much so, their nature differs from point to point and place to place.

Occurrence, movement and quality of ground water associated chiefly depend on the topographic gradient and nature of formations. Ground water occurrence is limited to the top shallow weathered zone, contact planes, interconnected fissure zones developed during tectonic processes of deformation.

The formations are concealed under soil cover. The rock type, nature of formation with depth and weak zones associated are not easily identifiable in the field. Striking ground water, drilling and construction of successful bore-wells in the area is difficult and a challenging task. In hard rocks, ground water occurs only in the shallow weathered zone and inter-connected fissures and joints extending to a limited depth. Ground water is being extracted by means of bore wells.

4.3.5 Method of Construction and Depth of Wells:

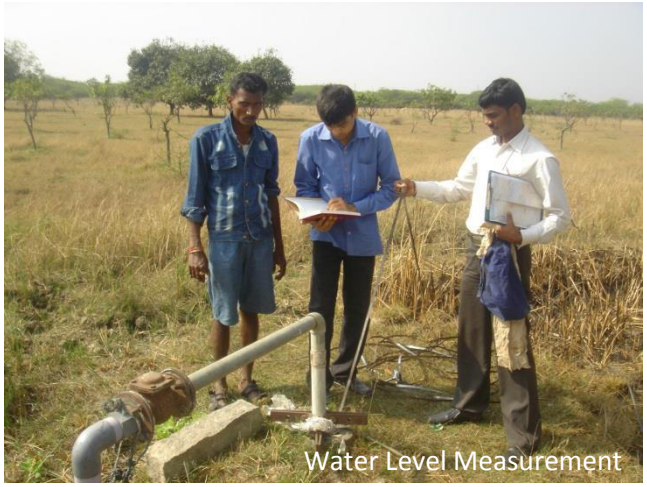
Extraction of ground water by means of open dug wells to meet both drinking and irrigation requirements were very much a common practice earlier. At present, Water Levels have fallen beyond the depth of Dug Wells. Construction of Dug Wells has become costlier and time consuming affair. With the advent of heavy duty, pneumatic, rotary cum percussion type, Down The Hole Hammer (DTH) fast drilling rigs, construction of Bore wells became very popular. The diameter of Bore Wells is 6". Generally drilling is terminated after striking ground water or after ascertaining that there is no chance of encountering potential zones at depth.

4.3.6 Ground Water Levels and Fluctuations

Ground water occurs under unconfined (Water table) condition in the interstices of near surface shallow weathered residuum. It also occurs under semi-confined to confined condition in the interconnected fissures, Joints and contact planes of hard rocks.

The depth to water level in the area is highly localized depending up on the natural rainfall water recharge conditions, return seepage from water applied for irrigation, topographic gradient and soils in the area. Shallow water level occurs in the topographic lows and deep water levels are in the areas of high surface relief. In the areas of heavy ground water draft there is general local lowering in ground water level as compared to the areas of less ground water extraction.

Deepest water level of about 25.20 m bgl is found between Daulatabad and Kasal villages. Shallow water levels of less than 7.6 m bgl are in the topographic lows, close to the irrigation tank ayacut area at Bodupatla Village. Majority of wells had water level range between 14 and 18 m bgl. The observed pumping water level in the wells fitted with energized submersible pump-sets at the pumping rate between 15 to 20 m^3/hr is found to be about 29 m bgl.



Water Level Measurement

Rainfall is the chief source of ground water recharge. Recharge to ground water takes place from ponds, irrigation sources, abandoned Dug Wells and also return recharge takes place from the water applied for irrigation. Depending on the distance from the surface water bodies, amount of

monsoon rainfall received, topography and soil conditions, and ground water recharge takes place through infiltration and deep percolation in each hydrological cycle. Maximum recharge takes place by the end of monsoon and water levels rise substantially by the end of October or November every year.

As the monsoon retreats, dry spell continues, ground water draft in the region for irrigation increases and ground water natural outflow from the base of drainage basin takes place, which cumulatively results in depletion of Ground Water Storage. Consequently, fall of water levels occur by the end of May or first week of June every year.

It is reported that pre and post monsoon water level fluctuation ranges are between 4 and 6 m in the watershed area.

4.3.7 Ground Water Gradient & Flow Pattern

After completely filling the voids and interstitial pore spaces, the ground water, either as a natural rejected recharge in the form of out flow discharge from any watershed / basin or under forced conditions of ground water draft, it always moves continuously from higher level to lower elevation. Watershed land slope is 530 m AMSL in the East and it is 500 m AMSL in the West and the elevation difference is 30 meters in a distance of about 20 Km. Ground water level is found almost parallel to ground surface.

4.4 Climate and Rainfall

The Project site falls in the Deccan Plateau region and the area experiences Semi-arid monsoon type of climatic conditions. Nearest Meteorological Station is at Hyderabad maintained by the India Meteorology Department. State Government also maintains rain gauge stations in each Mandal Head Quarters. The minimum and maximum normal rainfall of the Medak District respectively is 635 mm and 1036 mm and district normal annual rainfall is 933 mm. Maximum rainfall takes place during South-West monsoon season between Junes to September. Small amounts of rainfall also occur during October to December from North-East Monsoon and also through convection precipitation during March to May.

March to May constitutes summer season and December to January is the winter season. Temperatures rise from Middle of February and reach to Maximum of about 40° by the end of May. With the onset of monsoon, temperatures decrease and reach to a minimum of 14° during Winter Nights.

4.5 Anthropogenic Activities

The area being close to Hyderabad, major and medium industries have been set-up in the Watershed area, along the road between Palpanur and Daulatabad. Ground water is being extracted by means of Bore-wells to meet the industrial requirements. Manjira Water Supply Scheme from Kalpagor dam constructed at Singur on Manjira River passes along the Daulatabad main road which mainly caters to the Gajwel Town area. Protected water supply schemes are provided from this source to some of the nearby on-way villages. Bore-wells have been constructed to meet the drinking water requirements and agricultural demands. Bore-wells are fitted with energized submersible pumps provided with free power supply of Government.

4.6 Soils

Most of the Watershed area is covered by block cotton soils of thickness varying from one to 2 meters. Generally they are fertile and productive. In the low land depressions the soils have become saline, and there is subdued growth of orchards and having luxuriant growth of Prosopia species. A major part of watershed area is under rain-fed agriculture. Substantive portion of the area is under irrigated agriculture under irrigation tanks during Khariff season. Paddy is grown from surface water source under tanks. Sugarcane and paddy are grown under Bore-wells from ground water source during Rabi season in certain areas.

The Soil characteristics include both physical and chemical parameters. Soil survey was carried out to assess the soil characteristics of the study area. Representative soil sampling was done at several important locations and these locations are

shown in **Figure 4.3**. Analytical data of soil samples is presented in **Table 4.2**

Figure 4.3
Soil sample locations

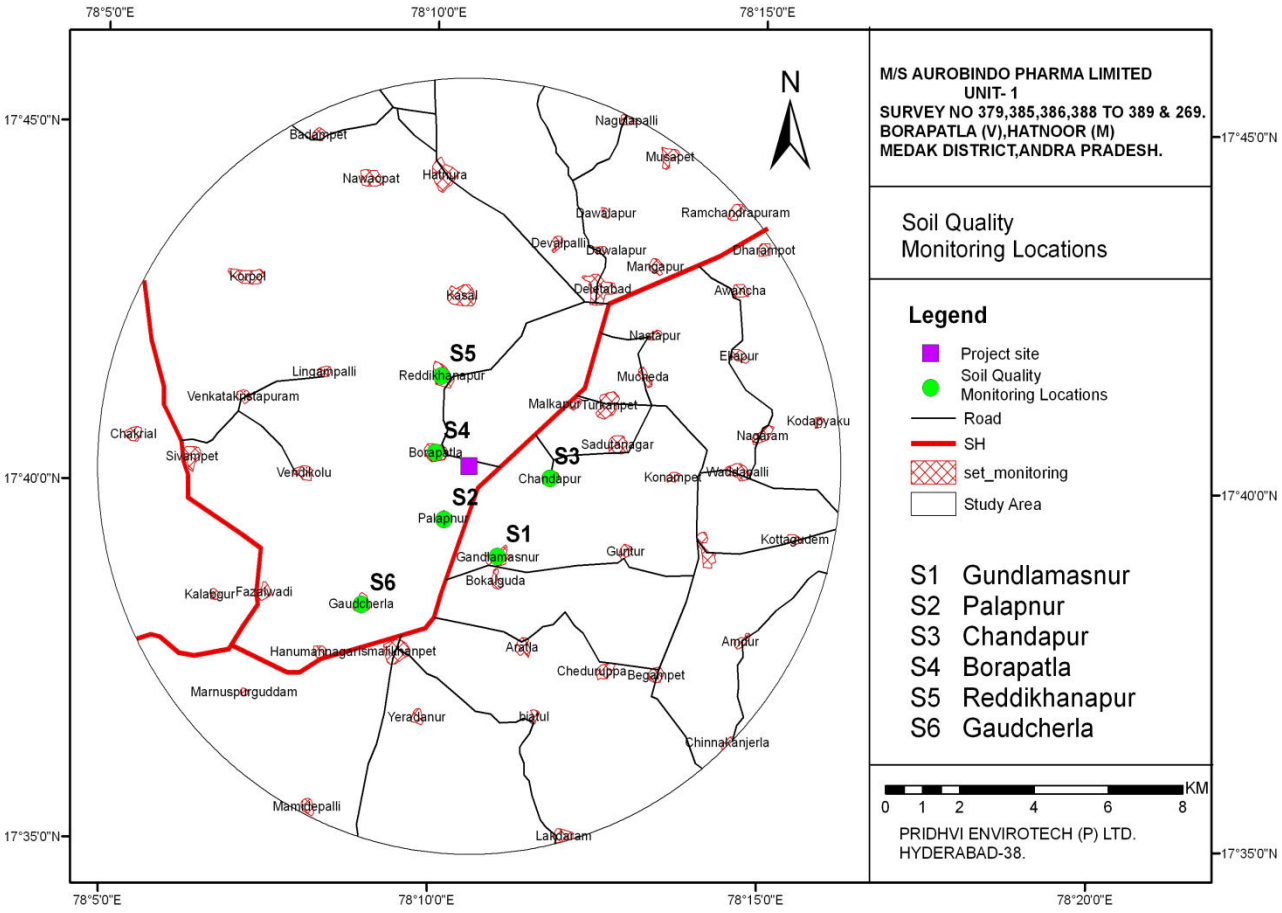


Table 4.2
Soil Analysis data

Date of Collection: 11-11-2013								
S.No.	**Parameters**	**Unit**	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**
1	*pH (Soil water extract)*		7.24	7.36	7.81	7.03	7.5	7.62
2	*E.C (Soil water extract)*	*µmhos/cm*	640	551	365	456	624	490
3	Nitrogen	mg/Kg	19.19	25.89	27.23	20.98	29.01	25
4	Bulk Density	g/cc	1.35	1.54	1.82	1.54	1.43	1.43
5	Infiltration rate	mm/hour	18	25	12	9	8	19
6	Porosity	%	48	42	31	42	46	46
7	Moisture	%	7.85	5.96	9.77	8.06	10.72	10.24
8	Cation-Exchange capacity(CEC)	meq/100gm	6.15	5.17	1.57	7.82	4.05	3.09
9	Organic Matter	%	1.2	2.0	3.1	1.0	1.6	1.6
10	Phosphorous (as P)	Kg/ha	0	790	919	931	0	730
11	Carbonates	%	Nil	Nil	Nil	Nil	Nil	Nil
12	Potassium (As K^+)	mg/Kg	245	400	816	3866	144	296
13	Sodium(as Na)	ppm	138	112	97	145	86	91
14	Calcium (as Ca)	ppm	195	148	136	172	129	124
15	Magnesium (as Mg^{2+})	ppm	84	69	73	81	65	70
16	Chlorides (as Cl)	ppm	162	130	115	126	145	138
17	Organic Carbon	%	0.41	0.58	0.62	0.45	0.53	0.56
18	Texture		Sandy loam	sandy loam	Silt Loam	Clay Loam	Clay Loam	Silt Loam
	a) Sand %	%	38.20	36.70	33.60	39.40	37.30	35.60
	b) Silt %	%	49.50	45.10	52.40	47.30	56.20	51.80
	c) Clay %	%	12.30	18.20	14.0	13.30	6.50	12.60

19	Sodium Absorption ratio	%	1.812	1.90	1.66	3.11	1.542	1.61
20	Aluminium(as Al)	mg/Kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
21	Arsenic(as As)	mg/Kg	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
22	Boron(as B)	mg/Kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
23	Cadmium(as Cd)	mg/Kg	<0.002	0.02	0.02	0.02	<0.002	<0.002
24	Chromium(as Cr)	mg/Kg	0.10	0.29	0.16	0.24	0.15	0.31
25	Copper(as Cu)	mg/Kg	0.10	1.6	1.3	1.9	0.5	1.6
26	Iron (as Fe)	mg/Kg	61	57	55	54	56	52
27	Lead (as pb)	mg/Kg	0.16	0.36	0.28	0.45	0.14	0.40
28	Manganese(as Mn)	mg/Kg	1.2	1.8	0.4	1.3	1.6	1.9
29	Mercury (as Hg)	mg/Kg	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
30	Nickel (as Ni)	mg/Kg	0.19	0.08	0.07	0.03	0.13	0.12
31	Selenium(as Se)	mg/Kg	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
32	Silver (as Ag)	mg/Kg	0.47	0.08	0.08	0.09	0.16	0.01
33	Zinc (as Zn)	mg/Kg	0.12	1.20	1.02	1.34	0.06	0.49
34	Available Phosphorous as P_2O_5	mg/Kg	4.91	7.14	8.05	5.80	9.37	7.58
35	Available Potassium K_2O	mg/Kg	30.83	46.42	0.49	42.85	52.67	50.44
36	Base Saturation	%	1.09	1.046	3.25	0.82	1.1	1.80
37	Ca/Mg Ratio	%	2.32	2.14	1.86	2.12	1.98	1.77
S1-Gundlamasanoor, S2- Palanpur, S3-Chandapur, S4-Borapatla, S5- Reddy Kanapur, S6-Goudicherla								

The test results of soil samples collected in the impact area are interpreted referring to the book; "Interpreting soil test results". The reference tables are presented in **Table 4.3.** The pH of soil samples ranges from slightly acid to mildly alkaline. The cation exchange capacity of the soils is very low to Low, contributed mainly by sodium exchangeable ions. The level of nitrogen of the samples is low to Medium the potassium levels are high to excessive. The base saturation of the samples is predominantly very Weakly Leached (three samples), strongly leached (two samples), moderately leached (two samples) and Weakly Leached (one sample). The calcium magnesium ratios of the samples reflect calcium low in all samples. Bulk density of soil of impact varies from 1.35 – 1.82 g/cc and soils are sandy loams(Two sample), Silty loams (in two samples) and clay loams(two samples).

Table 4.3 Soil Test Results – Reference Tables

General interpretation of pH measured		
pH	**Range**	**Classification**
	<4.5	Extremely Acidic
	4.51 - 5.0	Very Strong Acidic
	5.1-5.5	Strong Acid
	5.6- 6.0	Moderately Acid
	6.1-6.5	Slightly acid
	6.6-7.3	Neutral
	7.4-7.8	Mildily Alkaline
	7.9 -8.4	Moderately Alkaline
	8.5-9.0	Strongly Alkaline
	>9.0	Very Strongly Alkaline

Source:Bruceand Rayment (1982).

Rating for Cation exchange Capacity	
	CEC (Cmol)+)/kg
Very low	<6 *
Low	6-12
Moderate	12-25
High	25-40
Very High	>40

Source: Metson (1961)

* Soils with CEC less than three are often low in fertility and susceptible to soil acidification.

Ca/mg Ratio	
	Description
<1	Ca Deficient
1-4	Ca (Low)
4-6	Balanced
6-10	Mg (Low)
>10	Mg deficient

Source: Eckert (1987)

Base Saturation as a criterion of leaching	
Range (%BS)	**Rating**
70-100	Very Weakly Leached
50-70	Weakly Leached
30-50	Moderately Leached
15-30	Strongly Leached
0-15	Very Strongly Leached

Source: Metson (1961)

Rating of Total Nitrogen	
Rating (% by Weight)	**Description**
<0.05	Very low
0.05-0.15	Low
0.15-0.25	Modium
0.25-0.50	High
>0.5	Very High

Source: Bruce and Rayment (1982)

Extractable Potassium (K)	
	K
low	<150 ppm* (< 0.4 meq/100 g soil)
medium	150–250 ppm (0.4–0.6 meq/100 g soil)
high	250–800 ppm (0.6–2.0 meq/100 g soil)
excessive	>800 ppm (>2.0 meq/100 g soil)

Source: Abbott (1989)

4.7 Water Environment

The industrial development of any region is contingent on the availability of sufficient water resources, as most of the process industries would require water for process or cooling purposes. The potential for exploitation of ground water resources increases as development of new projects increases in industrial and

agricultural areas. With the increasing industrialization and urbanization the possibilities of contamination of surface water and ground water sources are rapidly increasing. The water resources in the area broadly fall into following categories:

1. Surface Water resources: Streams and ponds, etc.
2. Ground Water resources: Accumulation in deeper strata of ground.

4.7.1 Surface Water Resources

4.7.1.1 Surface Water Quality

Manjeera River and Nakka vagu are main surface water bodies in the region, representative water samples were collected from both these sources and analyzed according to the surface water standards; IS: 2296-1982.Also water samples were collected and analyzed from adjacent water bodies on Eastern and Western sides of the site. The representative surface water sampling locations are shown in **Figure 4.4** and analysis results are presented in **Table 4.4.** The analysis results show that the water from the area is predominantly clean and meets the prescribed standards.

Fig 4.4 Location map of Surface water Samples

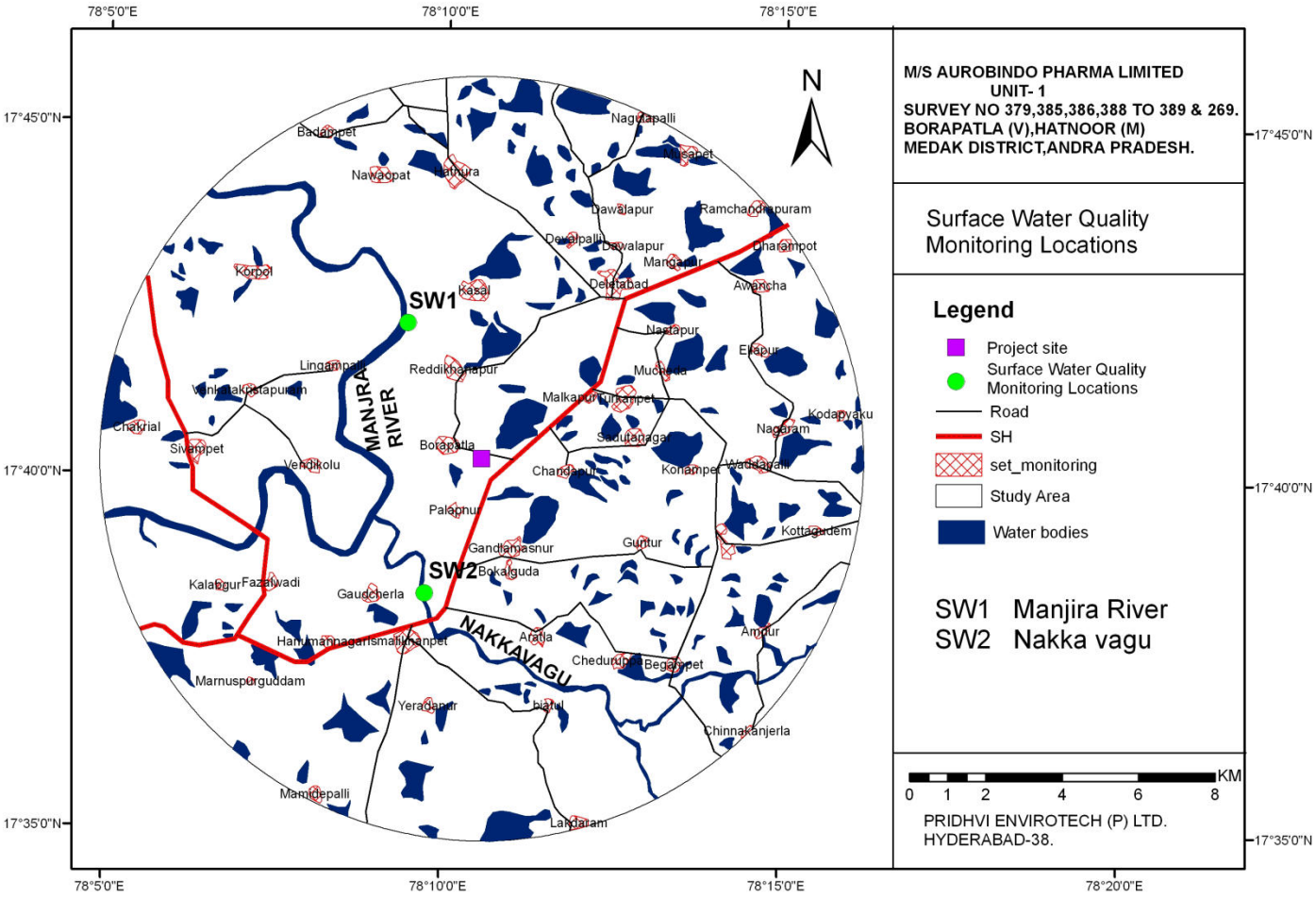


Table 4.4 Surface water quality

Date of sample 11.11.2013						
S.No.	**PARAMETER**	**Units**	**SW1**	**SW2**	**SW3**	**SW4**
1	Color	Hazen Units	Nil	6	05	06
2	Odour	-	Agreeable	Agreeable	Disagreeable	Disagreeable
3	Turbidity	NTU	0.30	0.90	1.2	0.95
4	pH		7.26	7.38	7.21	7.6
5	E.C	micromhos/cm	384	467	1250	1125
6	Total dissolved solids	mg/lit	215	290	890	790
7	Phenolphthalein alkalinity as CaCo3	mg/lit	Nil	20	Nil	Nil
8	Methyl orange alkalinity as CaCo3	mg/lit	104	149	485	461
9	Total alkalinity as CaCo3	mg/lit	104	169	485	461
10	Total hardnes as CaCo3	mg/lit	116	152	575	546
11	Calcium as Ca	mg/lit	29	36	148	163
12	Magnesium as Mg	mg/lit	10.57	15.07	49.82	33.66
13	Sodium as Na	mg/lit	34	37	133	126
14	Potassium as K	mg/lit	1.21	1.56	8.35	7.93
15	Copper as Cu	mg/lit	0.07	0.04	0.29	0.32
16	Iron as Fe	mg/lit	0.13	0.16	0.51	0.70
17	Manganese as Mn	mg/lit	<0.01	0.04	0.08	0.12
18	Chlorides as Cl	mg/lit	31	37	176	167
19	Sulphates as SO4	mg/lit	17	23	110	104
20	Nitrates as NO3	mg/lit	5.0	15.0	35.3	33.6
21	Flourides as F	mg/lit	0.42	0.46	1.42	1.65
22	Phenolic compounds as C6H5OH	mg/lit	<0.001	<0.001	0.03	0.05
23	Mercury as Hg	mg/lit	<0.001	<0.001	0.004	0.008
24	Cadmium as Cd	mg/lit	<0.01	<0.01	0.15	<0.01
	SW1 Manjeera River, SW2 Nakka Vagu (at the place of origin), SW3 Narati kunta, SW4 Kamasani kunta					

Quality of water is assessed based on IS 2296-1982as per the results the water of Manjeera and Nakka vagu comes under class A. Water of Narati kunta and Kamasani kunta comes under class C

4.7.2 Ground Water Resources

Ground water is the accumulation of water below the ground surface, caused by rainfall and its subsequent percolation through pores and crevices. Percolated water accumulates till it reaches impervious strata consisting of confined clay or confined rocks. Occurrence of ground water is controlled by landform, structure and lithology.

Ground water abstraction is by means of dug wells, dug cum driven wells, and bore wells. Ground water resources are ample in the study area. Every village has a number of traditional wells large and small. The state authorities have also provided tube wells fitted with hand pump for the drinking water requirement of villages in the study area. Presently the drinking water needs are mostly met from the ground water resources.

4.7.3 Quality of Ground Water

The quality of ground water occurring in the geological formations in the study area is generally good in most of the areas. The representative samples are collected from various dug wells and bore wells in the study area. The analytical results of water samples drawn from various locations in the study area are presented in **Table 4.5.** The map showing the locations of ground water sample collection is **Figure. 4.5.**

Qualityground water in the surrounding bore wells are tested. Bore wells are used for agricultural purpose. The analysis results show that the quality of ground water meets the requirement for agriculture.

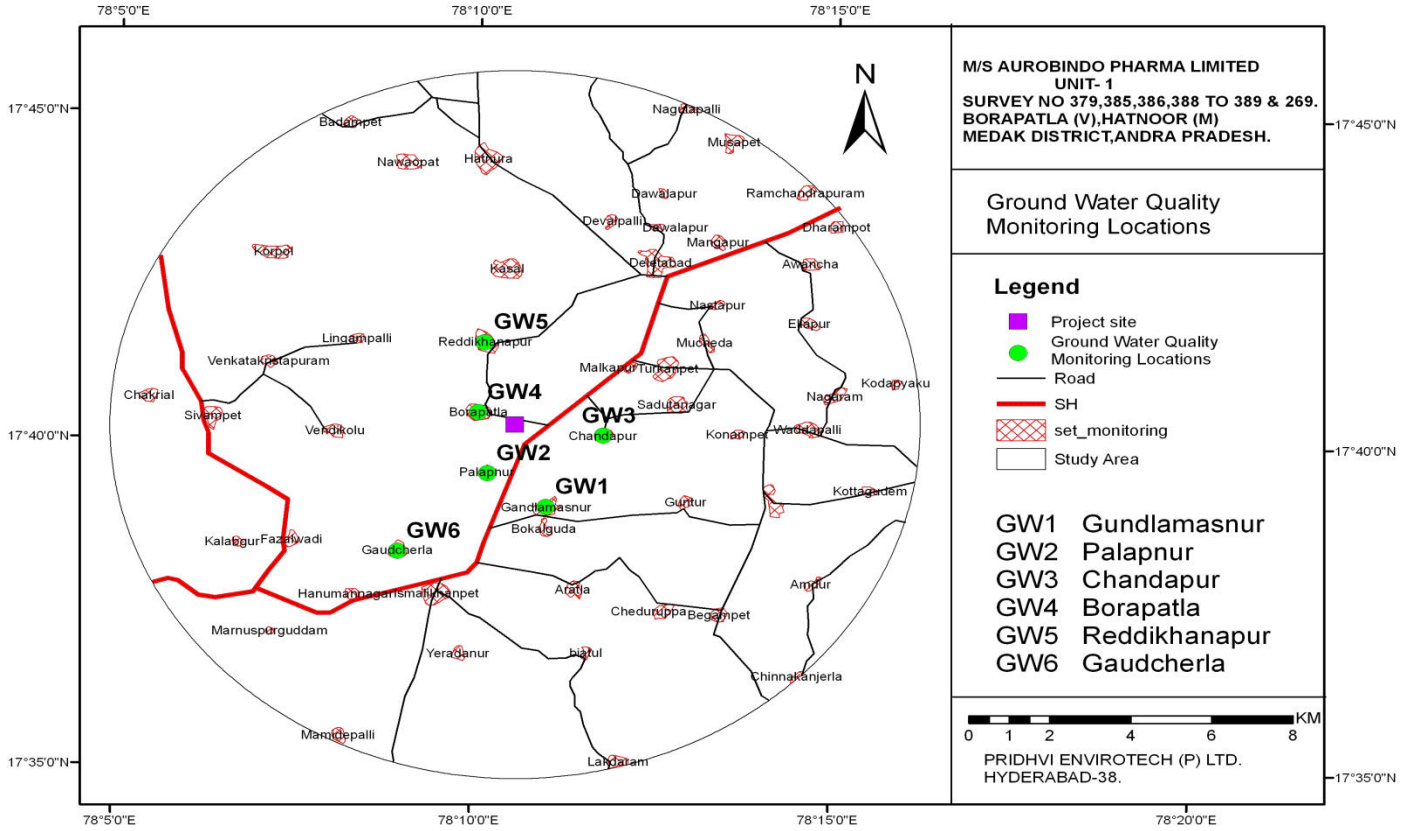
Table 4.5 Water Analysis Data (Ground water)

Date of Sampling 11.11.2013								
S.No.	**PARAMETER**	**GW1**	**GW 2**	**GW 3**	**GW 4**	**GW5**	**GW6**	**Method of Analysis**
1	Color (Hazen units)	1	3	2	3	4	2	IS:3025 part 0.4:1983
2	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	
3	Turbidity (NTU)	0.20	0.10	0.40	0.80	0.30	0.60	IS:3025 part 10:1984
4	pH	8.05	7.96	8.12	7.44	7.18	7.50	IS:3025 part 11:1983
5	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	
6	E.C (micromhos/cm)	863	992	587	1269	1181	948	
7	Total dissolved solids	550	638	360	825	760	602	IS:3025 part 16:2006
8	Phenolphthalein alkalinity as CaCo3	Nil	Nil	Nil	Nil	Nil	Nil	
9	Methylorange alkalinity as CaCo3	290	334	197	227	212	169	
10	Total alkalinity as CaCo3	290	334	197	227	212	169	IS:3025 part 23:2006
11	Total hardness as CaCo3	160	258	109	478	445	357	IS:3025 part 21:2002
12	Calcium as Ca	52	74	38	83	75	60	IS:3025 part 40:2004
13	Magnesium as Mg	7.3	17.74	3.40	65.74	62.59	50.31	IS:3025 part 46:2003
14	Sodium as Na	123	101	84	70	65	52	IS:3025 part 45:2003
15	Potassium as K	2.9	13.61	1.98	2.66	2.47	1.96	IS:3025 part 45:2003
16	Copper as Cu	0.05	0.06	**0.03**	0.08	0.12	0.09	IS:3025 part 42:2004
17	Iron as Fe	0.14	0.17	0.11	0.19	0.25	0.22	IS:3025 part 53:2003
18	Manganese as Mn	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	IS:3025 part 59:2006

19	Chlorides as Cl	46	53	31	181	169	135	IS:3025 part 32:1988
20	Sulphates as SO4	68	78	46	138	129	103	IS:3025 part 24:1986
21	Nitrates as NO3	6.50	7.40	4.50	9.45	8.61	7.0	IS:3025 part 34:1999
22	Flourides as F	0.52	0.70	0.49	0.6	0.92	1.14	IS:3025 part 60:2008
23	Phenolic compounds as C6H5OH	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
24	Mercury as Hg	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	IS:3025 part 48:2003
25	Cadmium as Cd	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	IS:3025 part 41:2003
26	Aluminum as Al	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	IS:3025 part 55:2003
27	Barium as Ba	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
28	Boron as B	0.13	0.15	0.1	0.18	0.21	0.16	IS:3025 part 57:2005
29	Selenium as Se	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	IS:3025 part 56:2003
30	Cyanide as CN	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	IS:3025 part 27:1998
31	Lead as Pb	0.02	0.04	<0.01	0.05	0.10	0.21	IS:3025 part 47:2003
32	Zinc as Zn	0.09	0.15	0.08	0.12	0.29	0.46	IS:3025 part 49:2003
33	Anionic Detergents as MBAS	Absent	Absent	Absent	Absent	Absent	Absent	
34	Free Residual Chlorine	Nil	Nil	Nil	Nil	Nil	Nil	IS:3025 part 26:2004
35	Pesticides	Absent	Absent	Absent	Absent	Absent	Absent	
36	Silver as Ag	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
37	Mineral Oil	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	G.C Method
38	Total Chromium as Cr+6	<0.01	<0.01	<0.01	0.03	0.02	<0.01	IS:3025 part56:2003
39	Polynuclear aromatic Hydrocarbons as PAH		Absent	Absent	Absent	Absent	Absent	

Bacteriological Parameters								
1	Total Plate Count/ml	84	72	65	86	81	94	
2	MPN of Coliform/100ml	1	2	Absent	4	3	12	
3	MPN of E-Coli/100ml	Absent	Absent	Absent	Absent	Absent	Absent	
	GW1 Gundlamasnur, GW2 Palapnur, GW3 Chandapur, GW4 Borapatla, GW5 Reddikhanapur, GW6 Gaudcherla							
	Note: All values expect pH are expressed in mg/lit							

Fig 4.5 Location map of Ground water Samples



4.8 Air Environment

4.8.1Meteorology

Micro meteorological studies are simultaneously conducted with the air quality monitoring. Meteorology plays a vital role in effecting the dispersion of pollutants, once discharged into the atmosphere, their transport, dispersion and diffusion into the environment. The meteorological data is very useful for interpretation of the baseline information and for model study of air quality impacts "also. Since meteorological data show wide fluctuations with time, meaningful interpretation can only be drawn from long term and reliable data. Such source of data is the India Meteorological Department (IMD) that maintains a network of meteorological stations at several important locations.

4.8.2 Meteorological Data for IMD Station

The data recorded at IMD station Medak is presented in Table 4.6. Salient features of the summarized data are as follows;

1. Wind Direction and Speed: Wind speed and direction have a significant role on the dispersion of atmospheric pollutants and therefore, the air quality of the area. Ground level concentrations for the pollutants are inversely proportional to the wind speed in down wind direction while in upwind direction no effect will be observed and in cross wind directions partial effect due to the emission sources is observed. The Climatological table of Medak IMD station from 1979-2000 is given under **Table 4.6.** Mean wind speeds are observed to be the highest in the months of June and July (5.6 – 6.3 kmph) and lowest in the months of October to January (1.3 – 1.6 kmph).

- Calm period is highest in the months of October to January.

- June to August may be considered as windy months with very low calm conditions.
- Most predominant wind directions for the months November to January are NE, E and SE.

2. Temperature: The following observations can be made from the **Table 4.8.**

- The Maximum and Minimum Temperatures in the months of November to January are 29.6 and 13.9 ^{O}C
- Differences in maximum and minimum daily temperatures remain, in general, less than 20 °C for the whole year.
- Variations in minimum and maximum temperatures and also during different months of the year reflect semi arid temperature environment.

3. **Humidity**: Moisture in the atmosphere changes the nature and characteristics of the pollutants. Fog provides surface area for suspended particles to coalesce and also enhances chemical reaction of the gaseous pollutants. The following observations can be made from the recorded data.

- The morning relative humidity (RH) attains the maximum in the month of July to August (82 % RH) and a minimum in the month of March (49% RH).
- The evening humidity attains the maximum in the month of August (72% RH) and a minimum in the month of April (25% RH).
- Variations in the relative humidity throughout the year reflect the tropical semi arid climate.

4. **Rain Fall**: The rainy season in the area extends June to October. The average total rainfall in a year 988 mm.

4.8.3 Micro Meteorological Station at Industry Site

The micro meteorological data at the industry site is collected simultaneously with the ambient air quality monitoring. The station was installed at height of 10 meters above the ground level and the same is located in such a way that there are no obstructions facilitating free flow of wind. Wind speed, wind direction, humidity and temperature is recorded on hourly basis from November 2013 – December,2013. A salient feature of micro meteorological data collected is as follows:

1. **Wind Direction and Speed**: The hourly wind speed and wind direction observations are computed and the same are presented in **Table 4.6** and the wind rose diagrams are presented in **Figure 4.6.** The following observations can be made from the collected data;
   - Calm period is observed to be 66.80% during the time of monitoring.
   - The predominant wind directions are ENE, E and SE with 5.35%, 4.69% and 4.69% respectively.
   - Followed by NE, ESE and SSE with 3.75%, 3.61% and 2.81% respectively.
   - Mostly the wind speeds are observed to be in the range of 1-5 kmph and 5-10 kmph.
2. **Temperature:** It may be noted that the daily temperature variations were: maximum temperature 28.3 °C to 32.8 °C and minimum temperaturesrange from 13.6 °C to 19.1 °C.
3. **Humidity:** The daily relative humidity values are observed to range between 19 to 98.4 %.
4. **Rain fall**: Rainfall was observed for the period and the total rainfall is 2.5 mm.

Table 4.6 Frequency Distribution of Wind Speeds and Wind Directions

Directions / Wind Classes (m/s)	0.5 - 2.1	2.1 - 3.6	3.6 - 5.7	5.7 - 8.8	8.8 - 11.1	>= 11.1	Total (%)
N	0.94	0.00	0.00	0.00	0.00	0.00	**0.94**
NNE	1.88	0.40	0.00	0.00	0.00	0.00	**2.28**
NE	3.22	0.54	0.00	0.00	0.00	0.00	**3.75**
ENE	3.89	1.47	0.00	0.00	0.00	0.00	**5.35**
E	3.62	1.07	0.00	0.00	0.00	0.00	**4.69**
ESE	2.82	0.80	0.00	0.00	0.00	0.00	**3.61**
SE	4.16	0.54	0.00	0.00	0.00	0.00	**4.69**
SSE	1.88	0.94	0.00	0.00	0.00	0.00	**2.81**
S	0.13	0.13	0.00	0.00	0.00	0.00	**0.27**
SSW	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
SW	0.27	0.00	0.00	0.00	0.00	0.00	**0.27**
WSW	0.27	0.00	0.00	0.00	0.00	0.00	**0.27**
W	0.00	0.67	0.00	0.00	0.00	0.00	**0.67**
WNW	0.13	0.40	0.00	0.00	0.00	0.00	**0.54**
NW	1.21	0.13	0.00	0.00	0.00	0.00	**1.34**
NNW	1.47	0.13	0.00	0.00	0.00	0.00	**1.61**
Sub-Total	25.84	7.23	0.00	0.00	0.00	0.00	**33.07**
Calms							**66.80**
Missing/Incomplete							**0.13**
Total							**100.00**

5. Inversion heights and Mixing heights of the study area:

Temperature inversion layers, also called thermal inversions or just inversion layers, are areas where the normal decrease in air temperature with increasing altitude is reversed and air above the ground is warmer than the air below it. Inversion layers can occur anywhere from close to ground level up to thousands of feet into the atmosphere.

Inversion layers are significant to meteorology because they block atmospheric flow which causes the air over an area experiencing an inversion to become stable. This can then result in various types of weather patterns. More importantly though, areas with heavy pollution are prone to unhealthy air and an increase in smog when an inversion is present because they trap pollutants at ground level instead of circulating them away.

Topography can also play a role in creating a temperature inversion since it can sometimes cause cold air to flow from mountain peaks down into valleys. This cold air then pushes under the warmer air rising from the valley, creating the inversion.

Mixing Height" or "Mixing Depth" (ft or m) signifies the height above the surface throughout which a pollutant such as smoke can be dispersed. During times of surface temperature inversions (typically night time with clear skies), the mixing height goes to zero and smoke dispersion is minimal.

As the site specific mixing height is not available USEPA approved general mixing heights as applicable for Industrial Source Complex (ISC) model have been considered for modeling to establish the worst case scenario. The mixing heights considered for modeling is given **Table 4.7**

Table 4.7

Mixing Heights Considered for Computations

Stability Class	Mixing Height (m)
A	1300
B & C	900
D	750
E & F	400

Figure 4.6 Wind Rose Diagram for 00-24 hrs

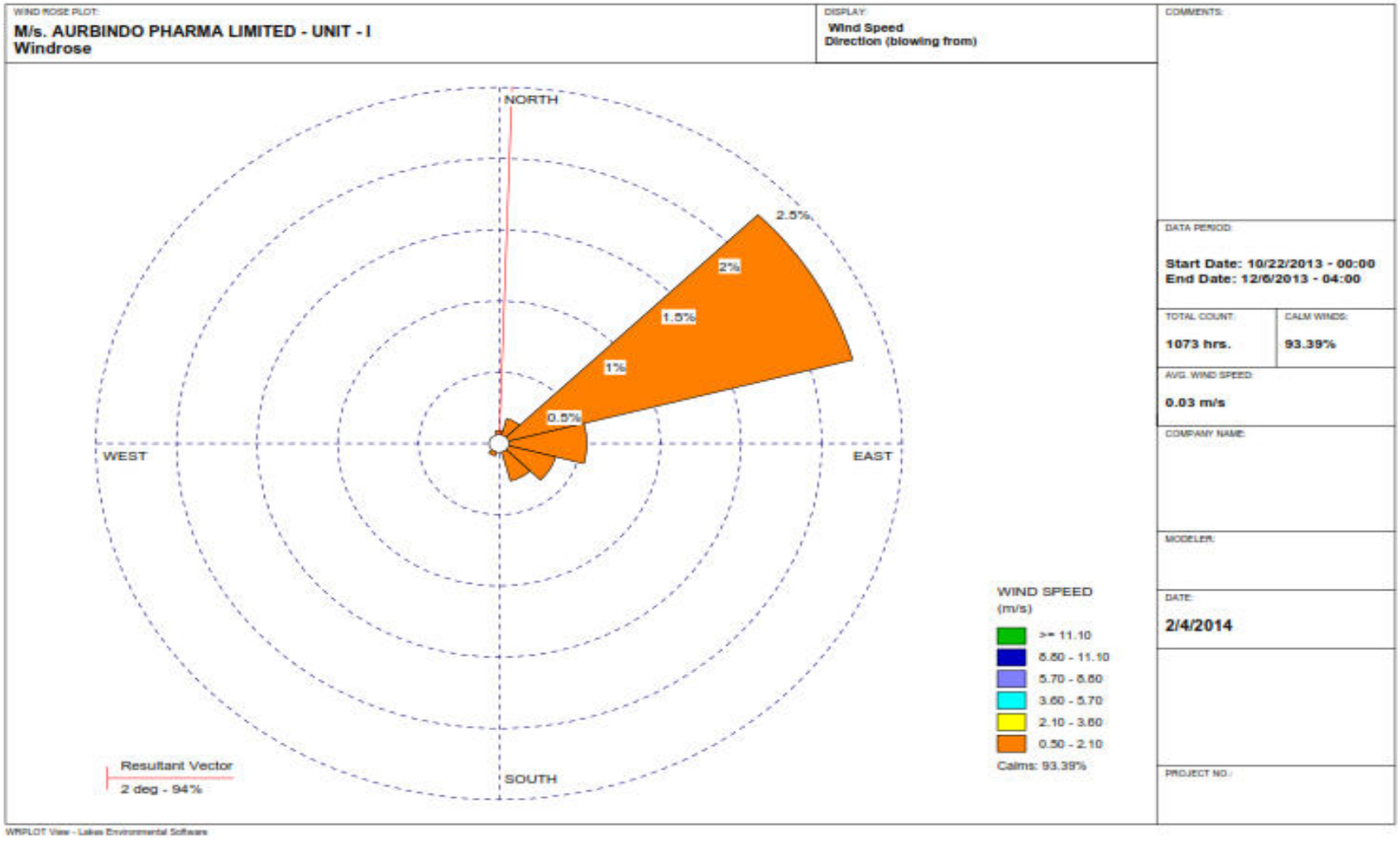


Table 4.8Medak IMD Data

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CLIMATOLOGICAL TABLE

स्टेशन : मेदक
STATION : Medak

अक्षांश LAT. 18° 03'
देशांतर LONG. 78° 16'
समुद्री तल सतह से ऊंचाई HEIGHT ABOVE M.S.L. 472 METRES
वर्षों पर आधारित BASED ON OBSERVATIONS 1979-2000

माह MONTH		स्टेशन का सतह दाब STATION LEVEL PRESSURE hPa	वायु तापमान AIR TEMPERATURE										आर्द्रता HUMIDITY		मेघ की मात्रा CLOUD AMOUNTS		वर्षा RAINFALL						माध्य पवन गति MEAN WIND SPEED Km/h
			माध्य MEAN						चरम EXTREMES														
			शुष्क बल्ब DRY BULB °C	नम बल्ब WET BULB °C	दैनिक अधिक मध्य DAILY MAX °C	दैनिक न्यून मध्य DAILY MIN °C	माह में उच्चतम HIGHEST IN THE MONTH °C	माह में निम्नतम LOWEST IN THE MONTH °C	उच्चतम HIGHEST °C	दिनांक और वर्ष DATE AND YEAR	निम्नतम LOWEST °C	दिनांक और वर्ष DATE AND YEAR	सापेक्ष आर्द्रता RELATIVE HUMIDITY %	वाष्प दाब VAPOUR PRESSURE hPa	समस्त मेघ ALL CLOUDS Oktas of sky	निम्न मेघ LOW CLOUDS Oktas of sky	मासिक योग MONTHLY TOTAL mm	वर्षा के दिनों की संख्या NO. OF RAINY DAYS	सर्वाधिक वर्षा वाले माह का योग TOTAL IN WETTEST MONTH WITH YEAR mm	सर्वाधिक शुष्कतम माह का योग TOTAL IN DRIEST MONTH WITH YEAR mm	24 घंटों की सबसे भारी वर्षा HEAVIEST FALL IN 24 HOURS mm	दिनांक और वर्ष DATE AND YEAR	
I		963.2	19.6	16.4	29.6	14.7	32.3	10.9	34.8	22 2000	2.7	7 1992	70	16.2	1.8	0.7	4.4	0.4	97.0 1995	0.0	63.0	17 1995	2.2
जनवरी JAN	II	959.2	27.7	18.7									39	14.5	2.1	0.7							
I		961.5	22.0	17.2	32.5	17.1	35.4	12.8	37.0	28 1980	8.0	17 1992	60	15.9	1.2	0.5	3.1	0.4	25.6 1998	0.0	16.0	4 1998	2.6
फरवरी FEB	II	957.5	30.8	19.3									31	13.4	1.8	0.7							
I		960.0	26.2	19.2	36.5	20.6	39.4	16.4	41.8	31 1996	11.2	4 1992	49	16.8	1.4	0.4	13.3	1.0	78.6 1981	0.0	45.0	23 1981	2.8
मार्च MAR	II	955.5	34.6	21.1									26	14.3	2.5	0.8							
I		957.6	29.9	21.2	39.3	23.6	41.8	19.6	43.5	28 2000	16.8	8 1989	44	18.4	1.9	0.4	15.1	1.4	41.2 1988	0.0	80.0	4 1995	3.9
अप्रैल APR	II	953.3	37.2	22.5									25	15.5	3.3	1.3							
I		955.2	31.2	22.0	40.2	25.9	43.2	21.6	45.0	27 1998	19.9	24 1990	43	19.2	3.0	0.8	41.2	2.5	273.8 1990	0.0	100.0	13 1990	4.1
मई MAY	II	950.6	38.2	23.4									26	16.8	3.7	1.5							
I		952.7	27.5	23.0	34.5	24.4	40.9	21.5	44.6	3 1998	13.9	17 1986	68	24.6	5.8	3.0	158.8	9.1	344.4 1989	25.5 1988	140.0	18 1981	6.3
जून JUN	II	948.8	32.4	24.1									51	23.3	5.9	3.4							
I		953.0	25.4	22.8	30.4	22.8	34.1	20.9	37.0	1 1996	18.1	10 1991	79	25.7	6.6	4.1	308.3	12.9	749.2 1988	115.8 1992	188.0	23 1989	5.6
जुलाई JUL	II	949.7	28.8	24.2									68	26.4	6.6	4.4							
I		954.0	24.8	22.6	29.2	22.4	32.2	20.9	35.6	15 1994	18.2	9 1991	82	25.8	6.5	4.3	343.0	14.8	558.1 2000	97.4 1985	139.0	1 1999	4.3
अगस्त AUG	II	950.7	27.8	24.1									72	27.1	6.5	4.2							
I		956.4	25.4	23.0	30.2	22.3	33.0	20.6	34.9	26 1987	16.5	29 1911	81	26.3	5.5	3.2	148.4	7.8	392.0 1983	19.8 1986	105.0	4 1980	2.4
सितम्बर SEP	II	952.5	28.4	24.3									70	27.1	5.7	3.0							
I		959.6	25.1	21.9	30.8	20.2	33.1	18.0	35.4	17 1986	10.6	25 1991	74	23.9	3.4	1.5	88.7	4.1	448.0 1995	0.8 1985	136.0	6 1983	1.4
अक्तूबर OCT	II	955.8	28.4	22.6									60	23.0	3.9	1.6							
I		961.9	22.6	18.6	29.5	16.5	31.9	11.9	33.8	4 2000	8.2	26 1991	67	18.6	2.3	0.7	28.3	1.4	156.4 1987	0.0	74.4	4 1987	1.3
नवम्बर NOV	II	958.4	27.0	20.0									50	18.0	2.9	1.0							
I		963.8	19.7	16.2	28.7	13.9	30.8	9.6	37.0	18 1995	5.0	16 1991	68	15.9	1.9	0.7	12.1	0.7	47.2 1997	0.0	43.4	31 1989	1.5
दिसम्बर DEC	II	959.8	26.3	18.2									42	14.5	2.3	0.7							
वार्षिक योग का सतह ANNUAL	I	958.2	24.9	20.3	32.5	20.2	43.2	8.8	45.0	27	2.7	7	65	20.6	3.4	1.7	1184.8	56.4	1625.9	707.4	188.0	23	3.1
TOTAL OR MEAN	II	954.4	30.6	21.9					5	1998	1	1992	47	19.5	3.9	1.9			1988	1984	7	1989	
वर्षों की संख्या NUMBER OF YEARS	I II	22	22	22	22	22	22	22	22		22		22	22	22	22	17	17	22	22	22		20

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CLIMATOLOGICAL TABLE

स्टेशन : मेहबूबनगर
STAION : Mahbubnagar

		मौसम परिघटना WEATHER PHENOMENA No. OF DAYS WITH						पवन WIND No. OF DAYS WITH WIND SPEED (Km. p. h.)				PERCENTAGE No. OF DAYS WIND FROM										मेघ CLOUD No. OF DAYS WITH CLOUD AMOUNT (ALL CLOUDS) O K T A S					No. OF DAYS WITH LOW CLOUD AMOUNT O K T A S						दृश्यता VISIBILITY No. OF DAYS WITH VISIBILITY				
MONTH																																		
जनवरी JAN	I	0.5	0.0	0.0	0.0	0.0	0.0	0	0	16	15	0	7	8	24	3	6	0	2	50	18	3	5	3	2	27	1	1	1	1	0	1.4	3.1	0.0	10.2	15.3
	II							0	0	20	11	0	33	12	20	1	5	1	5	34	12	6	10	2	1	25	2	4	0	0	0	0.0	0.1	0.9	8.5	21.5
फरवरी FEB	I	0.5	0.0	0.0	0.0	0.0	0.0	0	0	17	11	1	8	8	26	3	9	1	7	38	19	3	4	1	1	25	1	1	1	0	0	2.0	1.4	0.9	8.4	15.4
	II							0	0	20	8	1	17	8	17	1	16	1	9	30	13	6	9	1	0	22	2	4	0	0	0	0.0	0.0	0.1	6.6	21.4
मार्च MAR	I	1.2	0.0	0.0	0.0	0.0	0.0	0	0	21	10	1	5	5	17	3	19	1	14	35	20	3	4	3	1	27	1	2	1	0	0	1.5	1.3	1.5	10.4	16.1
	II							0	0	24	7	1	16	5	19	2	18	2	12	25	10	6	11	3	1	24	2	4	1	0	0	0.0	0.0	0.9	6.0	22.1
अप्रैल APR	I	1.5	0.0	0.0	0.0	0.0	0.0	0	0	24	6	1	7	2	13	1	32	3	20	21	17	3	6	2	2	27	1	2	0	0	0	1.9	1.9	0.4	9.4	16.5
	II							0	0	25	5	1	17	3	21	1	20	2	19	16	6	5	14	4	1	20	3	6	1	0	0	0.0	0.1	0.6	7.0	22.3
मई MAY	I	2.7	0.0	0.0	0.0	0.0	0.0	0	0	27	4	1	7	1	6	1	33	6	33	12	13	3	8	4	3	24	2	3	1	1	0	0.6	2.3	0.6	10.3	17.2
	II							0	0	26	5	1	19	2	12	0	23	1	26	16	4	5	14	5	3	18	4	7	1	1	0	0.0	0.2	1.0	7.5	22.3
जून JUN	I	11.0	0.0	0.0	0.0	0.0	0.0	0	0	29	1	0	2	0	3	0	66	6	19	5	2	1	8	6	13	15	3	6	3	5	0	0.1	3.2	0.9	9.1	16.8
	II							0	0	27	3	1	5	0	5	0	54	3	22	10	1	1	9	9	10	9	2	11	4	4	0	0.0	1.4	0.8	7.1	21.0
जुलाई JUL	I	16.5	0.0	0.0	0.0	0.0	0.0	0	0	29	2	0	0	0	1	0	73	9	11	6	1	1	3	7	17	8	2	7	5	9	0	0.0	2.8	1.0	7.8	19.4
	II							0	0	27	4	0	2	1	3	0	57	2	23	12	0	0	6	8	16	6	2	11	5	7	0	0.0	1.9	0.9	8.2	22.0
अगस्त AUG	I	15.6	0.0	0.0	0.0	0.0	0.0	0	0	28	3	0	1	0	0	0	67	5	18	9	1	1	6	6	17	7	3	9	3	9	0	0.0	3.4	1.0	9.0	17.8
	II							0	0	26	6	0	3	0	1	0	51	3	27	15	0	1	7	8	15	7	2	11	3	8	0	0.0	2.4	1.2	7.2	20.2
सितम्बर SEP	I	9.3	0.0	0.0	0.0	0.0	0.0	0	0	23	7	0	2	1	3	0	37	4	28	25	2	2	8	6	12	11	3	7	3	6	0	0.0	2.0	1.3	10.3	15.4
	II							0	0	23	7	2	11	1	4	0	33	1	23	25	0	1	12	7	10	11	4	9	2	4	0	0.0	2.2	1.1	9.0	17.7
अक्टूबर OCT	I	4.7	0.0	0.0	0.0	0.0	0.0	0	0	14	17	1	8	3	13	1	12	1	8	53	10	4	7	4	6	21	2	4	1	3	0	0.0	3.0	1.6	10.1	16.3
	II							0	0	21	10	2	26	4	11	0	11	1	10	35	4	5	13	5	4	19	3	6	1	2	0	0.0	2.1	1.6	8.1	19.1
नवम्बर NOV	I	1.6	0.0	0.0	0.0	0.0	0.0	0	0	12	18	1	17	5	15	0	3	0	3	56	15	3	6	3	3	24	2	2	1	1	0	0.7	0.8	0.7	10.9	17.0
	II							0	0	19	11	1	38	4	11	1	2	0	4	39	9	5	10	4	2	23	1	4	1	1	0	0.0	0.0	1.3	8.0	19.0
दिसम्बर DEC	I	0.7	0.0	0.0	0.0	0.0	0.0	0	0	12	19	1	7	8	19	1	3	0	2	59	18	3	5	3	2	26	1	2	1	1	0	1.0	3.0	0.2	10.4	16.4
	II							0	0	14	17	2	27	8	10	0	1	1	1	52	14	5	9	2	1	24	2	3	1	1	0	0.0	0.0	1.3	7.9	21.8
वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN	I	65.8	0.0	0.0	0.0	0.0	0.0	0	0	257	108	1	6	3	11	1	31	3	14	30	137	31	73	48	76	242	30	47	21	35	0	9.0	29.2	13.2	116.1	200.4
	II							0	0	274	91	1	17	4	11	1	24	1	15	26	68	45	132	57	63	209	29	76	21	28	0	0.0	10.5	11.5	82.2	251.0
महीनों का NUMBER OF YEARS	I	22						22				22									22					22						22				

4.9 Ambient Air Quality

Air pollution means the presence in the outdoor atmosphere of one or more contaminants or combinations thereof in such quantities and of such duration as are or may tend to be injurious to human, plant or animal life or property. Air pollutants include smoke, vapors, soot, fumes, gases, mist, odors, particulate matter, radioactive material or noxious chemicals. With upcoming industrial activity a range of different pollutants are released into the atmosphere that are dispersed and have a significant impact on neighborhood air environment. Thus collection of base line data of air environment occupies a predominant role in the impact assessment statement. The ambient air quality status across the study zone forms basis for prediction ofthe impacts due to the proposed project.

The data required to assess air quality impacts in and around neighborhood is achieved by designing such a network, which encompasses micro meteorological conditions, quantity and quality of emissions, locations, duration, resources/monitoring technology and operational criteria. The optimal scheme for air quality monitoring should consider all the above factors.

4.9.1 Scope of Field Study

The scope of baseline status of the ambient air quality can be assessed through a well-designed ambient air quality stations network. An intensive ambient air quality monitoring of the study area consisting of 10 km. radius

With the proposed industry site as the center point was carried out during the period from October 2013 - December 2013. The ambient air quality was monitored at nine locations spread over entire study area. Figure 4.7 presents the locations of nine ambient air quality-monitoring stations. At each sampling station

monitoring was carried out for 24 hours in a day for 2 days a week, and for three months. The major air pollutants monitored on 24 hourly basis are, PM_{10}, $PM_{2.5}$, Sulfur dioxide, Oxides of Nitrogen & VOC. Sampling and analysis of the above variables is according to the guidelines of Central Pollution Control Board.

National Ambient Air Quality Standards is presented in **Table 4.9.**

Table 4.9 National Ambient Air Quality Standards

Pollutant	Time Weighted Average	Concentration in Ambient Air		
		Industrial, Residential, Rural and Other Area	Ecological Sensitive Area (Notified by Central Government)	Methods of Measurement
Sulphur Dioxide (SO_2)	Annual*	50	20	Improved west and Gaeke
	24 Hours**	80	80	Ultraviolet fluorescence
Nitrogen Dioxide (NO_2)	Annual*	40	30	Modified Jacob & Hochheiser (Nn-Arsenite)
	24 Hours**	80	80	Chemiluminescee
Particulate Matter (Size Less than 10µm) or PM_{10}	Annual*	60	60	Gravimetic TOEM
	24 Hours**	100	100	Beta Attenuation
Particulate Matter (Size Less than 2.5µm) or $PM_{2.5}$	Annual*	40	40	Gravimetic TOEM
	24 Hours**	60	60	Beta Attenuation

Pollutant	Time Weighted Average	Concentration in Ambient Air		
		Industrial, Residential, Rural and Other Area	Ecological Sensitive Area (Notified by Central Government)	Methods of Measurement
Ozone (O_3)	8 hours** 1 hour**	100 180	100 180	UV Photometric Chemilminescence Chemical Method
Lead (Pb)	Annual* 24 hours**	0.50 1.0	0.50 1.0	AAS /ICP method after sampling on EPM 2000 or equivalent filter paper ED - XRF using Teflon filter.
Carbon Monoxide (CO)	8 hours** 1 hour**	02 04	02 04	Non Dispersive Infra Red (NDIR) Spectroscopy
Ammonia (NH_3)	Annual* 24 hours**	100 400	100 400	Chemilminescence Indophenol blue method
Benzene (C_6H_6)	Annual*	05	05	Gas Chromotography based continuous analyzer Absorption and Desorption followed by GC analysis
Benzo (o) Pyrene(BaP) – Particulate Phase only,	Annual*	01	01	Solvent extraction followed by HPLC/GC analysis

Pollutant	Time Weighted Average	Concentration in Ambient Air		
		Industrial, Residential, Rural and Other Area	Ecological Sensitive Area (Notified by Central Government)	Methods of Measurement
Arsenic (As),	Annual*	06	06	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
Nickel (Ni),	Annual*	20	20	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

G.S.No.826 (E) dated 16th November, 2009. Vide letter no. F. No. Q-15017/43/2007-CPW

*Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform interval.

** 24 hourly/8/1 hourly monitored values as applicable, shall be complied with 98 percent of the time in a year 0.2% of time they may be exceeded the limits but not on two consecutive days of monitoring.

4.9.2 Description of Sampling Locations

The location of ambient air quality stations is contingent on the meteorological status of the area. Hence the micro meteorological data was collected before initiating the ambient air quality monitoring. **Table 4.10** presents the ambient air quality locations and their distances and directions from the plant site.

Table 4.10

Locations of Ambient Air Quality Monitoring Stations

Site Code	Location	Direction	Distance from Industry Site Km	Long Lats
AAQ1	Project Site	--	--	78°10'34.5"/17°40'2.9"
AAQ2	Gundlamasanur	SE	2.42	78°11'3.3"/17°39'3.9"
AAQ3	Palapnur	S	1.54	78°10'13.4"/17°39'31.5"
AAQ4	Chandapur	E	2.13	78°11'51"/17°40'3.2"
AAQ5	Borapatla	W	0.98	78°10'1.7"/17°40'30.9"
AAQ6	Reddy Khanapur	NW	2.40	78°10'8.6"/17°41'29.3"
AAQ7	Gaudcharla	SW	4.59	78°08'56.5"/17°38'18.6"

4.9.3 Pre-project Ambient Air Quality Status

1. Plant Site

The air quality station was fixed on the top of a temporary platform at a height of about 2.5 m above the ground ensuring the free flow of winds.

The monitoring results of the station shows that the PM_{10} values range between 69.45 – 74.32 µg/m^3 the mean values are 71.34 µg/m^3. The SO_2 and NO_X levels vary between 14.0 -16.0 µg/m^3 and 28 - 36 µg/m^3 and the mean values 15.25 µg/m^3 and 31.25 µg/m^3.The CO is measured falls in between minimum 1.52 and maximum 1.84 ppm and VOC falls between minimum 14 and maximum 19 ppm.

2. Gundlamasanur

This location lies at a distance of about 2.42 km towards South East from the center of the plant. This village is considered in to assess the cross wind dispersion of the ambient pollutants considering the prevailing meteorological conditions during the winter season. The air quality station was fixed on the top of a

residential building at a height of about 3.5 m above the ground ensuring the free flow of winds.

The monitoring results of the station shows that the PM_{10} values range between 45.67 – 78.1 µg/m^3 the mean values are 56.33 µg/m^3. The SO_2 and NO_X levels vary between 9.0 -15.0 µg/m^3 and 25 - 32 µg/m^3 and the mean values 12 µg/m^3 and 28.25 µg/m^3.The CO is measured falls in between minimum 1.22 and maximum 1.47 ppm and VOC falls between minimum 12 and maximum 19 ppm.

3. Palapnur

This location lies at a distance of about 1.54 km towards South from the center of the plant. This village is considered in to assess the downwind dispersion of the ambient pollutants considering the prevailing meteorological conditions during the winter season. The air quality station was fixed on the top of a residential building at a height of about 3.5 m above the ground ensuring the free flow of winds.

The monitoring results of the station shows that the PM_{10} values range between 48.56 – 71.56 µg/m^3 the mean values are 56.97 µg/m^3. The SO_2 and NO_X levels vary between 7.0 -13.0 µg/m^3 and 10 - 22 µg/m^3 and the mean values 9.75 µg/m^3 and 17.5 µg/m^3.The CO is measured falls in between minimum 1.26 and maximum 1.48 ppm and VOC falls between minimum 04 and maximum 15 ppm.

4. Chandapur

This location lies at a distance of about 2.13 km towards East from the center of the plant. This village is considered in to assess the up wind direction of the ambient pollutants considering the prevailing meteorological conditions during the winter season. The air quality station was fixed on the top of a residential

building at a height of about 3.5 m above the ground ensuring the free flow of winds.

The monitoring results of the station shows that the PM_{10} values range between 47.12 – 72.56 µg/m^3 the mean values are 56.76 µg/m^3. The SO_2 and NO_X levels vary between 8.0 -13.0 µg/m^3 and 20 - 25 µg/m^3 and the mean values 10.25 µg/m^3 and 22.25 µg/m^3.The CO is measured falls in between minimum 1.02 and maximum 1.24 ppm and VOC falls between minimum 4 and maximum 9 ppm.

5. Borapatla

This location lies at a distance of about 0.98 km towards West from the center of the plant. This village is considered in to assess the downwind dispersion of the ambient pollutants considering the prevailing meteorological conditions during the winter season. The air quality station was fixed on the top of a residential building at a height of about 3.5 m above the ground ensuring the free flow of winds.

The monitoring results of the station shows that the PM_{10} values range between 56.56 – 79.23 µg/m^3 the mean values are 64.50 µg/m^3. The SO_2 and NO_X levels vary between 11.0 -16.0 µg/m^3 and 29 - 38 µg/m^3 and the mean values 13 µg/m^3 and 33.25 µg/m^3.The CO is measured falls in between minimum 1.29 and maximum 1.53 ppm and VOC falls between minimum 14 and maximum 19 ppm.

6. Reddy Kahanapur

This location lies at a distance of about 2.40 km towards NW from the center of the plant. This village is considered in to assess the cross wind dispersion of the ambient pollutants considering the prevailing meteorological conditions during the winter season. The air quality station was fixed on the top of a residential

building at a height of about 3.5 m above the ground ensuring the free flow of winds.

The monitoring results of the station shows that the PM_{10} values range between 51.23 – 71.34 µg/m^3 the mean values are 58.65 µg/m^3. The SO_2 and NO_X levels vary between 8.0 -14.0 µg/m^3 and 24 - 29 µg/m^3 and the mean values 11 µg/m^3 and 26.5 µg/m^3.The CO is measured falls in between minimum 1.07 and maximum 1.26 ppm and VOC falls between minimum 7 and maximum 12 ppm.

7. Goudcherla

This location lies at a distance of about 4.59 km towards SW from the center of the plant. This village is considered in to assess the downwind dispersion of the ambient pollutants considering the prevailing meteorological conditions during the summer season. The air quality station was fixed on the top of a residential building at a height of about 3.5 m above the ground ensuring the free flow of winds.

The monitoring results of the station shows that the PM_{10} values range between 41.34 – 68.23 µg/m^3 the mean values are 52.19 µg/m^3. The SO_2 and NO_X levels vary between 7.0 -12.0 µg/m^3 and 21 - 28 µg/m^3 and the mean values 9.25 µg/m^3 and 24.5 µg/m^3.The CO is measured falls in between minimum 1.04 and maximum 1.15 ppm and VOC falls between minimum 4 and maximum 12 ppm.

Table 4.11 Ambient Air Quality Status (24 hourly)

Pollutant	Maximum	Minimum	Mean	98%
1) Location: Project Site				
PM_{10}	74.32	69.45	71.34	74.0
SO_2	16.0	14.0	15.25	16.0
NOx	36.0	28.0	31.25	35.7
2) Location: Gundlamasanur				
PM_{10}	78.1	45.67	56.33	78.10
SO_2	15.0	9.0	12.0	14.88
NOx	32.0	25.0	28.25	31.82
3) Location: Palapnur				
PM_{10}	71.56	48.56	56.97	70.61
SO_2	13.0	7.0	9.75	12.88
NOx	22.0	10.0	17.5	21.88
4) Location: Chandapur				
PM_{10}	72.56	47.12	56.76	72.00
SO_2	13.0	8.0	10.25	12.88
NOx	25.0	20.0	22.25	24.88
5) Location: Borapatla				
PM_{10}	79.23	56.56	64.51	79.18
SO_2	16.0	11.0	13.0	15.82
NOx	38.0	29.0	33.25	37.76
6) Location: Reddy Khanapur				
PM_{10}	71.34	51.23	58.66	70.92
SO_2	14.0	8.0	11.0	13.88
NOx	29.0	24.0	26.5	28.88
7) Location: Gaudcherla				
PM_{10}	68.23	41.34	52.20	68.125
SO_2	12.0	7.0	9.25	11.88
NOx	28.0	21.0	24.5	27.88

Table 4.12 Ambient Air Quality Status for VOC, CO

Site Code	Location	CO, in ppm		VOC, in ppm	
		Min	Max	Min	Max
AAQ1	Project Site	1.52	1.84	0.5	8.0
AAQ2	Gundlamasanur	1.22	1.47	0.0	2.0
AAQ3	Palanpur	1.26	1.48	0.0	0.5
AAQ4	Chandapur	1.02	1.24	0.0	2.0
AAQ5	Borapatla	1.29	1.53	0.0	2.0
AAQ6	Reddy Khanapur	1.07	1.26	0.0	0.5
AAQ7	Goudcherla	1.04	1.15	0.0	0.2

4.10 Noise Environment

Noise is an unwanted sound without musical quality. Artificial noise and its impact on environment, grown space with advancing human civilization. Noise pollution is equally hazardous to environment as air, water and other forms of pollution. Various noise measurement units have been introduced to describe, in a single number, the response of an average human to a complex sound made up of various frequencies at different loudness levels. The most common scale is, weighted decibel dB (A), measured as the relative intensity level of one sound with respect to
reference sound.

Figure4.7 Location Map of Ambient Air Quality Monitoring Stations

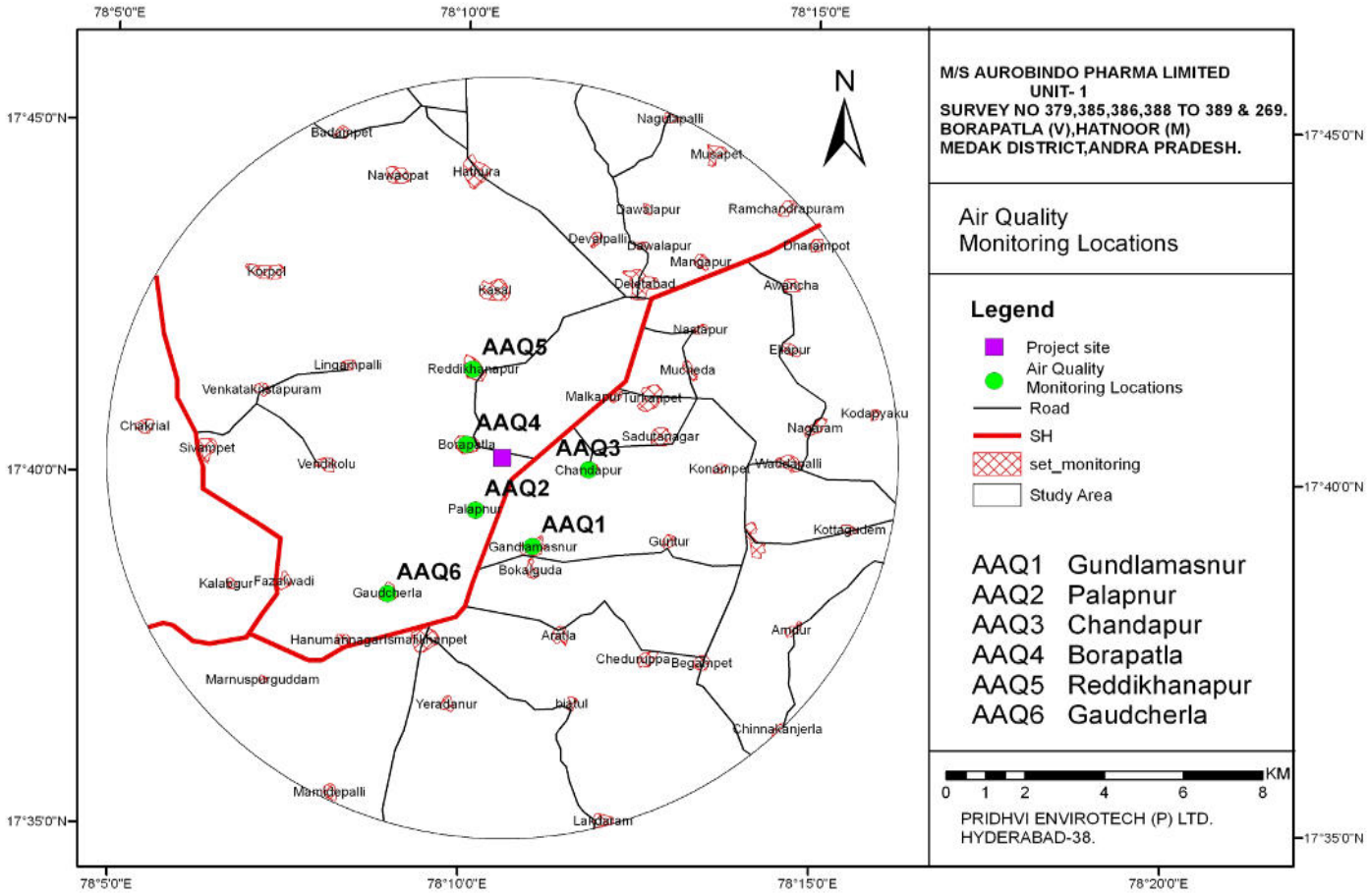
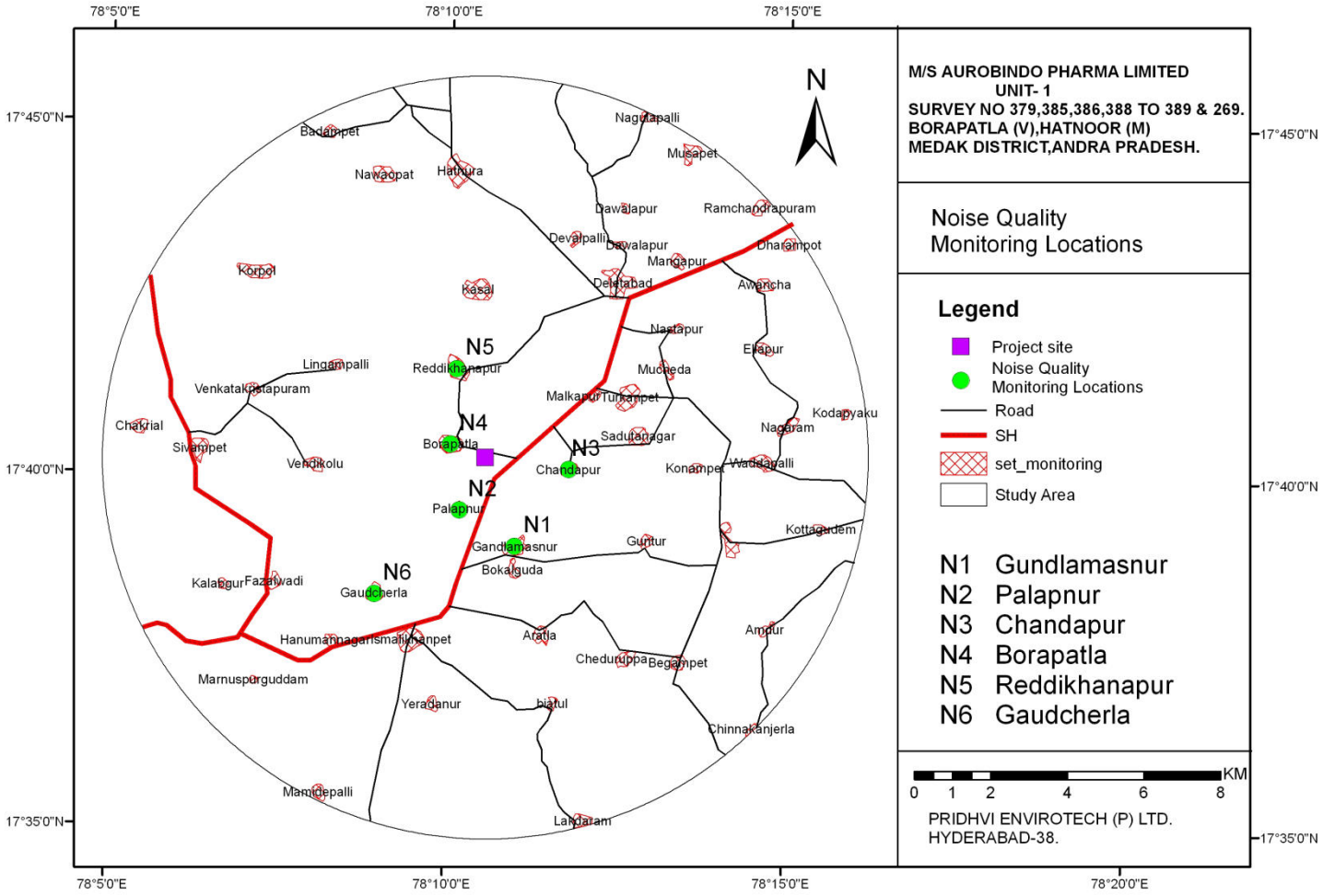


Figure 4.8 Location Map for Noise Monitoring



The impact of noise depends on its characteristics (instantaneous, intermittent or continuous in nature), time of day (day or night) and location of noise source. **Table 4.13**shows the effects of different noise levels on human beings. The environmental impact of noise can have several effects varying from noise induced hearing loss to annoying depending on noise levels.

The assessment of noise pollution on neighborhood environment due to the proposed industry was carried out keeping in view, all the considerations mentioned above. The existing status of noise levels is measured at 6 locations at various villages including the site within the study area. **Figure 4.8** shows noise level measured locations. The measured noise values are shown in **Table 4.14.** Noise levels are high at the urban traffic junctions compared to the industrial and village areas.

Table 4.13Effects on Human Beings at Different Noise Levels

Source	Noise Level dB(A)	Effects
Large Rocket Engine (Near By)	180	Threshold of Pains
Hydraulic Press (1m)	130	
Jet take off (60 m)	120	Maximum vocal effort possible
Automobile Horn (1m)	120	
Construction Noise (3m)	110	
Shout, Punch, Press, Circular Saw	100	Very annoying
Heavy Truck (15m), Farm Machinery	90	Prolonged exposure Endangers Lathes, Sports Car, Noisy Machines hearing loss
Automobile (15m)	80	Annoying
Loud Conversations	60	
Living Room in Home	50	Quiet

Power Station (15m)	50	
Bed Room in Home	40	
Tick of Wall clock (1m)	30	
Whisper	20	
Rattling of Leaves by Breeze	10	Barely audible

Table 4.14 Equivalent Noise levels in the Study Area

S.No	Location	Equivalent Noise Level dB(A)			
		Day Maximum	Day Minimum	Night Maximum	Night Minimum
1	Project Site	61.80	53.20	56.20	50.20
2	Gundlamasnur	51.60	43.60	53.8	40.70
3	Palapnur	49.20	41.60	50.30	40.60
4	Chandapur	51.60	43.60	53.80	40.70
5	Borapatla	52.30	42.20	53.40	42.40
6	Reddy Khanapur	49.70	41.30	50.90	40.60
7	Gaudcherla	49.80	40.40	51.60	40.20

Note: Day time is reckoned in between 6.00 a.m to 10.00 p.m.
Night time is reckoned between 10.00 p.m. to 6.00 a.m.

4.11 Socio Economic Environment

Industrial development reflects in social development i.e., growth in infrastructure facilities, growth in employment rates, increased demands for housing, and other amenities etc., which will have a bearing on the socio economic status. The Study area is rural in nature. The study area is dependent mostly on dry crop agriculture. The area is irrigated by ground water sources and few tanks. In this context it is necessary to study the present socioeconomic status with respect to the proposed development in the coming future.

4.11.1 Objectives

The primary objectives of the socio-economic assessment are:

- Understanding the baseline socio-economic environment obtaining in the impact zone.
- Identifying the key stakeholders who are likely to be impacted by the establishment of the proposed project.
- Assessing the positive and negative impacts of the project on the socio-economic environment in the area.
- Suggesting mitigation measures to minimize the negative impacts.

4.11.2 Scope

The scope of socio-economic impact assessment extends to:

- Assessing the baseline socio-economic environment prevailing in the impact area focusing the core and buffer zones.
- Identifying key economic sectors and major sources of livelihood in the study area.
- Understanding social structures and lifestyles of people in the area who are likely to be affected most.
- Assessing physical and social infrastructure facilities accessible to the project affected people.
- Identifying heritage sites and archaeological monuments, if any in the area which may be affected by the proposed project.
- Predicting the likely socio-economic impacts as a consequence of establishing the project.
- Suggesting adverse impact mitigation measures in line with the felt needs, aspirations and expectations of the project affected people.
- Preparing an appropriate Socio-economic Environment Management Plan.

4.11.3 Approach

The basic approach to carrying out the SEIA focused on:

- Zeroing-in on the project impact area covering all the villages and other habitations falling within the mandatory 10 km radius from the project site.
- Collecting the basic information with respect to the villages in the project impact area in terms of census village code, name of the Mandal in which a particular village falls, number of households, population level (as per Census 2011) and growth of village population during the last decade, distance from the proposed project site etc.
- Gathering macro level socio-economic information, at Mandal level, with the help of secondary data.
- Identifying critical knowledge/information gaps which impede an objective and reliable assessment of the socio-economic impacts of the project.
- Zeroing-in on the data/information to be collected for a fair impact assessment and deciding upon the sources and means to collecting the same.
- Identifying the key stakeholders and potential respondents for collecting the required information.
- Drawing a sampling frame and size specifying sample villages, number of households to be contacted for primary data/information collection and agencies to be contacted for eliciting information on various aspects relevant to the study.
- Finalisation of survey instruments, constitution of a survey team and orientation of field investigators.
- Carrying out field surveys in the sample villages and simultaneously carrying out data accuracy and reliability checks.
- Processing, tabulation and analysis of data with the help of appropriate statistical tools.
- Interpretation of data to arrive at valid conclusions.
- Preparing and presenting SEIA report.

4.11.4 Methodology

The socio-economic impact assessment of the proposed project relied on a mix of both secondary and primary data collected from various sources. The SEIA was carried out in three different stages – Desk Research, Field Survey and Data Analysis and Report Preparation. The methodology adopted at each stage is explained in what follows.

4.11.5 Desk Research

A fairly comprehensive desk research to understand the socio-economic setting in and around the project site was the first initiative towards carrying out the SEIA of the project. Accordingly, published and unpublished information available on the subject was referred, reviewed and critical information gaps identified by the SE EIA team. The major documents and information sources extensively referred to are:

Table 4.15

Sources of data for socio economic survey

Sl. No.	Document	Source
1	Handbook of Statistics – Medak District, 2011	Chief Planning Officer – Medak District
2	Census – 2011 Provisional Population Tables for Medak District and Andhra Pradesh	Registrar General of India
3	Medak District Industrial Profile	District Industries Centre, Medak
4	Brief Industrial Profile of Medak District	MSME Development Institute, Hyderabad
5	State of Community Health at Medak District	Greenpeace
6	Polluting Industries in Medak District	Andhra Pradesh Pollution Control Board

Besides, unpublished information of the Departments of Industries, Education, Health, Irrigation, Agriculture and Social Welfare was also referred to gain deeper insights into the socio-economic setting of Medak district in general and the project area in particular.

The desk research has enabled the study team to effectively leverage the macro level socio-economic information available and identify information gaps at the village and household levels.

It was during this stage, the key stakeholders were identified and study instruments – schedules and checklists – prepared, tested and finalised. Similarly, the sampling frame and sample size were also designed and finalised. The sampling frame for the study consisted of villages, households, district and mandal level officials as also local opinion leaders.

A stratified random technique was followed to select the sample villages and households. Accordingly, the sample villages were picked up at random from the three impact zones considered – core, buffer and minimal affected. The number of household to be contacted in each village was determined on the basis of the size of population of the respective village. In the absence of household level information, selection of respondent households was made at random during the visit to the respective village. However, while selecting the respondent households, emphasis was on contacting households, who are economically poor, susceptible to shifts in livelihood patterns and belonged to vulnerable social communities. Accordingly, the sample villages selected for the survey together with the number of households across each village are presented in Table – 4.16

Table – 4.16

Sample Villages Selected for Socio-Economic Impact Assessment

S.No	Sample Village	Mandal	Location from Project Site (km)		Sample Households (No.)
			Direction	Distance (km)	
1	Borpatla	Hathnoora	NW	0.5	16
2	Palpanur	Hathnoora	SW	1.5	7
3	Chandapur	Hathnoora	SE	2.0	8
4	Gundla Machanur	Hathnoora	S	3.0	9
5	Kasala	Hathnoora	NW	4.0	10
6	Sadulla Nagar	Hathnoora	E	4.5	10
7	Arutla	Sangareddy	SE	5.0	8
8	Vendikole	Pulkal	W	5.0	9
9	Ismailkhanpet	Sangareddy	SW	5.5	7
10	Doulatabad	Hathnoora	NE	6.0	7
11	Shivampet	Pulkal	W	8.0	10
12	Hathnoora	Hathnoora	N	8.5	11
Total					**112**

The sample villages accounted for 41.7% of the population and 40.6% of the number of households of the total 47 villages.

It needs to be mentioned in this context that an element of purposiveness was induced into selection of sample villages with a view to focusing more on villages in the core and buffer zones of impact. Such a selection of the sample villages was well justified as the entire area beyond the core and buffer impact zones has a relatively strong industrial base and hence the

project under consideration is therefore not likely to have any significant impact on the socio-economic environment there.

On the conclusion of the desk research, a five member study team was constituted. The team members have had considerable exposure and experience in conducting large size socio-economic research studies especially in Telangana. They are well versed with the socio-economic setting in the project area, and understood the local dialect.

4.11.6 Field Surveys

Planned in-depth field surveys, from 3rd January to 5th February, 2014 constituted the most important element of the methodology. Field surveys helped collect fairly reliable primary data with respect to the major livelihood sources, family incomes and expenditure, education and health status, basic amenities available, lifestyles, standard of living etc., of residents in the project impact zone.

Field surveys were carried out in all the 12 sample villages contacting a total of 112 households. The potential respondents in the sample households were approached personally by the Field Investigators who explained the purpose of the visit and solicited their participation by sharing the intended information unbiasedly. The Field Investigators also clarified the doubts and apprehensions expressed by the respondents. Once the respondents were willing and ready to participate, household level socio-economic information was collected with the help of a structured questionnaire. A number of questions were open ended to facilitate capturing perceptions of the respondents objectively.

In addition to household surveys, Participatory Rapid Assessment (PRA) tools comprising Transect Walks, Focus Group Discussions, and Opinion Leader Interviews were used for collecting village level qualitative information.

Accordingly, the study team carried out:

- Transect walks around all the sample villages along with a few natives.
- Carried out 5 Focus Group Discussions, comprising 15 members per group representing women, youth, household heads and opinion leaders to elicit information pertaining to their awareness, expectations and apprehensions about the proposed project.
- Detailed discussions with Sarpanch, MPDO and Chairperson-ZPTC, District Planning Officer, District Agriculture Officer, District Horticulture Officer, District Industries Centre and Lead Bank Manager to understand the major livelihood sources – existing and alternative – in the area.

Demographic characteristics of the study area falling within 10 km radius of the proposed project site have been compiled to assess the pre-project socio-economic status.

4.11.7Geographical Coverage

The geographical coverage for SEIA of the project extends over the area falling within the 10 km radius from the project site and comprises as many as 47 inhabiting villages. These villages are administratively distributed across 15 Mandals (Blocks) as detailed in Table 2.1 below.

4.11.7.1 Population Distribution

The population distribution of the study area is presented in **Table 4.17**. The population density in the study area is less reflecting the rural nature and lack of irrigation facilities. The total population of the area is 90455 consisting of 45844 males and 44601 females.

Table – 4.17

Details of Villages Comprising Study Area

S.No	Village	Mandal	No. of House-holds	Population (Census 2011)			SCs	STs	Average Literacy (%)
				Total	Males	Females			
1	Borpatla	Hathnoora	578	2633	1285	1348	765	32	49.1
2	Palpanur	Hathnoora	222	1008	508	500	167	0	46.8
3	Chandapur	Hathnoora	238	1050	538	512	183	5	51.1
4	Reddikhanapur	Hathnoora	293	1625	838	787	432	10	50.0
5	Kasal	Hathnoora	832	3789	1898	1891	769	48	54.7
6	Malkapur	Shankaram-pet	129	642	324	318	90	0	60.9
7	Turkampet	Hathnoora	162	887	496	391	12	7	57.0
8	Sadulnagar	Hathnoora	303	1307	642	665	115	4	56.3
9	Mucheda	Hathnoora	203	869	428	441	627	38	35.0
10	Konampet	Daulatabad	93	400	187	213	202	0	43.7
11	Gandlamasnur	Hathnoora	377	1838	935	903	501	1	45.1
12	Arutla	Hathnoora	264	1197	608	589	221	0	45.8
13	Vendikolu	Pulkal	295	1296	672	624	334	0	55.3
14	Lingampalli	Papannapet	152	754	391	363	440	0	51.4
15	Hathnoora	Hathnoora	1196	6605	3708	2897	1499	264	57.2
16	Musapet	Shankaram-pet	456	1849	922	927	366	684	44.2
17	Dawalpur	Papannapet	415	1586	789	797	218	0	51.2
18	Devalapalli	Hathnoora	174	735	371	364	182	0	51.0
19	Doulatabad	Hathnoora	1041	4579	2311	2268	857	129	59.5
20	Mangapur	Hathnoora	258	1208	609	599	375	17	49.1
21	Ramachandra-puram	Ramachandra-puram	284	1218	621	597	140	0	51.7
22	Dharampet	Raikode	150	689	333	356	249	0	59.0
23	Awancha	Narsapur	53	226	119	107	24	0	52.2
24	Nastipur	Hathnoora	200	1011	585	426	222	40	58.5
25	Ellapur	Papannapet	182	753	358	395	167	7	46.3
26	Kodapyaku	Hathnoora	152	596	288	308	43	28	47.4
27	Nagaram	Hathnoora	175	756	378	378	224	0	54.3
28	Waddapalli	Daulatabad	249	1307	670	637	164	0	49.5
29	Begumpet	Daulatabad	261	1044	525	519	240	46	54.4
30	Cheduruppa	Sangareddy	533	2389	1185	1204	248	283	47.0
31	Amdur	Jinnaram	293	1211	616	595	164	4	47.7
32	Chinnkanjerla	Patancheru	387	1678	824	854	279	14	45.4

33	Lakdaram	Patancheru	851	3733	1881	1852	463	10	58.2
34	Baitul	Sangareddy	258	1163	578	585	279	326	40.2
35	Yeradanur	Sangareddy	544	2346	1194	1152	424	693	44.2
36	Ismailkhanpet	Sangareddy	1625	7060	3591	3469	1157	611	50.4
37	Mamuspurgudem	Andole	300	1265	626	639	492	0	42.6
38	Kalabgur	Sangareddy	292	1289	642	647	385	3	59.4
39	Fazalwadi	Sangareddy	789	3554	1801	1753	649	538	53.1
40	Shivampet	Shivampet	1170	5365	2602	2763	605	1331	55.0
41	Chakrial	Pulkal	655	2873	1448	1425	813	157	55.2
42	Venkatakrishna -puram	Pulkal	264	1089	538	551	205	0	48.5
43	Korpol	Pulkal	847	3456	1693	1763	639	62	52.8
44	Nawabpet	Shivampet	593	2529	1268	1261	291	410	51.7
45	Badampet	Kohir	254	1442	743	699	692	34	47.0
46	Nagulapalli	Alldurg	322	1325	650	675	475	123	42.9
47	Mamidipalli	Sangareddy	697	3221	1627	1594	478	1613	49.5
Total			**20055**	**90445**	**45844**	**44601**	**18556**	**7572**	**50.6**

66% of the villages however, fall in the contiguous Mandals of Hathnoora, Pulkal, Sangareddy and Shivampet.

4.11.7.2 Impact Zones

Of the total 47 villages comprising the overall project impact zone, 3 villages fall in the core impact zone (up to 2 km in aerial distance from the project site); 11 villages fall in the buffer zone (3-5 km) and the remaining 33 villages in the minimal affected zone (beyond 5 km and up to 10 km). Categorization of villages in the project impact zone by their location in various impact zones is presented in **Table 4.16** below.

Table – 4.18

Categorization of Villages in Project Impact Area

Sl. No.	Impact Zone	Village	Population (Census 2011)
I	Core	Borpatla	2633
		Palpanur	1008
		Chandapur	1050
II	Buffer	Reddikhanapur	1625
		Kasal	3789
		Malkapur	642
		Turkampet	887
		Sadulnagar	1307
		Mucheda	869
		Konampet	400
		Gandlamasnur	1838
		Arutla	1197
		Vendikolu	1296
		Lingampalli	754
III	Minimal Affected	Hathnoora	6605
		Musapet	1849
		Dawalpur	1586
		Devalapalli	735
		Doulatabad	4579
		Mangapur	1208
		Ramachandra-puram	1218
		Dharampet	689
		Awancha	226
		Nastipur	1011
		Ellapur	753
		Kodapyaku	596
		Nagaram	756

		Waddapalli	1307
		Begumpet	1044
		Cheduruppa	2389
		Amdur	1211
		Chinnkanjerla	1678
		Lakdaram	3733
		Baitul	1163
		Yeradanur	2346
		Ismailkhanpet	7060
		Mamuspurgudem	1265
		Kalabgur	1289
		Fazalwadi	3554
		Shivampet	5365
		Chakrial	2873
		Venkatakrishnapuram	1089
		Korpol	3456
		Nawabpet	2529
		Badampet	1442
		Nagulapalli	1325
		Mamidipalli	3221

It is evident that 6.4% of the villages fall in the core impact zone while 23.4% fall in the buffer zone and a whopping 70.2% in the minimal affected zone. The SEIA study lays emphasis on covering more villages in the core and buffer zones vis-à-vis the minimal affected zone.

4.11.8 Data Analysis

Industrial development projects of any size will have impacts on people's way of life, their culture, community, health and wellbeing, their assets and livelihoods. The impacts could be negative and positive. Socio-economic impact assessment seeks to identify such impacts and focus on the ways and means to minimize the incidence of negative impacts. It is therefore imperative to understand the baseline socio-economic scenario in the study area to systematically gauze the magnitude of possible impacts. The study team thus has captured a basic socio-economic profile of the area as presented in what follows.

4.11.8.1 Demographic Profile

The sociological aspects of this study include human settlements, demography, and social strata such as Scheduled Castes and Scheduled Tribes and literacy levels besides infrastructure facilities available in the study area. The economic aspects include occupational structure and income levels of workers.

The key demographics of the study area comprising 47 villages are presented in **Table 4.19** below.

Table – 4.19

Salient Features of Demographics in Study Area

S. No	Demographic Parameter	Data as per Census 2011	Salient Features
1	Total Population (No.) - Males - Females	90,445 45,844 44,601	• Forms 3.0% of the district population • Sex Ratio in the area is 973 compared to 992 for the district • 100% of the population in the study area is rural population compared to 76.0% at the district level
2	SCs (No.)	18,556	
3	STs (No.)	7,572	
4	Average Literacy (%)	50.6%	• Considerably lower than the district average of 62.5%
5	Households (No.)	20,060	• Accounts for 3.0% of the total households in the district • Average 4.5 persons per household – 2.3 males and 2.2 females

4.11.8.2 Occupational Distribution

The occupational distribution points to the predominance of Agricultural Laborers followed by Cultivators and other than Household Workers.

4.11.8.3 Livelihoods

Agriculture

Agriculture and allied activities are traditionally a predominant source of livelihood in the area. Paddy, Pulses and Maize are the principal food crops raised while Cotton and Sugarcane are the major cash crops grown. Vegetables are also grown though in a small way.

Farming in the area is largely monsoon dependent as sustainable irrigation facilities are scanty and severely limited. Normal rainfall in the area varies from a minimum of 831.1 mm in Sangareddy Mandal to a maximum of 932.7 mm in Hathnoora Mandal compared to district average of 868 mm. The rainfall data for the period 2007-8 to 2010-11 points to the fact that the district and the project have generally received rainfalls below the normal levels.

In the absence of perennial rivers, the Medak district does not enjoy large potential for sustainable irrigation. The only source of irrigation is the tube wells. As such, farming is a mono cropping and a near subsistence activity.

The contribution of agriculture is almost stagnant and a fairly high degree of underemployment prevalent. As such, younger generations in the area are increasingly looking for more remunerative and skill based alternative livelihoods.

Agriculture allied activities such as rearing milch cattle and backyard poultry farming are other complementary sources of incomes to the households. Engagement of women in these activities is more common. Some of the women are also engaged in small businesses as vegetable and flowers vending.

Industry

Over the past two decades, rapid industrial growth in the area has contributed to the development of alternative livelihoods. An estimated 25% of the population in the area depends on the industry sector for livelihood. The industry base in the area is predominated by more than 200 large and medium enterprises engaged in the production of products as diverse as drugs and pharmaceuticals, chemicals, engineering goods, and textiles.

Besides, a large number of survivalist micro enterprises exist essentially as self-employment ventures.

The younger population in the area looks more towards the industry and services sectors for exploring employment opportunities. Only less than 5% of them are keen to explore self-employment through establishment of micro enterprises in manufacturing and servicing segments.

4. 11. 8.4 Lifestyles

No reliable information/data are available, either at the district or mandal levels, on the lifestyles of people. As such it will be very difficult to assess the lifestyles in the area with reasonable accuracy. However, based on an impressionistic assessment during the field surveys, it is felt that a majority of the population in the area owns a residence to live in. They have access to basic amenities such as drinking water, electric power, education and healthcare. A majority of the people in the also have access to a mobile phone and a cable TV connection.

Generally, participation and interaction among the people in the area is more during festivals, functions and cultural events. Participation in marriages and mourning is reported to be more common among homogenous social groups.

The recreation facilities in the area are reflected in watching TV, playing, cinema going and partying.

4.11.8.5 Physical Infrastructure

All the villages are electrified and connected with village roads.Transport is essentially provided by the State Road Transport Corporation. Most of the study area has excellent road network in all the villages. Regular bus facilities are available to the all the villages. Besides, private transportation, mostly share autos, is most common in the interiors.

The entire population in the area has access to potable water supply operated and maintained by the Government. All the villages are fluoride free.

4.11.8.6 Social Infrastructure

Established infrastructure exists in the area for education up to Graduation, Polytechnic and Engineering courses.

Healthcare is available largely through a network of Government run Hospitals and PHCs. Private clinics also exist in the area. Specialty medicare is accessible nearest at Hyderabad some 50 km away.

The housing facilities in the area are good to moderate.

4.11.9 Archaeological Monuments

A dilapidated fort is noticed near Ismailkhanpet. Though, no archaeological monuments, heritage precincts or religious places were noticed in the study area that may be adversely affected by the establishment of the proposed project.

4.11. 10 Household Survey Results Demographics

The 112 sample households have a total population of 588 implying an average 5.25 members per household. 52.6% of the population consists of males and 47.4% females. 63.1% are adults; 29.1% children and 7.8% are aged.

Average literacy is 45.6%. Male literacy is significantly high at 60.5% compared to female literacy of 29.0%. 59.0% of the household population pursued secondary education, while 24.2% pursued primary education. Only 16.8% received higher education.

Assets Owned

The various assets owned and the percentage of household population owning these assets is presented in **Table 4.20**.

Table – 4.20

Ownership Assets by Sample Households

Sl.No	Assets	Magnitude of Ownership (%)
1	Land	52.7
2	House	98.2
3	TV	83.9
4	Fridge	3.4
5	Mobile phone	77.7
6	Cooking Gas	59.8
7	PC/Laptop	1.8
8	2-wheeler	22.3
9	Truck/Mini-truck	1.0

Sources of Livelihood

Agriculture and allied activities are the predominant source of livelihood for the household population, followed other sources such as wage employment in the industry sector and self-employment.

39.8% of the household population is engaged as agricultural labourers and works under MNREGS; 22.6% as cultivators, predominantly as tenant marginal and small farmers; 2.8% in agri-allied activities; 21.0% as workers in the industry sector and 13.8% pursue self-employment. Below table gives overall picture of employment in the study area

Table 4.21 Employment – Study Area

(Census Data – 2011)

Category	Population
Total Population	90445
Total Population – Male	45844
Total Population – Female	44601
Total Main Workers	31997
Total Marginal Workers	11484
Total Non Workers	44812

Family Incomes

The family incomes of the surveyed households from Rs. 2000 – 5000 to > 10000 p.m. 59.8% of the households have family incomes in the range of Rs. 5001 – 10000 p.m., while 33.0% have family incomes > Rs. 10000 p.m. Only 7.1% of the household have incomes in the range of Rs. 2000 – 5000 p.m.

Family Expenditures

65.2% of the households have family expenditures ranging from Rs. 5001-10000 p.m.; 19.6% in excess of Rs. 10000 p.m. and 15.2% have expenditures ranging from Rs. 2000 – 5000 p.m. The simple average family expenditure of the survey households works out to Rs. 8200 p.m.

The expenditure pattern points to that 34.5% of the overall family expenditure goes for food; 26.7% for clothing and grooming; 11.0% for education; 6.3% for healthcare and 21.5% on housing, recreation and other needs.

4.11.11 Aspirations and Apprehensions

As revealed during focus group discussions, nearly 70% of the respondents are aware of the industrial growth in the area and about the proposed project. While they are convinced with the positive impacts of the project, they are also wary of the negative impacts on the surrounding environment. The perceptions of the respondents as regards to the Expansion of the Bulk Drugs & intermediates Unit in the area could be summarized as follows:

- Industrial growth in the region has significantly supported the sustainable livelihoods in the area especially for skilled and semi-skilled persons.
- Development of the secondary sector in the area has positively contributed to induced development leading to creation of multiplier self and wage employment opportunities.
- It would help further strengthen infrastructure development in the area.

- It would adversely affect the groundwater resources leading to depletion and contamination.
- It may aggravate air pollution through release of obnoxious gases and odors.

4.12 Land Use Pattern

For the analysis of land use & land cover in the study area of the proposed site, satellite data of IRS-P6 LISS IV-MX for the period February;2011 was taken. The study area covers 10 km all-round the proposed unit

The satellite data is geometrically corrected with respect to Survey of India topo sheets. To carry out the same, ground control points (GCPs) were identified on the maps and raw satellite data. The coefficients for two co-ordinate transformation equations were computed based on polynomial regression between GCPs on map and satellite data. Alternate GCPs were generated till the Root Mean Square (RMS) error was less than 0.5 pixels and then both the images were co-registered.

4.12.1 Land use / Land cover Classification of the Study area

Based on the scale and the satellite resolution the Land Use/Land Cover classification can be made. The satellite data of IRS LISS IV was used while carrying out the analysis. Since digital image processing was carried out to delineate various land use / land cover categories viz. build up area, crop areas and forests, waste lands such as land with or without scrub, water bodies and Transportation. Necessary training sets were identified based on tone, texture, size, shape pattern and location information. The interpreted map was verified on ground at limited points and final land use / land cover map was prepared. The Satellite image of the study area is given at **Figure 4.9** and land use and land cover map of the study area is

given at **Figure4.10**

Figure 4.9
Satellite image of the study area

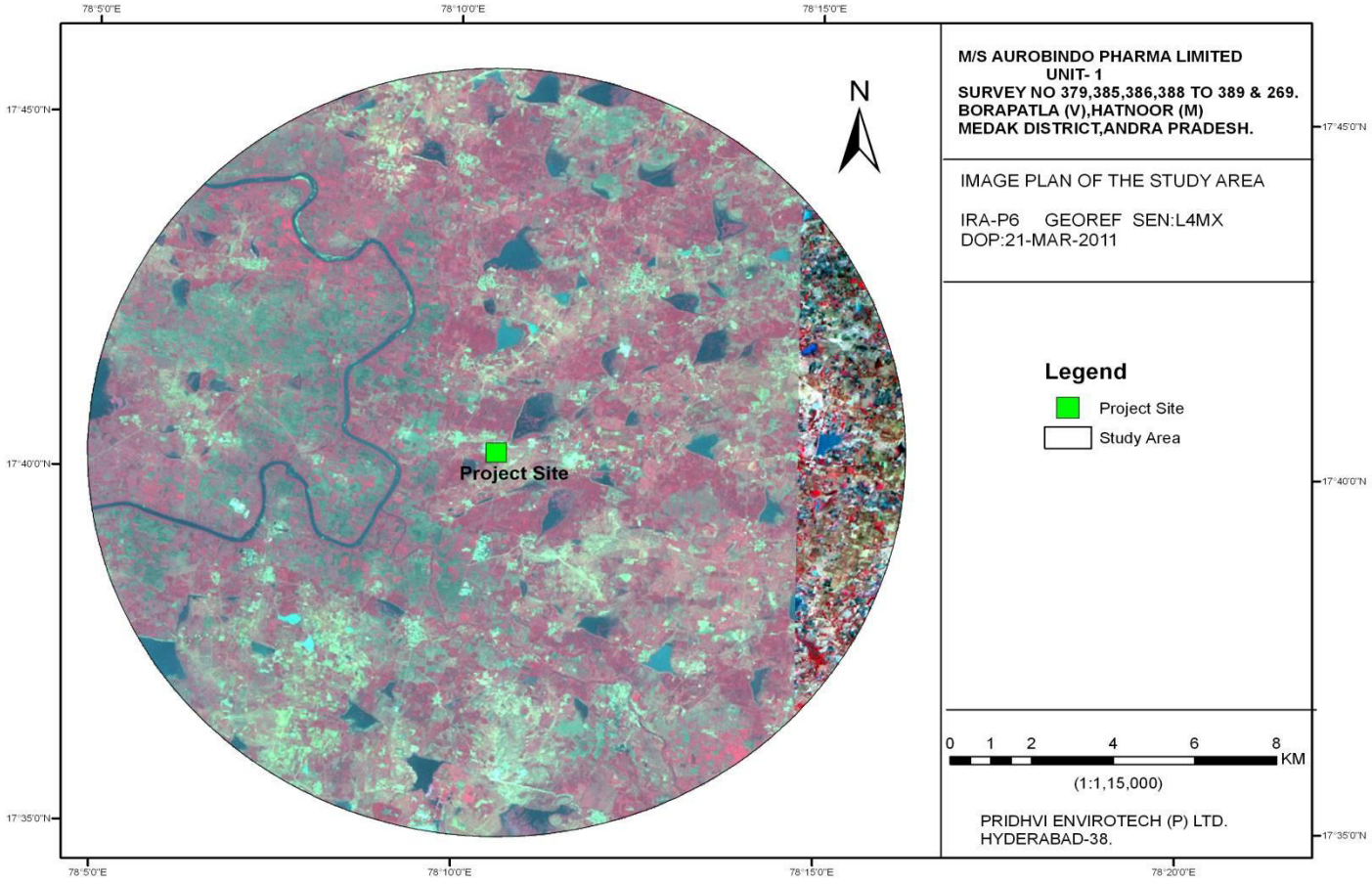
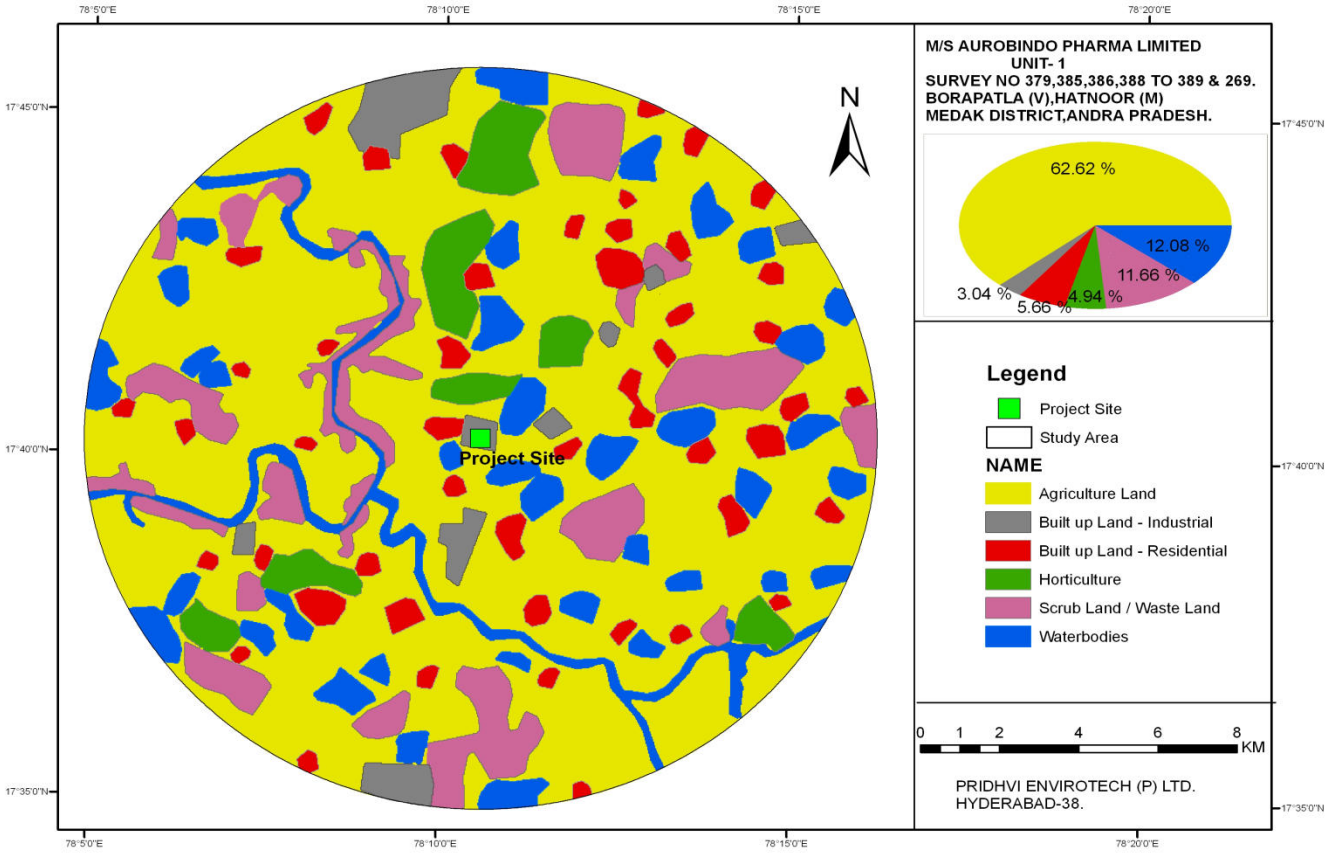


Figure 4.10

Land Use and Land Cover map of the study area



Below table provides and land use for various requirements in the study area

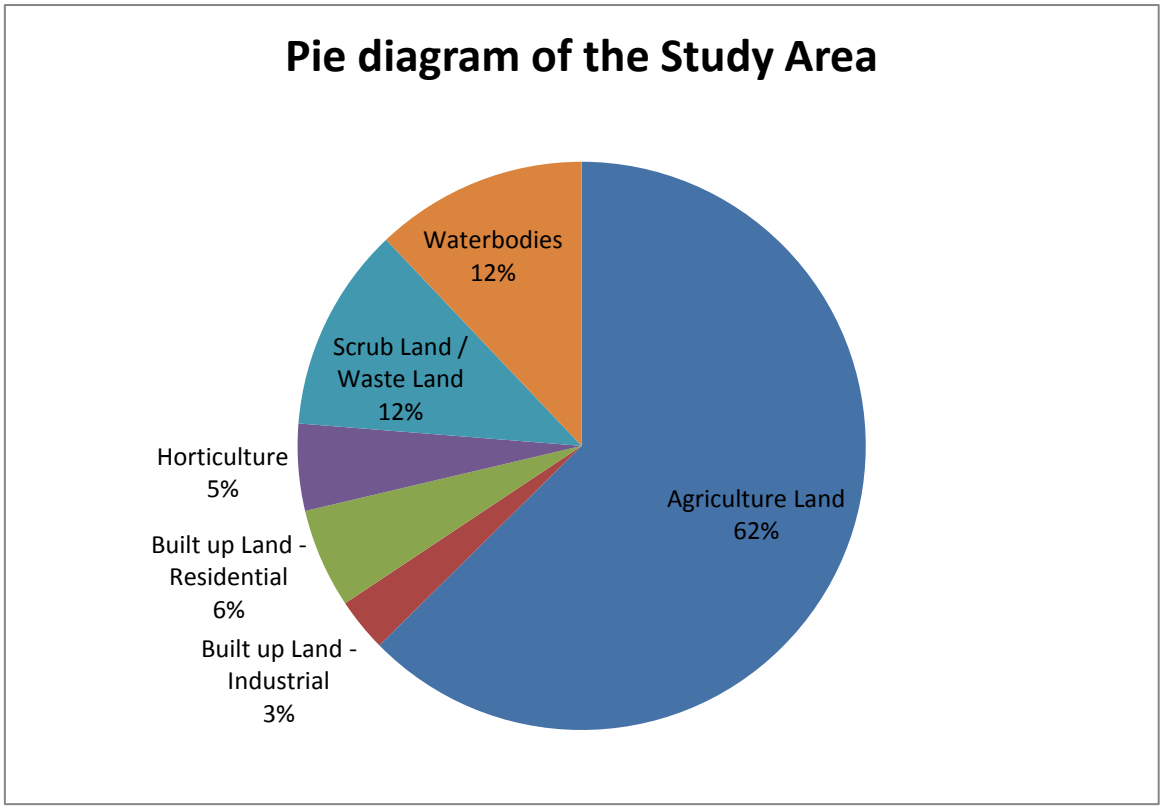
TABLE 4.19 Land Use/Land Cover classes in Study area

Land Use/Land Cover Category	Study area in Sq. Km.	% of Study area
Agriculture Land	196.7167	62.62
Built up Land - Industrial	9.5420	3.04
Built up Land - Residential	17.7924	5.66
Horticulture	15.5192	4.94
Scrub Land / Waste Land	36.6226	11.66
Water bodies	37.9630	12.08
Total area	**314.1599**	**100.00**

The Pie diagrams of the land use is given in figure 4.11. Based on the study it can be noted that 62% of total land area are agricultural lands, 12% are Water bodies, 11.66% are scrubs. There are no Reserve forests or forest lands within 10 KM radius

Figure 4.11

Pie diagram of land use the in study area



4.12.2 Cropping Pattern

The arability of the lands in the study area is not good and dry crops are observed in most of the area. There are no lands under irrigation projects. The major source in the study zone is Dug wells and tube wells. As per the District Hand Book 2011, the gross area irrigated is 3032 hectares including both kharif and rabi. The net irrigated land is 2042 hectares.

Rice, Jowar and Maize are grown both as rain-fed crops and also under wells during monsoon khariff period. The principal Crops of the area are green gram, red gram, cow gram, chillies, turmeric, sugarcan, ground nut, onions, seasmum, sunflower, mustard,and aromatic plants & Flowers & mulberry trees.

4.13 Flora and Fauna

Biological Impact Assessment (BIA) has gained importance in Environmental Impact Assessment (EIA) after the Earth Summit of 1992. As a consequence of the Convention on Biological Diversity (CBD), BIA has become an integral and important component of environmental impact assessment (EIA). Growing concerns among the people, planners, natural resource managers and academics across the globe for the biodiversity conservation have provided added impetus to BIA. BIA requires an inventory of the biological resources as base line data. These biological resources may be at stake once the proposed project is executed and also provides a broad understanding about the status of other components of the environment that are likely to be impacted. Soil, water and biological communities are interdependent and therefore the BIA provides clues regarding the health and conservation status of soil and water as well. BIA documents and collates the baseline data and information on the status of biodiversity and biotic resources likely to be impacted by the proposed activity and suggests measures mitigation of the impact. Thus the fundamental objective of the BIA is to conserve the biodiversity and ensure its sustainable utilization. In India BIA comes under the purview of Environmental Protection Act 1986, Environmental Impact Assessment

Notification of 2006, Wildlife Act of 1972, Forest Conservation Act 1980 amended in 1988 and the Biodiversity Act of 2002. The National Action Plan on Climate Change (NAPCC) document prepared by the prime Minister's Council on Climate Change has constituted a national Mission for a Green India with an ambitious program of increasing the forest cover from 23% to 33% with an initial corpus of Rs.6000 crores for afforestation of 6 million hectares.

The Convention on Biological Diversity (CBD), the Ramsar Convention, and the Convention on Migratory Species (CMS) recognize Environmental Impact Assessment (EIS) as an important decision making tool to help plan and implement development with biodiversity "in mind." The conventions require signatories ("parties") to apply EIA to proposals with potential negative impacts on biodiversity to help meet their objectives, so that development proposals respect mechanisms for the conservation of biodiversity, result in sustainable use of biodiversity resources, and ensure fair and equitable sharing of the benefits arising from use of biodiversity. According to the International Association for Impact Assessment (IAIA), Impact Assessment provides opportunities to ensure that biodiversity values are recognized and taken into account in decision-making. Importantly, this involves a participatory approach with people who might be affected by the proposal.

The main aim of Conservation of Biodiversity is to ensure "No Net Loss". The biodiversity related Conventions are based on the premise that further loss of biodiversity unacceptable. Biodiversity must be conserved to ensure it survives, continuing to provide services, values and benefits for current and future generations. The following approach has been chosen by the IAIA to help achieve 'no net loss' of biodiversity:

1. Avoidance of irreversible loss of biodiversity
2. Seeking alternative solutions to minimize biodiversity loss
3. Use of mitigation to restore biodiversity resources.
4. Compensation for unavoidable loss by providing substitutes of at least similar
5. Looking for opportunities for enhancement.

This approach can be called "positive planning for biodiversity." It helps to achieve 'no net loss' by ensuring the safety and survival of rare or endangered or endemic or threatened (REET) species.

4.13.1 Objectives and purpose of the study

The basic objectives of the study is to evaluate the status of the flora and fauna of the core area (area identified for the proposed power plant) and the buffer areas with specific reference to the rare or endangered or endemic or threatened (REET) species. The study is also designed to evaluate the adverse impacts of the proposed expansion of the port activity, if any and to suggest remedial / mitigation measures in accordance with the adjectives as desired by the IAIA and the Ministry of Environment and Forests (M.o.E&F), government of India (Gol). With these objectives in mind, the following work was undertaken by a team of experienced professional:

1. Documentation and evaluation of the status of the terrestrial flora of the core area and surrounding areas (buffer area).
2. Inventorization of the terrestrial fauna of the core area and buffer area
3. Assessment of the frequency, density, dominance, Importance Value Indices (IVI) and Shannon – Wiener Indices of the diversity of different plant communities.
4. Prediction of the impacts of the proposal port activity on the REET species.
5. Development of a management / mitigation plan to minimize the impacts of the proposed port activity on the biotic environment so that there is no net loss of biodiversity.

4.13.2 Methodology for the study of Flora and Fauna

Flora and Fauna studies are carried out between October 2013 to December, 2013 to assess the list of terrestrial plant and animal species that occur in the core area and the buffer area up to 10Km radius from proposed project site. The entire core area has been surveyed for

enumeration of flora and fauna. This area is described hereafter as the core area. Within the core area, 9 locations of 100 m^2 each were chosen for phytosociological investigation using restricted random sampling techniques. For the purpose of calculation of Importance Value Indices (IVI) quadrat method was used for estimation of frequency and density while the cover was estimated by modified line intercept method. Where ever feasible, sampling and phyto sociological analysis of vegetation was done using samples of 100 m x 10 m belt transects for tree species, 10m x 10m quadrats for shrubs and 1 m x 1 m quadrats for herbs. According these sample techniques, the frequency and density of herbs in 1 m2, shrubs in 10 m2 and trees in 100 m2 are equal. Thus one tree is considered equivalent to 10 shrubs or 100 herbs. The Importance Value Indices (IVI), of each species was calculated based on canopy cover

4.13.3 Environmental Setting of the site

Aurobindo Pharma Ltd., Unit – I is located at Borapatla Village, Hathnoora Mandal, in Survey Nos: 388 and 389. It is an existing bulk drug unit in operation since 1992. The proposed expansion does not involve any changes in land use and land cover of the of the core area. Nakkavagu and Manjira River are the two lotic bodies found in the buffer zone. There are several small to medium irrigation tanks on all sides of the industry. There are no forest lands or Reserve Forest areas in the study zone

4.13.4. Flora of the core area

Except for a few weeds, most of the natural vegetation and flora of the industrial site was lost and it is replaced by avenue plantations, block plantations, lawns and gardens. A list of plants present in the core area is given in **Table 4.23**. In addition to the list of species grown in the premises of the industry, Siam Weed (*Chromolaena odorata*) and *Hyptis suaveolens* were seen quite often in the campus.

Table 4.23

List of trees and shrubs found in the premises of the bulk drug unit

Scientific Name	**Common Name or Local Name**
Acacia auriculiformis	Australian wattle
Ailanthus excelsa	Avenue tree
Albizia lebbeck	Siris
Alstonia scholaris	Tree
Araucaria columnaris	Araucaria
Azadirachta indica	Neem
Callistemon lanceolatus	Bottle brush tree
Cassia fistula	Amaltas
Crataeva religiosa	Sacred plant
Cupressus sempervirens	Cupressus
Dalbergia sissoo	Sissoo
Delonix regia	Tree
Dendrocalamus strictus	Bamboo
Eucalyptus tereticrnis	Nilgiri
Ficus benjamina	Tree
Grevillea robusta	Silver Oak
Holoptelia integrifolia	Tree
Leucaena leucocephala	Subabul
Millingtonia hortensis	Tree
Mimusops elengi	Tree
Scientific Name	**Common Name or Local Name**
Peltophorum pterocarpum	Copper pod
Plumeria rubra	Tree
Polyalthia longifolia	Tree
Polyalthia pendula	Tree with drooping branches
Pongamia pinnata	Biodiesel plant
Spathodea companulata	Trumpet Flower tree
Swietenia mahogoni	Mahogany
Syzygium cumini	Jamun
Tamarindus indica	Tamarind
Ttectona grandis	Teak
Terminalia arjuna	Arjuna
Terminalia catappa	Badam
Thuja occidentalis	Thuja
Ornamental shrubs	
Acalypha hispida	Red-hot cattail
Bougainvillea spp.,	Ornamental varieties
Barleria cristata	Philippine violet
Cestrum diurnum	Din Ka Raja
Cycas revoluta	Sago cycas

Duranta repens	Suitable as a hedge plant
Ervatamia divaricata	Tabernaemontana
Ervatamia coronaria	Grape jasmine
Hamelia patens	Fire bush or Scarlet bush
Hibiscus rosasinenisis	China rose
Ixora parviflora	Ixora
Lagerstroemia speciosa	Giant Crape-myrtle
Lantana camara	Ornamental Lantanas
Mussaenda erythrophylla	Red Mussaenda
Mussaenda luteola	Dwarf Yellow Mussaenda
Nyctanthes arbortristis	Night-flowering Jasmine
Nerium indicum	Nerium
Poinsettia pulcherrima	*Poinsettia*
Plumbago capensis	Cape *Plumbago*
Pentas carnea	Pentas
*Rosa spp. (*Roses)	Roses
Russelia juncea	Firecracker Plant
Russelia floribunda	*Russelia*
Tecoma capensis	Cape Honeysuckle
Tecoma stans	Yellow bell
Thuja compacta	Thuja
Thevetia peruviana	Yellow Oleander

4.13.5 Vegetation and Flora of the Buffer zone

There are no ecologically sensitive areas such as biosphere reserves, national parks, wildlife sanctuaries, important birdlife areas (IBA), wetlands or migratory corridors of wildlife within the 10 Km buffer zone. There are no Reserve Forests within in core or buffer zones. A list of trees, shrubs and perennial climbers found in the buffer zone is given in **Table 4.24.** Besides the species given in the Table, all common cultivated fruit trees such as Mango, Sapota, Guava, Jamun and others are also found in the buffer zone. A list of grasses found in the buffer zone is given in **Table 4.25.** Another list of herbaceous species found in the buffer zone as well as in the core area is given in **Table 4.26**

Table 4.24
List of trees, shrubs and perennial climbers found in the buffer zone of the industry

Scientific name	Common or Local name	Family
Acacia ferruginea	Pandra Khair	Mimosaceae
Acacia auriculiformis	Australian Wattle	Mimosaceae
Acacia caesia	Korintha	Mimosaceae
Acacia catechu	Khair / Nalla sandra	Mimosaceae
Acacia farnesiana	Muriki thumma	Mimosaceae
Acacia leucophloea	Tella tumma	Mimosaceae
Acacia nilotica	Nalla tumma	Mimosaceae
Acacia planifrons	Godugu Thumma	Mimosaceae
Acacia sundra	Sundra	Mimosaceae
Acaia holosericea	Holosericea	Mimosaceae
Acaia horrida	Parikithumma	Mimosaceae
Acaia instia	Korinta	Mimosaceae
Achrus sapota	Sapota	Sapotaceae
Aegle marmelos	Maredu	Rutaceae
Ailanthus excelsa	Peddamaanu	Simaroubaceae
Alangium salvifolium	Ooduga	Alangiaceae
Albizia lebbek	Dirisanam	Mimosaceae
Alhagi camelorum	Camel thorn	Fabaceae
Allamanda cathartica	Allamanda	Apocynaceae
Anacardium occidentale	Cashew nut	Anacardiaceae
Annona squamosa	Custard apple	Annonaceae
Anogeissus acuminata	Pasi	Combretaceae
Anogeissus latifolia	Chirumaanu	Combretaceae
Asperagus racemosa	Satavari	Liliaceae
Azadirachta indica	Vepa	Meliaceae
Azima tetracantha	Tella Uppili	Salvadoraceae
Bassia latifolia	Ippa	Sapotaceae
Bauhinia racemosa	Aare chettu	Caesalpiniaceae
Bauhinia variegata	Mandari	Caesalpiniaceae
Benkara malabarica	Pedda manga	Rubiaceae
Bombax ceiba	Booruga	Bombacaceae
Bombax malabariucm	Silk cotton	Bombacaceae
Borassus flabellifer	Taati / Taadi	Araceae
Breynia retusa	Chinna purugudu	Euphorbiaceae
Breynia vitis-ideae	Nalla purugudu	Euphorbiaceae
Buchanania angustifolia	Pedda -mori	Anacardiaceae
Buchanania latifolia	Char / Sarapappu	Anacardiaceae
Butea monosperma	Modugu	Fabaceae
Callistemon citrinus	Indian bottle brush tree	Myrtaceae
Calotropis gigantea	Tella Jilledu	Asclepiadaceae

Scientific name	Common or Local name	Family
Calotropis procera	Jilledu	Asclepiadaceae
Calycoperis floribunda	Bonta teega	Combretaceae
Canthium dicoccum	Nalla balusu	Rubiaceae
Canthium parviflorum	Balusu	Rubiaceae
Capparis zeylanica	Kutajamu	Capparidaceae
Careya arborea	Vaikumbha	Myrtaceae
Carissa spinarum	Kalivi / Vaaka	Apocynaceae
Cascabela thevetia	Patcha ganneru	Apocynaceae
Cassia auriculata	Tangedu	Caesalpiniaceae
Cassia fistula	Rela	Caesalpiniaceae
Catunaregam spinosa	Manga / Chinna manga	Rubiaceae
Celastrus paniculata	Dante	Celastraceae
Chloroxylon sweitenia	Billudu	Flindarsiaceae
Cissus vitiginea	Adavi Gummadi	Vitaceae
Cocos nucifera	Coconut	Araceae
Codioeum varieigatum	Croton	Euphorbiaceae
Cordia dichotoma	Bankiriki	Cordiaceae
Cosmostigma racemosum	Adavitamalapaaku	Apocynaceae
Crataeva religiosa	Urimidi	Capparidaceae
Cryptostegia grandiflora	Rubber vine	Asclepiadaceae
Daemia extensa		Asclepiadaceae
Dalbergia sisso	Sisso or Seesum	Caesalpiniaceae
Decalepis hahiltonii	Maredu kommulu	Periplocaceae
Dendrocalamus strictus	Bamboo / Veduru	Poaceae
Desmodium pulchellum	Deyyapu mokka	Fabaceae
Dichrostachys cinerea	Sara Thumma	Mimosaceae
Diospyros chloroxylon	Ulinda	Ebenaceae
Diospyros melanoxylon	Tunki	Fabaceae
Dodonaea viscosa	Bandedu	Sapindaceae
Dolichondrone crispa	Nirwodi	Bignoniaceae
Dolichondrone falcata	Wodi	Bignoniaceae
Erythina indica	Indian coral tree	Papilionaceae
Erythroxylon monogynum	Dedaraaku	Erythroxylaceae
Eucalyptus teretocronis	Eucalyptus	Myrtaceae
Eucalyptus hybrid	Eucalyptus / Nilagiri	Myrtaceae
Euphorbia caducifolia	Brahma jemudu	Euphorbiaceae
Ficus benghalensis	Marri	Moraceae
Ficus racemosa	Medi	Moraceae
Ficus religiosa	Raavi	Moraceae
Givotia rottleriformis	Tella Poliki	Euphorbiaceae
Glycomis mauritiana	Tanaka	Rutaceae
Grevellia robusta	Silver oak	Proteaceae
Grewia flavescens	Jaana	Tiliaceae
Grewia hirsuta	Jaani Chettu	Tiliaceae
Grewia obtusa	Jaana	Tiliaceae

Scientific name	Common or Local name	Family
Grewia orbiculata	Pedda Jaani	Tiliaceae
Grewia tillifolia	Pedda Jaana	Tiliaceae
Grewia villosa	Bantha	Tiliaceae
Hardwickia binata	Yepi	Caesalpiniaceae
Hemidemus indicus	Sugandhapala	Periplocaceae
Heterophragma roxburghii	Bondudgu	Bignoniaceae
Holoptelia integrifolia	Nemali naara	Ulmaceae
Ipomoea carnea	Rubber mokka	Convolvulaceae
Jatropha glandulifera	Wild Castor	Euphorbiaceae
Kigelia africana	Yenugu Paadam	Bignoniaceae
Lagerstroemia parviflora	Chennangi	Lythraceae
Lantana camara	Lantana	Verbenaceae
Leptadenia reticulata	Mukkupala Teega	Asclepiadaceae
Leucaena leucocephala	Subabul	Mimosaceae
Limonia acidissima	Velaga	Rutaceae
Mangifera indica	Mamidi	Anacardiaceae
Maytenus emerginata	Danti	Celastraceae
Millingtonia hortensis	Aakaasa malle	Bignoniaceae
Mimosa polyancistra	Thumma	Mimosaceae
Mimosa rubicaulis	Pariki kampa	Mimosaceae
Mimosops elengi	Pogada	Sapotaceae
Morinda pubescens	Togaru	Rubiaceae
Moringa olivaefera	Munaga	Moringaceae
Muntingia calabura	Wild cherry	Elaeocarpaceae
Odina wodier	Gumpena	Anacardiaceae
Oroxylum indicum	Dundilam	Bignoniaceae
Parkinsonia aculeata	Jeeluga	Widespread
Peltophorum pterocarpum	Konda chinta	Caesalpiniaceae
Pergularia daemia	Dustapa teega	Asclepiadaceae
Phoenix sylvestris	Eetha	Araceae
Phyllanthus emblica	Usiri	Euphorbiaceae
Phyllanthus reticulatus	Pulasari / Puliseru	Euphorbiaceae
Pithecellobium dulce	Seema chinta	Mimosaceae
Plumeria acutifolia	Temple tree	Apocynaceae
Plumeria alba	Tella devaganneru	Apocynaceae
Plumeria rubra	Erra devaganneru	Apocynaceae
Polyalthia cerasoides	Tella chilkadudi	Annonaceae
Polyalthia longifolia	Ashoka	Annonaceae
Polyalthia pendula	Asoka	Annonaceae
Pongamia pinnata	Ganuga	Fabaceae
Prosopis juliflora	English tumma	Mimosaceae
Prosopis spicigera	Jammi chettu	Mimosaceae
Quisqualis indica	Rangoon creeper	Combretaceae
Rauwolfia tetraphylla	Bara Chandrika	Apocynaceae
Ricinus communis	Castor	Euphorbiaceae

Scientific name	Common or Local name	Family
Saccopetalum tomentosum	Chilka dudi	Annonaceae
Samanea saman	Nidrabhangi	Mimosaceae
Sapindus emarginatus	Kunkundu	Sapindaceae
Sarcostemma bevistigma	Som	Asclepiadaceae
Semecarpus ancardium	Marking nut tree	Anacardiaceae
Spathodea companulata	Flame of the forest	Bignoniaceae
Spondias mangifera	Konda maamidi	Anacardiaceae
Sterculia foetida	Adavi badam	Sterculiaceae
Strychnos nux-vomica	Usti	Loganiaceae
Syzigium cumini	Neradu	Myrtaceae
Tabermantana coronaria	Nandivardhanam	Apocynaceae
Tamarindus indica	Chinta	Caesalpiniaceae
Tecoma stanns	Patcha turai	Bignoniaceae
Tectona grandis	Teak / Teku	Verbenaceae
Terenna asiatica	Kommi	Rubiaceae
Terminalia arjuna	Tella maddi	Combretaceae
Terminalia bellerica	Taani / Taandra	Combretaceae
Terminalia catappa	Baadam	Combretaceae
Terminalia tomentosa	Nalla maddi	Combretaceae
Thespecia populnea	Ganga Raavi	Malvaceae
Thevetia nerifolia	Yellow oleander	Apocynaceae
Tylophora indica	Kukkapala teega	Asclepiadaceae
Vitex negundo	Vaavili / Nirgundi	Verbenaceae
Wattakaka volubilis	Tummudu teega	Asclepiadaceae
Wrightia tinctoria	Pala –kordusha	Apocynaceae
Ziziphus numularia	Nela regu	Rhamnaceae
Ziziphus rugosus	Regu	Rhamnaceae
Ziziphus xylopyra	Goti or gotti	Rhamnaceae

Table 4.25
List of grasses and sedges found in the buffer zone during the Winter season

Scientific name	Family	Importance
Alloteropsis cimicina	Poaceae	Fodder
Andropogon jwarancusa	Poaceae	Fodder grass
Aristida depressa	Poaceae	Fodder
Aristida hystrix	Poaceae	Fodder in early stages
Aristida setacea	Poaceae	Used for making brooms
Bothriochloa pertusa	Poaceae	Fodder grass
Brachiaria cruciformis	Poaceae	Fodder grass
Brachiaria distachya	Poaceae	Fodder grass
Brachiaria mutica	Poaceae	Fodder grass
Brachiaria reptens	Poaceae	Fodder grass

Scientific name	Family	Importance
Cenchrus ciliaris	Poaceae	Fodder grass
Chloris barbata	Poaceae	Fodder grass
Chrysopogon fulvus	Poaceae	Fodder grass
Cymbopogon coloratus	Poaceae	Aromatic non palatable perennial grass
Cymbopogon caesius	Poaceae	Aromatic non palatable perennial grass
Cynodon dactylon	Poaceae	Palatable fodder and soil binder
Cyperus rotundus	Cyperaceae	Nut grass, a notorious weed
Dichanthium annulatum	Poaceae	Palatable fodder gass
Dichanthium caricosum	Poaceae	Palatable fodder gass
Eremopogon faveolatus	Poaceae	Palatable fodder grass
Heteropogon contortus	Poaceae	Fodder when young

Table 4.26
List of herbaceous plant species found in the study area during Winter season

Name of species	Family	Importance
Abrus precatorius	Fabaceae	Medicinal
Abutilon crispum	Malvaceae	Non palatable weed
Abutilon indicum	Malvaceae	Non palatable weed
Acalypha indica	Euphorbiaceae	Medicinal
Achyranthes aspera	Amaranthaceae	Medicinal
Adhatoda vasica	Acanthaceae	Medicinal
Aerva lanata	Amaranthaceae	Medicinal
Aerva tomentosa	Amaranthaceae	Medicinal
Ageratum conyzoides	Asteraceae	Non palatable weed
Aloe barbadensis	Liliaceae	Leaf fiber and soil binder
Aloe vera	Liliaceae	Medicinal
Amaranthus spinosus	Amaranthaceae	Non palatable weed
Argemone mexicana	Papaveraceae	Medicinal
Aristolochia bracteata	Aristolochiaceae	Medicinal
Aristolochia indica	Aristolochiaceae	Medicinal
Barleria cristata	Acanthaceae	Wild prickly ornamental
Barleria prionitis	Acanthaceae	Grown as an ornamental
Boerhaavia diffusa	Nyctaginaceae	Medicinal
Cassytha filiformis	Lauraceae	Medicinal
Cissus quadrangularis	Ampelidaceae	Medicinal
Citrullus vulgaris	Cucurbitaceae	Edible fruit
Cleome aspera	Capparidaceae	Non-palatable weed with medicinal properties

Name of species	Family	Importance
Cleome gynandra	Capparidaceae	Non-palatable weed with medicinal properties
Clitoria ternatea	Fabaceae	Medicinal
Conyza stricta	Asteraceae	Non-palatable weed
Crinum asiaticum	Amaryllidaceae	Ornamental
Crotalaria verrucosa	Fabaceae	Medicinal
Croton bonplandianum	Euphorbiaceae	Non-palatable weed
Datura metel	Solanaceae	Medicinal
Desmodium gangeticum	Fabaceae	Non palatable weed
Desmodium triflorum	Fabaceae	Palatable weed
Duranta repens	Verbenaceae	Grown as a hedge plant
Evolvulus alsinoides	Convolvulaceae	Medicinal and fodder
Evolvulus nummularis	Convolvulaceae	Fodder
Hibiscus micranthus	Malvaceae	Medicinal and ornamental
Hyptis suaveolens	Lamiaceae	Non-palatable aggressive weed
Indigofera enneaphylla	Fabaceae	Palatable legume
Ipomoea carnea	Convolvulaceae	Large perennial shrub
Neptunia triquetra	Mimosaceae	Weed
Oldenlandia umbellata	Rubiaceae	Fodder
Parthenium hysterophorus	Asteraceae	Notorious allergic weed
Polycarpaea corymbosa	Caryophyllaceae	Medicinal
Ruellia tuberosa	Acanthaceae	Very widespread plant with attractive flowers
Rungia repens	Acanthaceae	Fodder
Sanseveria roxburghiana	Liliaceae	Medicinal
Scilla indica	Liliaceae	Non-edible bulbs
Sida acuta	Malvaceae	Non-palatable weed
Sida cordifolia	Malvaceae	Non-palatable weed
Tragia involucrata	Euphorbiaceae	Medicinal
Trainthema portulacastrum	Ficoidaceae	Fodder and vegetable
Tridax procumbens	Asteraceae	Medicinal
Urginea congesta	Liliaceae	Common weed of shady places
Urginea coromandeliana	Liliaceae	Common weed of shady places
Waltheria indica	Sterculiaceae	Non-palatable weed
Withania somnifera	Solanaceae	Medicinal

4.13.6 Terrestrial Fauna of the study area

As the core are is under intensive industrial use and surrounded by a compound wall on all sides, there are no chances of occurrence of any wild animals other than the rodents that are found in any residential area. Rats, bandicoots, mice, squirrels and lizards are some of the natural fauna that is found in the core area as well as in nay other locality. A list of birds found or reported from the study

area is given in **Table 4.27.** Pea Cocks and Pea Fowls are quite common. They were found in groups of 2 to 8. Though they (Pea Cocks and Pea Fowls) are our national bird and included in Schedule of the Indian Wildlife (protection) Act, they are placed in the LC (least concern) category by the IUCN. If permitted, it is easy to domesticate and multiply them.

4.13.7 Rare and Endangered animals:

There are no Rare and Endangered animals in core zone or buffer zone.

Table 4.27

List of Birds either spotted or reported from the areas in and around the project site.

Scientific Name	Common Name	Family	WPA Schedule
Accipiter badius	Shikra	Accipitridae	IV
Acridotheres tristis	Common myna	Sturnidae	IV
Aegithinia tiphia	Common Iora	Irenidae	IV
Alcedo atthis	Smallblue kingfisher	Alcedinidae	IV
Amaurornis phoenicurus	White-breasted waterhen	Recurvirostridae	IV
Anas poecilorhyncha	Spot-billed duck	Anatidae	IV
Ardea cinerea	Grey Heron	Ardeidae	IV
Ardeola grayii	Pond Heron	Ardeidae	IV
Athene brama	Spotted owlet	Noctuidae	IV
Bubulcus ibis	Cattle Egret	Ardeidae	IV
Centropus sinasis	Greater coucal	Phasianidae	IV
Ceryle rudis	Lesser pied Kingfisher	Alcedinidae	IV

Scientific Name	Common Name	Family	WPA Schedule
Columba livia	Blue rock pigeon	Columbidae	IV
Coracias benghalensis	Indian roller	Coraciidae	IV
Corvus splendens	House crow	Corvidae	V
Dendrocitta vagabunda	Indian tree pie	Corvidae	IV
Dendrocygna javanica	Lesser whistling-duck	Anatidae	IV
Dicaeum erythrorhynchos	Tickell's flower pecker	Dicaeidae	IV
Dicrurus macrocercus	Black drongo	Dicruridae	IV
Egretta garzetta	Little egret	Ardeidae	IV
Elanus caeruleus	Black-shouldered kite	Accipitridae	IV
Eudynamys scolopace	Asian koel	Cuculidae	IV
Fulica atra	Coot	Rallidae	IV
Gallinula chloropus	Indian Moorhen	Rallidae	IV
Halcyon smyrnensis	White-Breasted King fisher	Alcedinidae	IV
Hierococcyx varius	Brain fever bird	Ardeidae	IV
Himantopus himantopus	Black-winged stilt	Recurvirostridae	IV
Hydrophasianus chrugus	Pheasant tailed Jacana	Jacanidae	IV
Lanius excubitor	Great grey shrike	Daniidae	IV
lxobrychus cinnamomeus	Chestnut bittern	Ardeidae	IV
Megalaima haemacephala	Copper smith Barbet	Capitonidae	IV
Merops orientalis	Small Bee eater	Meropidae	IV
Milvus migrans	Black kite	Accipitridae	IV
Motacilla alba	White wagtail	Motacillidae	IV
Motacilla flava	Yellow wagtail	Motacillidae	IV
Motacilla maderaspatensis	Large pied wagtail	Motacillidae	IV
Nectarinia asiatica	Purple sunbird	Nectariniidae	IV
Nectarinia zeylonica	Purple-rumped sunbird	Nectariniidae	IV
Oriolus oriolus	Eurasian golden oriole	Oriolidae	IV
Passer domesticus	House sparrow	Passeridae	IV
Pavo cristatus	Pea cock / Pea Fowl (National Bird)	Phasianidae	I (LC as per IUCN)
Perirocotus cinnomomeus	Small Minivet	Phasianidae	IV
Phalacrocorax carbo	Large Cormorant	Phalacrocoracidae	IV
Phalacrocorax niger	Little cormorant	Phalacrocoracidae	IV
Porphyrio porphyrio	Purple moorhen	Rallidae	IV
Prinia inornata	Plain prinia	Cisticolidae	IV

Scientific Name	Common Name	Family	WPA Schedule
Prinia socialis	Ashy prinia	Cisticolidae	IV
Psittacula cyanocephala	Blossom headed Parakeet	Psittacidae	IV
Psittacula krameri	Rose-Ringed Parakeet	Psittacidae	IV
Pycnonotus cafer	Red-vented bulbul	Pycnonotidae	IV
Saxicolodies fulicata	Indian robin	Turdinae	IV
Streptopelia chinensis	Spotted dove	Columbidae	IV
Streptopelia decaocto	Eurasian Collared-Dove	Columbidae	IV
Streptopelia Senegalensis	Little brown dove	Columbidae	IV
Streptopelia tranquebarica	Red Collared-Dove	Columbidae	IV
Sturnus pagodarum	Brahminy starling	Sturnidae	IV
Terpsiphone paradisi	Asian paradise-flycatcher	Muscicapidae	IV
Turdoides caudatus	Common babbler	Timalinae	IV
Upupa epops	Common hoopoe	Upupidae	IV
Vanellus indicus	Red-wattled lapwing	Charadriidae	IV

4.13.8 Aquatic Flora and Fauna of the buffer zone:

Manjira River and Nakka vagu are the two lotic bodies found in the buffer zone. It is very well known that Nakka Vagu is highly polluted with industrial effluents and it is devoid of any flora or fauna. But Manjira River supports a rich variety of flora and fauna. Besides the aforesaid lotic water bodies, several lentic water bodies of irrigation tanks are found on all sides in the buffer zone. But they get dried up during summer. A list of aquatic / semi aquatic macrophytes found along the borders of Manjira River, Tanks and ponds of the buffer zone is given in **Table 4.28.** A list of fishes either caught by the fisherman or reported from the Manjira River and its environs is given in **Table 4.29**. There are no rare or endangered or threatened (RET) species.

Table 4.28

List of aquatic / semi aquatic macrophytes found along the borders of Manjira River, Tanks and ponds of the buffer zone.

Latin name	**Family**
Alternanthera philoxeroides	Solanaceae
Aponogeton natans	Aponogetonaceae
Azolla pinnata	Azollaceae
Brachiaria mutica	Poaceae
Carex cruciata	Cyperaceae
Latin name	**Family**
Centella asiatica	Apiaceae
Chrysopogon aciculatus	Poaceae
Colocassia esculenta	Araceae
Cynodon dactylon	Poaceae
Cyperus arenarius	Cyperaceae
Cyperus exaltatus	Cyperaceae
Echinochloa colona	Poaceae
Echinochloa stagnina	Poaceae
Eichhornia crassipes	Pontederiaceae
Hydrilla verticillata	Hydrocharitaceae
Ipomoea aquatica	Convolvulaceae
Ludwigia perennis	Onagraceae
Malachra capitata	Malvaceae
Marsilia quadrifoliata	Marsiliaceae
Nelumbo nucifera	Nelumbiaceae
Nymphaea nauchali	Nympheaceae
Nymphaea stellata	Nympheaceae
Nymphoides hydrophylla	Nympheaceae
Nymphoides indica	Nympheaceae
Ottelia alismoides	Hydrocharitaceace
Oxalis corniculata	Oxalidaceae
Paspalidium geminatum	Poaceae
Phragmites karka	Cyperaceae
Pistia stratoides	Araceae
Salvinia cucullata	Salviniaceae
Typha angustata	Typhaceae
Vallisneria spiralis	Hydrocharitaceae

Table 4.29

List of fishes either caught by the fisherman or reported from the Manjira River and its environs

Common name	Latin name
Catla	*Catla catla*
Rohu	*Labeo rohita*
Murrel	*Channa striatus*
Murrel	*Channa punctatus*
Wallago	*Wallago attu*
Cat fish	*Mystus vittatus*
Cat fish	*Hetyeropneustes fossilis*
Spiny eel	*Mastecembalus armatus*
Giant River Prawn	*Macrobrachium rosenberghii*
Silonia	*Silonia silonia*
Pearl spot	*Etroplus suratensis*
Indian Mottled Eel	*Anguilla bengalensis*
Gobids	*Glossogobius giuris*
Gobids	*Platycephalus sp.*
Mrigal	*Cirrhinus mrigala*
Tilapia	*Oreochromis aureus*
Tilapia	*Oreochromis mossambicus*
Tilapia	*Oreochromis niloticus*
Tilapia	*Tilapia rendalli*

CHAPTER 5: IDENTIFICATION & PREDICTION OF IMPACTS

5.1 INTRODUCTION

Prediction of impacts depends on the nature and size of activity being undertaken and also on the type of pollution control measures that are envisaged as part of the project proposal. As seen from the earlier sections the project is spread over 71.0 acres comprising of Plant activity, utilities, roads and environmental infrastructure required to cater to the current & proposed expansion activities.

The potential impacts on the environment from the proposed expansion activity are identified based on the nature of the various activities associated with the operation and also on the current status of the environmental quality at the project area and its surroundings. Both beneficial (positive) and adverse (negative) impacts are considered.

5.2 POTENTIAL IMPACTS

All the potentially significant environmental impacts from the project are grouped as below.

Environmental Interactions

Air Environment

Impact on ambient air quality

Impact on ambient noise

Land environment

Impacts on land use
Impacts on soil fertility

Impacts on agriculture
Impacts on forests and wildlife

Socio Economics

Impacts on demand-supply
Impacts on natural resources
Impacts on industry
Impacts on infrastructure
Impacts on employment

Indirect Impacts

Impacts on public health and safety
Impacts on cultural resources
Impacts on aesthetics

5.3 PREDICTION OF IMPACTS

Prediction of impacts is the most important component in the environmental impact assessment studies. Several scientific techniques and methodologies are available to predict impacts of developmental activities on physic, ecological and socio-economic environment. Such predictions are superimposed over the baseline data of environmental quality to derive the environmental scenario. The prediction of impacts helps to prepare the environmental management plan to be executed during the on-going activities for the project to minimize the adverse impacts on environmental quality.

The mathematical models are the best tools to quantitatively describe the cause effect relationships between sources of pollution and different components of environment. In case, mathematical models are not available or it is not possible to identify/validate a model for a particular situation, predictions could be made through available scientific knowledge and judgments.

The mathematical model used for predictions on air quality impact in the present study includes All Terrain Dispersion model by Lakes Environmental, Canada. In case of water, land and socio-economic environment the predictions are made based on available scientific knowledge and judgments.

The impacts assessment is carried out for the following phases and resented in the following paragraphs.

- Impacts during development phase
- Impacts during operation phase

5.4 IMPACTS DURING DEVELOPMENT PHASE

The important activities involved during the development phase are:

- Site Development
- Socio economic impacts

The impacts due to above mentioned developmental activities are short term and are limited to the construction phase. The impacts will be mainly on air quality, marine water & sediment quality and socio-economics.

5.4.1 Land availability

Company is already having 71.0 Acres of land which was a plain land. There is no rehabilitation and resettlement activity involved in the proposed establishment.

Below table gives the land availability for expansion activity and land use for various purposes of present & proposed activity

Table 5.1

Land use statement of the site

S. No.	Description of Land Use	Area (Acres)	
		Existing	Proposed
1.	Built Up Area (Manufacturing Blocks, Utility Services and Wastewater Treatment)	14.9	17.5
2.	Roads and Cart Tracks	6.6	8.0
3.	Green Belt	18.4	24.5
4.	Lawns and other open area	25.6	21.0
	Total	**65.5**	**71.0**

Land requirement for proposed expansion activity would be 5.5 Acres including additional environmental infrastructure. Thus enough land is available for expansion activity without disturbing green belt area

5.4.2 Site Development

This activity would involve clearing the site and further development of infrastructure comprising of construction of Effluent handling facilities, Utilities, laying of roads and pipe lines. During construction phase, there will be small amount of air emissions and noise

Vehicular emissions are the major source of air quality impacts. The principal cause of air pollution during the construction phase is the diesel-powered vehicles used in haulage of aggregates, earth and other construction material. In addition, the construction yards are also one of the contributors to air pollution. Air Quality could also be affected by dust & particulate matter arising due to site clearing, vehicular emissions, processing & handling of construction materials. Gaseous emission like Sulphur dioxide, nitrous oxide, CO might be released due to welding and operation of DG sets etc. The air impacts will be experienced only in the premises. The impacts on the air environment could be negated on exercising controls such as sprinkling of water along unpaved roads, provision of acoustic enclosures to construction of machinery, setting up of construction yards away from habitations etc.

Generally the activities, which affect the air environment also, impact the noise environment. The issues related to air pollution during the construction phase also apply to noise pollution.

Runoffs from the construction yards could affect the water environment. These runoffs if not properly collected it will affect the ecology of the water bodies. Further there might be a possibility of formation of water puddles in low lying area which can create an environment conductive to disease carrying vectors and also affect the ground water quality.

5.4.3 Socio Economics Impacts

As this unit is existing unit and construction labor would be available in the surrounding villages, there will not be any impact of migration of workers. There will be economic benefit to local villagers due to construction activity

5.5 IMPACTS DURING OPERATION

During the Operation Phase of the project there would be impacts on the air environment and socio-economic aspects. The following sections present the impacts during the operation phase. **Figures 5.1 to 5.6** outline various impacts that can occur in operational stage.

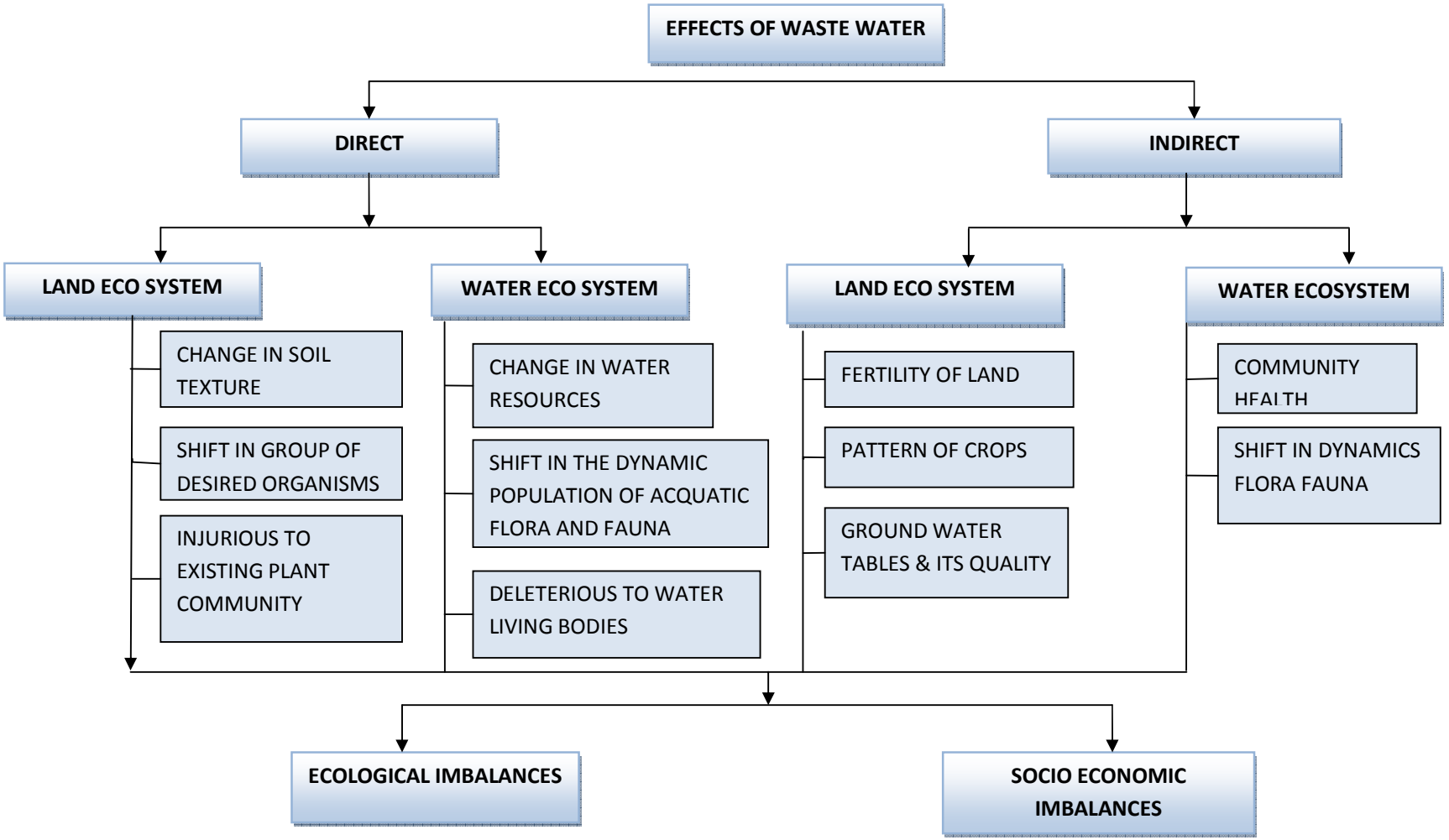


Fig 5.1 Identification of Likely Impacts of waste water

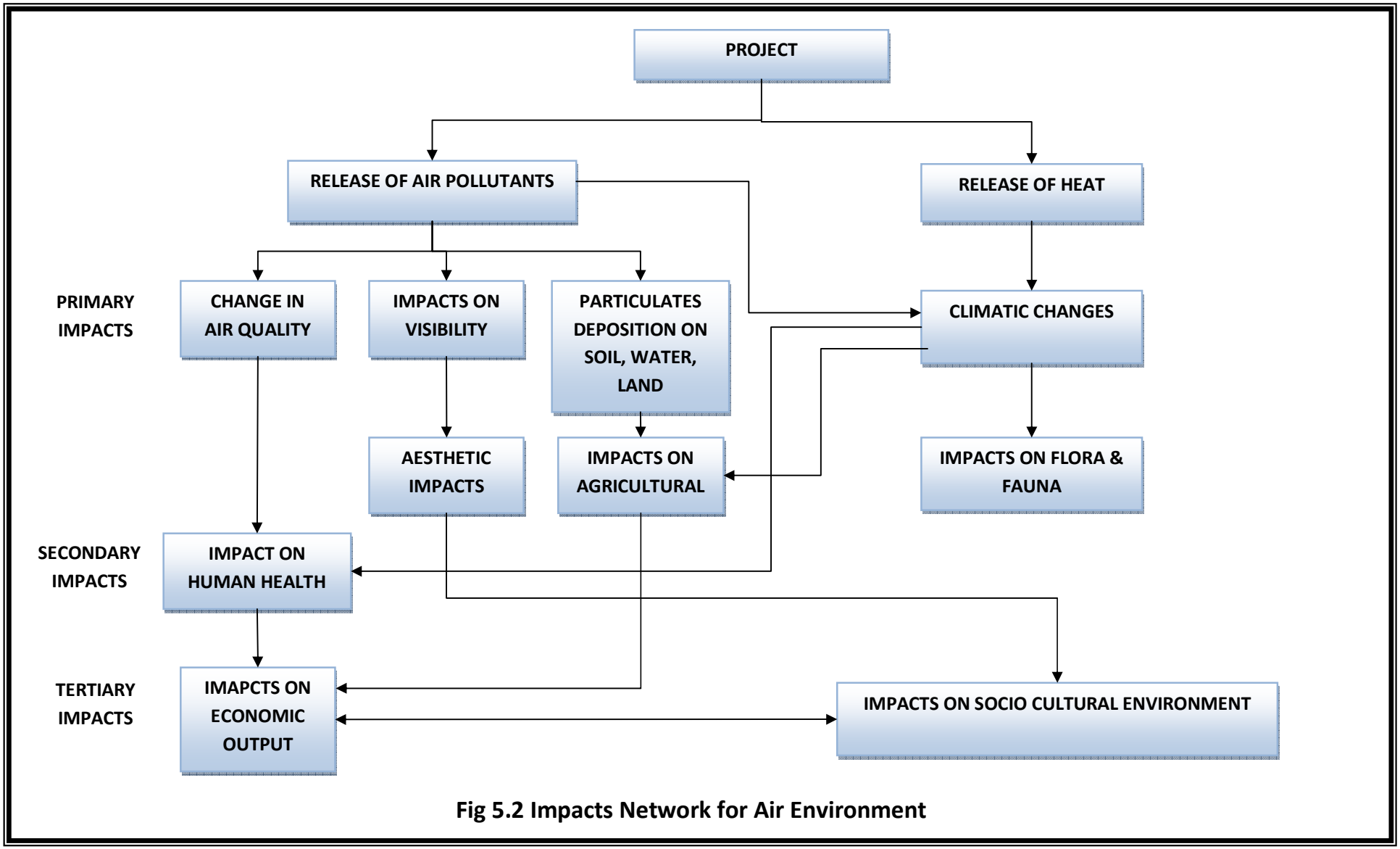


Fig 5.2 Impacts Network for Air Environment

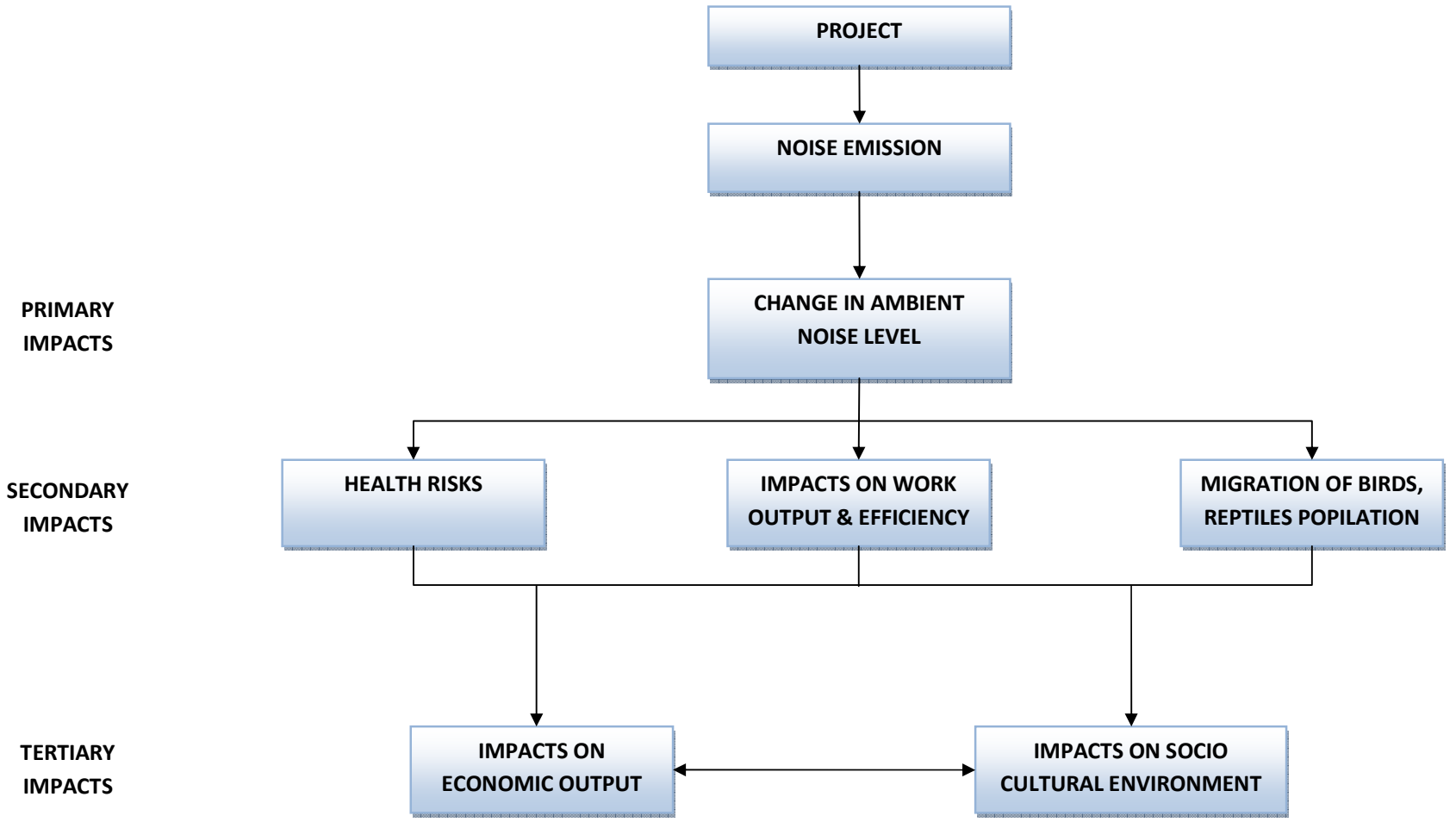


Fig 5.3 Impacts Network for Noise Environment

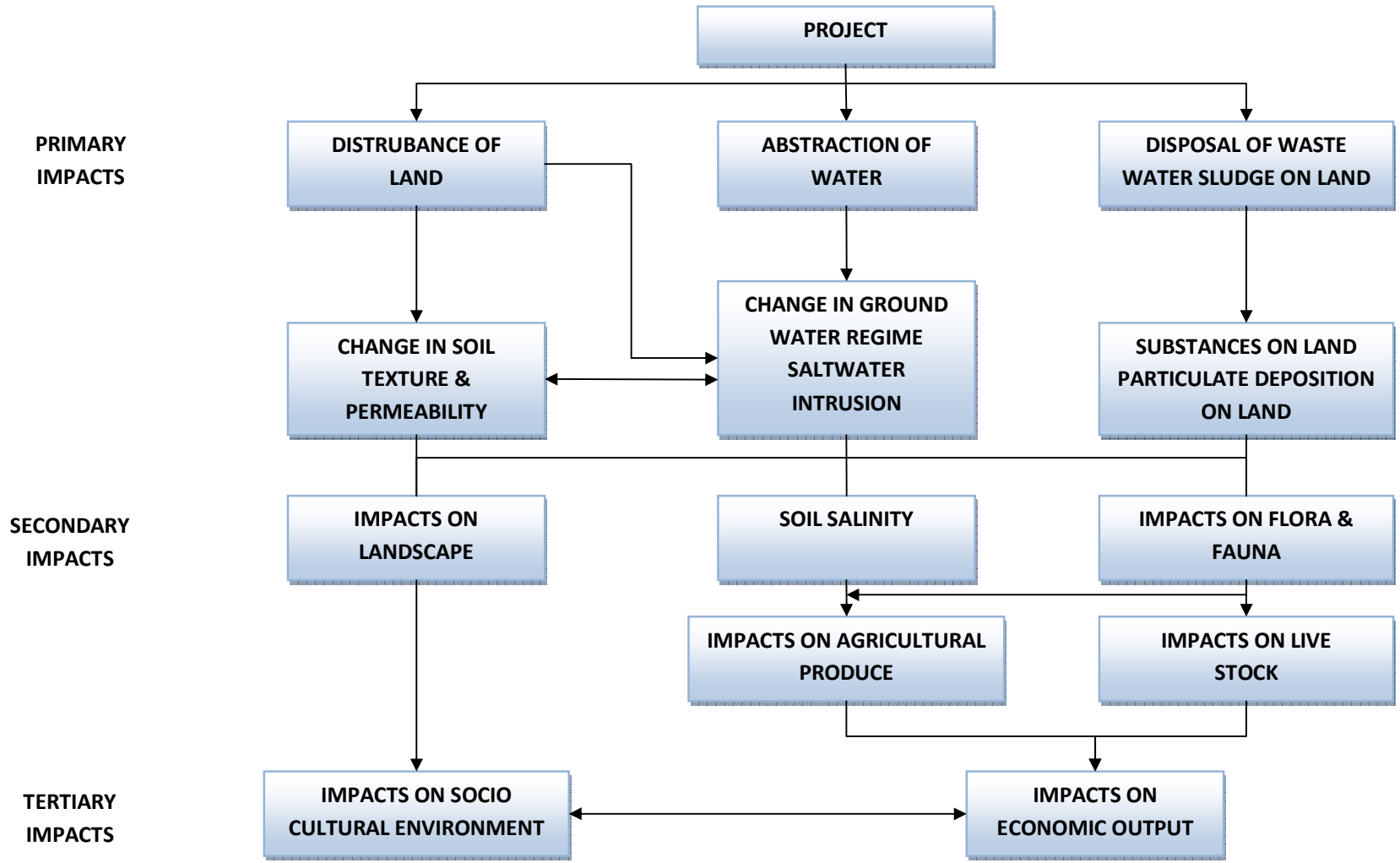


Fig 5.4 Impacts Network for Land Environment

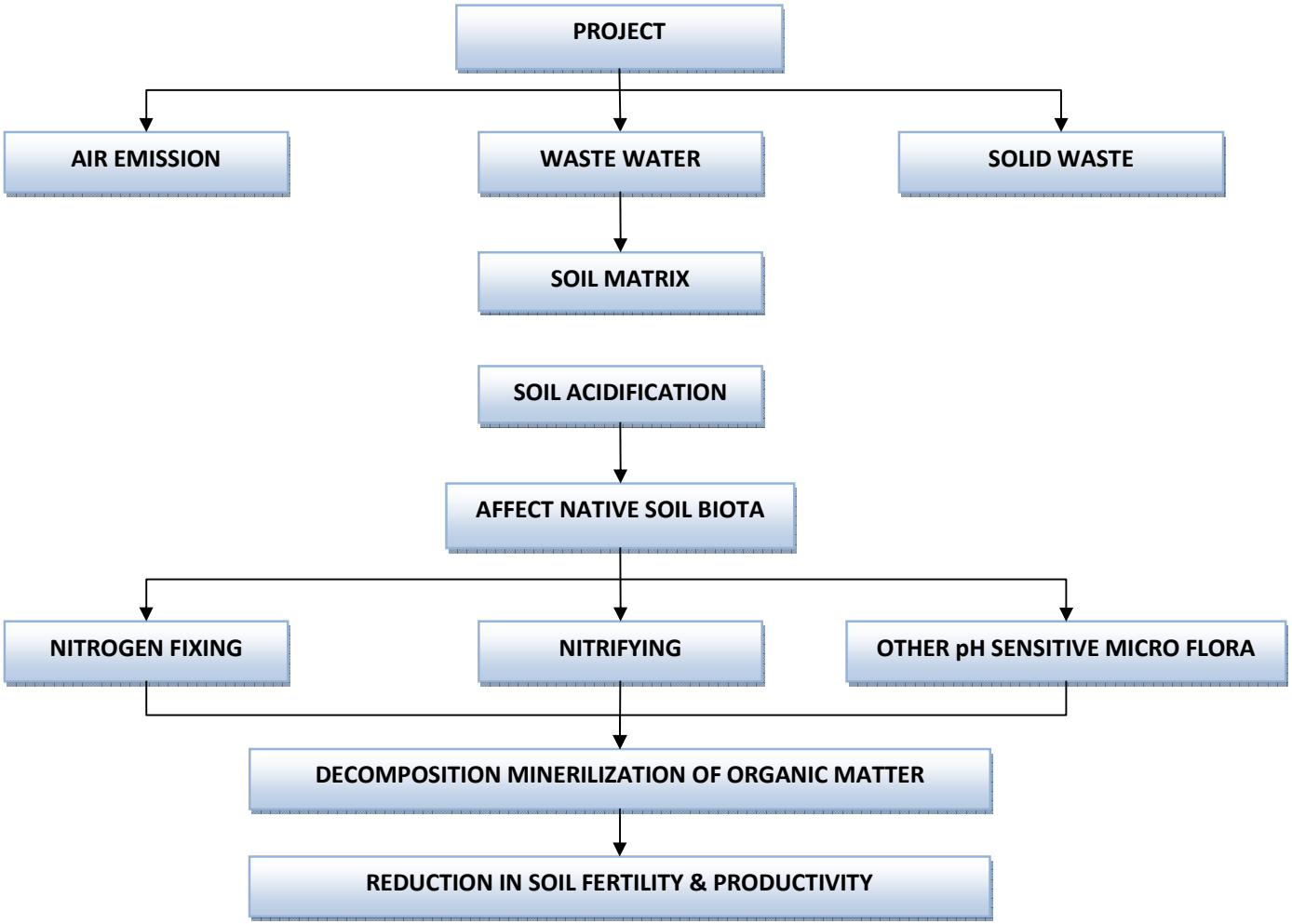


Fig 5.5 Impacts Network for Biological Flora & Fauna

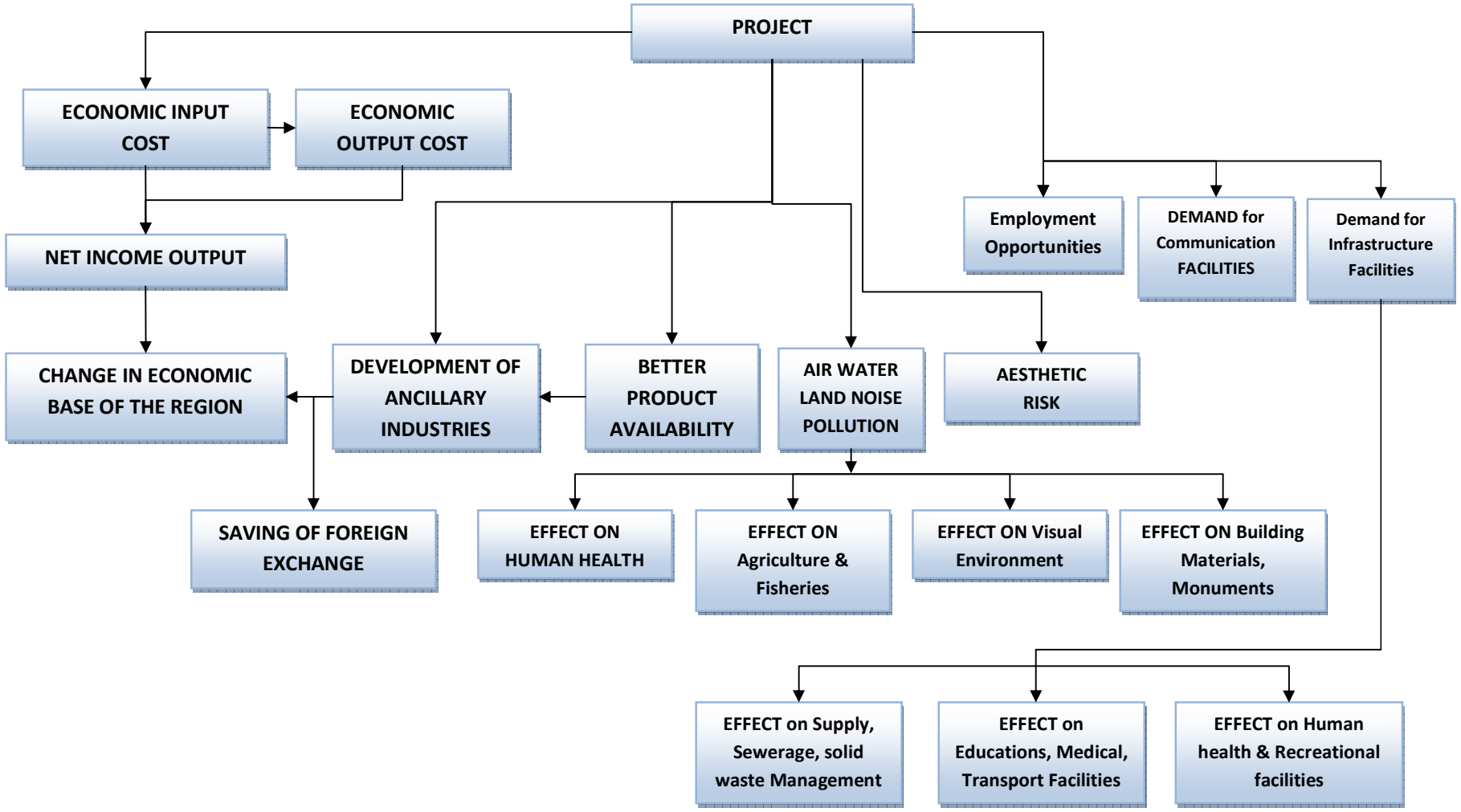


Fig 5.6 Impacts Network for Socio Economic & Cultural Environment

5.6 IMPACTS ON AIR ENVIRONMENT

5.6.1 Details of Mathematical Modeling

An attempt has been made to predict impacts of the boiler emissions on ambient air quality by means of air quality simulation models. The ultimate step in such an approach is to run the available data through a screening model where a rough computation of the worst-case scenario is obtained.

For the present case, computation of 24 hour average ground level concentrations were carried out using industrial Source Complex – Short Term (ISCST3). Industrial Source Complex (ISCST3) is an Air modeling Project of Lakes environmental, Canada. The model is based on algorithms contained in US Environmental Protection Agency (EPA).

STACK EMISSION

1. ISCST3 MODEL

ISCST3 is a commercial air dispersion modeling software having industrial Source Complex – Short Term (ISCST3) and Industrial Source Complex – Long Term (ISCLT3) models. These two models predict pollutant a concentrations or deposition from an industrial source complex. Both models predict pollutant concentrations from continuous point, area volume and open pit sources. They are versatile and can be used for estimating concentrations from virtually all types of sources emitting a non-reactive pollutant.

ISCST3 Model improves productivity by offering the following advantages.

- Intuitive graphical interface with full-screen data entry
- Rapid project development using base map file formats including Auto CAD DXF and windows BMP
- Direct import of digital terrain elevation data
- Constant 2-D and 3-D visualization of model input data
- Enhanced model runtime and memory performance
- Comprehensive on-line documentation

2. ISCST3 MODEL OPTIONS

The ISCST3 models offer following features for wide variety of sources and scenarios.

1. Sources: Up to 1000 point, area, volume, and open pit sources maybe entered (line sources can be simulated as a series of point sources). Sources may be grouped so that concentration is calculated from individual sources, specific groups of sources, or all sources. Results for up to 500 source groups can be generated in a single run. A sources file can be easily edited to vary the scenario.

2. Emission rates: Production variation can result in time varying emission rates. ISCST3 models this emission rate variation in different ways, ISCST3 emission rates can vary by hour of day, month, season, wind speed, and stability category, ISCST3 emission rates can vary by month, season, quarter, wind speed, and stability category.

3. Receptors: Receptor grids can be created automatically or manually using Cartesian or polar coordinates. Discrete and boundary receptors can also be defined. Concentration can be calculated for all terrain elevations in ISCST3, Terrain up to stack height in ISCST3, and for receptors above ground elevation (flagpole receptors). Up to five separate grids may be entered for each modeling run. A maximum of 10,000 receptors can be modeled.

4. Special Effects: Effects of stack-tip downwash, direction-specific building downwash, buoyancy-induced dispersion, deposition of particulate matter, depletion of matter from plume, and dispersion using either Posquil-Gilfford or Briggs urban coefficients can be analyzed. Pollutant thresholds of interest may also be specified.

5. Terrain: ISCST3 simplifies the process of predicting concentrations from continuous releases in simple, intermediate, and complex terrain. ISCST3 implements EPA guidelines for intermediate terrain modeling.

6. Deposition and Plume Depletion: ISCST3 can model the dry and wet deposition of particulate matter from the plume to the surface. The model can also simulate the dry and wet depletion (removal) of particulate or gaseous mass from the plume as it is deposited on the surface. ISCST3 treats the effects of dry deposition and dry depletion. However in the present case the deposition and plume depletion rates have been neglected.

7. Meteorological Data: The ISCST3 models calculate concentration from historical or user-specified meteorological data. ISCST3 aspects hourly meteorological data preprocessed by PCRAMMET, RAMMET or MPRM, as well as ASCII formats. ISCST3 requires a frequency distribution of wind speed, stability class, and wind direction (STAR data) in an ASCII format.

8. ISC3 Parameter Limits: ISCST3 has a set limit of one thousand sources five hundred source groups, twelve pollutants, ten thousand receptor, five gridded receptor networks, and seven short-term averages (ISCST3)

9. Dispersion Coefficients: The use of dispersion coefficients depends on the land use within a 3 km radius of site. If 50% of the area consists of Auer Land-use types 11(heavy industrial), 12(light moderate industrial, C1 (Commercial), R2 (Compact residential) and R3(compact residential) then urban dispersion coefficients are used, In other cases the rural dispersion coefficients are used. This is similar to PROBES/70/1997 'Assessment of Impact to Air Environment Guidelines for Conducting Air Quality Modeling" published by CPCB.

10. Downwash: When one or more buildings interrupt the wind flow, and area of turbulence called building downwash is created. Pollutants emitted

from a fairly low level (e.g. roof vent or short stack) can be caught in this turbulence effecting their dispersion. In the present case the building downwash effects have been neglected.

11. Stability Classes: The Insulation based classification as described in PR0BES/70/1997 'Assessment of Impact to Air Environment Guidelines for Conducting Air Quality Modeling" are used in this model.

5.6.2 Input data for the model

1. Identified Sources

The prediction of impact has been carried out using air quality simulation models. The main sources of pollution envisaged form the Boilers and DG Sets are as follows

- Process Emissions.
- Emissions from Utilities – Boilers, DG Sets etc.

Process Emission

The gases which are normally released during the reactions have been arrived based on the statistical data collected and presented in chapter 2 of this report. Since the quantities envisaged are minimal they have not been considered for prediction of impacts.

Emissions from Utilities

Under utilities the sources of emissions are 1 Boiler of 39TPH is proposed. The emissions from the coal based boilers have been provided in the following table. 3 x 750 KVA and 4 x 1010 KVA DG Sets, diesel as a fuel are proposed and the emissions have been presented in the following table.

Table: 5.2 Proposed Emission sources

S. No	Stack attached to	Stack	Dia of stack at top (m)	Temp. of exhaust gases ^{o}C	Exit velocity m/S	Pollutant Emission Rate gm/Sec		
						PM	SO2	NOx
PROPOSED EMISSION SOURCES								
1	39 TPH Husk/CFB	50	1.4	175	10.45	1.84	4.82	1.61
2**	3 x 750KVA DG Set	5.5	0.3	350	7.5	0.13	0.21	0.38
3**	4 x 1010 KVA DG Set	6.4	0.3	380	15.1	0.18	0.28	0.45

*** DG set will be used during load shut down.*

2. Stack height Calculation as per CPCB Guidelines with the following formulae.

DG Sets:

For 750 KVA DG Sets

Effective stack height = H = 0.2√KVA
= 0.2√750 = 5.48 m
A Stack height of 5.5 m above roof level of DG room is provided.

For 1010 KVA DG Sets

Effective stack height = H = 0.2√KVA
= 0.2√1010 = 6.35 m
A Stack height of 6.4 m above roof level of DG room is provided.

For 39 TPH Boiler

The height of the stack is calculated based on the formula prescribed by CPCB i.e., $H=74(Q)^{0.27}$, on SPM basis, where H is the physical height of the stack in meters and Q is emission rate of SPM tons/hr. The stack height is calculated for fuel Coal consumption of 195 TPD with an ash content of 40%. The calculated height of stack as follows.

SPM Basis:

39TPH Boiler

Coal Consumption	:	195 TPD
Ash Generation @ 40% of coal	:	78 TPD
Fly ash (5% of total Ash)	:	0.163 T/hr

Stack height calculated (SPM) $H=74(Q)^{0.27} = 74(0.163)^{0.27} = 45.34$ m

SO_2 Basis

Total Fuel consumption	:	195 TPD
Sulphur content in coal	:	0.8% (by Wt Max.)
SO_2 emission	:	65.0 kg/hr
Stack height	:	$14(65)^{0.3} = 48.98$ m

A stack height of 50 m height will be provided based on SO_2 basis as the same is the highest.

3. Receptors Considered

Prediction of ground level concentrations of the pollutants were carried out based on site meteorological data collected during October 2013 to December 2013. For calculation of ground level concentrations a grid of 10 km x 10 km with a receptor interval of 250 meters is considered.

4. Meteorological Data

For each hour the meteorological information fed into the model included the following:

- Wind direction
- Wind Speed
- Ambient temperature
- Stability class
- Mixing height

For the prediction of rise in ground level concentrations of pollutants, the actual meteorological data recorded at the project site during the study period Winter Season October 2013 to December 2013 was used. The summarized meteorological data for this period is herewith provided in Table 4.3. On observing the wind pattern for the season it is seen that there is no single direction predominance with the percentage of wind in all the directions being of the order of 2 to 5.35%. However ENE followed by E, SE, NE, ESE winds may be said to be predominant for the winter season.

Table 5.3 Meteorological Data at Site

Directions / Wind Classes (m/s)	0.50 - 2.10	2.10 - 3.60	3.60 - 5.70	5.70 - 8.80	8.80 - 11.10	>= 11.10	Total (%)
N	0.09	0.00	0.00	0.00	0.00	0.00	0.09
NNE	0.18	0.00	0.00	0.00	0.00	0.00	0.18
ENE	2.26	0.00	0.00	0.00	0.00	0.00	2.26
E	0.54	0.00	0.00	0.00	0.00	0.00	0.54
ESE	0.36	0.00	0.00	0.00	0.00	0.00	0.36
SSE	0.27	0.00	0.00	0.00	0.00	0.00	0.27
S	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SSW	0.09	0.00	0.00	0.00	0.00	0.00	0.09
WSW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WNW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-Total	3.80	0.00	0.00	0.00	0.00	0.00	3.80
Calms							**93.39**
Missing/Incomplete							**2.81**
Total							**100.00**

5.6.3 Base line data of air quality

Below tables from 5.4 to 5.7 provides base line concentrations recorded at monitoring stations

Table 5.4
Maximum concentrations of pollutants at monitoring stations

Village Name	Micrograms/M3				
	PM10	SO2	NOX	VOC	CO
Project Site	74.32	16.0	36.0	8.0	1.84
Borapatla	79.23	16.0	38.0	2.0	1.53
Reddy Khanapur	71.34	14.0	29.0	0.5	1.26
Chandapur	72.56	13.0	25.0	2.0	1.24
Gundlamasanur	78.10	15.0	32.0	2.0	1.47
Palanpur	71.56	13.0	22.0	0.5	1.48
Goudcherla	68.23	12.0	28.0	0.2	1.15

Table 5.5
Average concentrations of pollutants at monitoring stations

Village Name	Average in Micrograms/M3				
	PM10	SO2	NOX	VOC	CO
Project Site	71.34	15.25	31.25	4.00	1.67
Borapatla	64.50	13.00	33.25	1.00	1.40
Reddy Khanapur	58.66	11.00	26.50	0.25	1.17
Chandapur	56.76	10.25	22.25	1.00	1.15
Gundlamasanur	56.32	12.00	28.25	1.00	1.31
Palanpur	56.96	9.75	17.50	0.25	1.34
Goudcherla	52.19	9.25	24.50	1.00	1.09

Table 5.6
Minimum concentrations of pollutants at monitoring stations

Village Name	Micrograms/M3				
	PM10	SO2	NOX	VOC	CO
Project Site	69.45	14.0	28.0	0.5	1.52
Borapatla	56.56	11.0	29.0	0.0	1.29
Reddy Khanapur	51.23	8.0	24.0	0.0	1.07
Chandapur	47.12	8.0	20.0	0.0	1.02
Gundlamasanur	45.67	9.0	25.0	0.0	1.22
Palanpur	48.56	7.0	10.0	0.0	1.26
Goudcherla	41.34	7.0	21.0	0.0	1.04

Table 5.7
98% percentile values of pollutants at monitoring stations

Village Name	Micrograms/M3		
	PM10	SO2	NOX
Project Site	75.00	16.00	35.70
Borapatla	79.18	15.82	37.76
Reddy Khanapur	70.92	13.88	28.88
Chandapur	72.00	12.88	24.88
Gundlamachanoor	78.10	14.88	31.82
Palpanpur	70.61	12.88	21.88
Goudcherla	68.12	11.88	27.88

5.6.4 Predictions

The predicted maximum 24 hourly ground level concentrations of PM_{10}, SO_2, and NO_X and distance of occurrence during the study period are presented in **Table 5.8**.

It may be observed that the annual predicted maximum 24 hourly GLC's of PM_{10}, SO_2 and NO_X are 1.58, 2.60 and 4.46 $\mu g/m^3$ respectively and the maximum values are observed at a distance of 2.0 km from the center of plant site in the south west direction. However it may be noted that the predicted values of SO_2 and NOX are based on the assumption that the DG

sets are used constantly, where as the DG set usage is only during the load shut down.

The GLC's are also predicted at air quality monitoring locations and the predicted GLC's are presented in **Table 5.9** and the cumulative concentrations at various villages are tabulated in Table 4.4. It may be observed from the table that the predicted results show that incremental rise over existing base line status of ambient air quality is within the limits prescribed by CPCB for residential and rural areas. Hence the control measures and height of the stack is sufficient to disperse the pollutants into the atmosphere and keeping the baseline levels within the prescribed limits. The predicted ground level concentrations are graphically displayed for PM_{10}, SO_2 and NO_X respectively in **Figure. 5.7, 5.8 and 5.9**.

Table 5.8 Predicted Maximum Values of SPM, SO_2 and NO_x

Pollutant	Predicted GLC's ($\mu g/m^3$)	Distance (km)	Direction
Particulate Matter, PM_{10} $\mu g/m^3$	1.58	2.0	SW
Sulpur dioxide (SO_2), $\mu g/m^3$	2.60	2.0	SW
Oxides of Nitrogen (NO_X), $\mu g/m^3$	4.46	2.0	SW

Table 5.9 Predicted GLC's at Monitoring Locations (24 Hours)

Village Name	Base Line			Prediction			Cumulative		
	PM10	SO2	NOX	PM10	SO2	NOX	PM10	SO2	NOX
Project Site	74.32	16.00	35.70	0.02	0.04	0.06	74.34	16.04	35.76
Borapatla	79.23	15.82	37.76	0.33	0.06	0.17	79.56	15.88	37.86
Reddy Khanapur	71.34	13.88	28.88	0.01	0.23	0.04	71.35	14.11	28.92
Chandapur	72.56	12.88	24.88	0.01	0.02	0.03	72.57	12.98	24.91
Gundlamachanoor	78.10	14.88	31.82	0.01	0.02	0.04	78.11	14.90	31.86
Palpanur	71.56	12.88	21.88	0.02	0.03	0.05	71.58	12.91	21.93
Goudcherla	68.23	11.88	27.88	0.31	0.51	0.88	68.54	12.39	28.75
NAAQS Limit	100	80	80						

Note : Base Line Values are Maximum 24 hour concentrations

Fig. 5.7 Isopleths Showing 24 Hourly GLC's of PM10

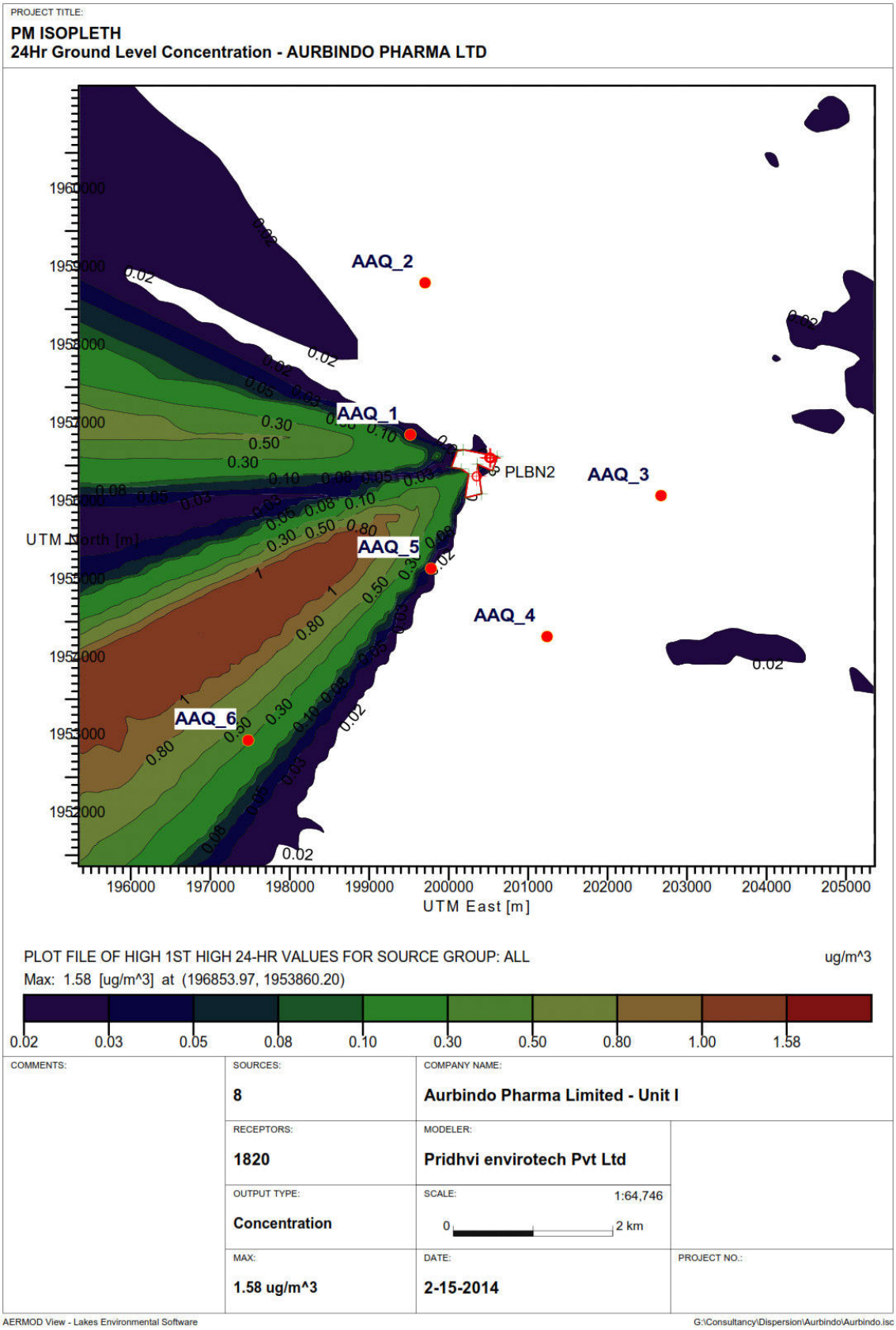


Fig. 5.8 Isopleths Showing 24 Hourly GLC's of SO_2

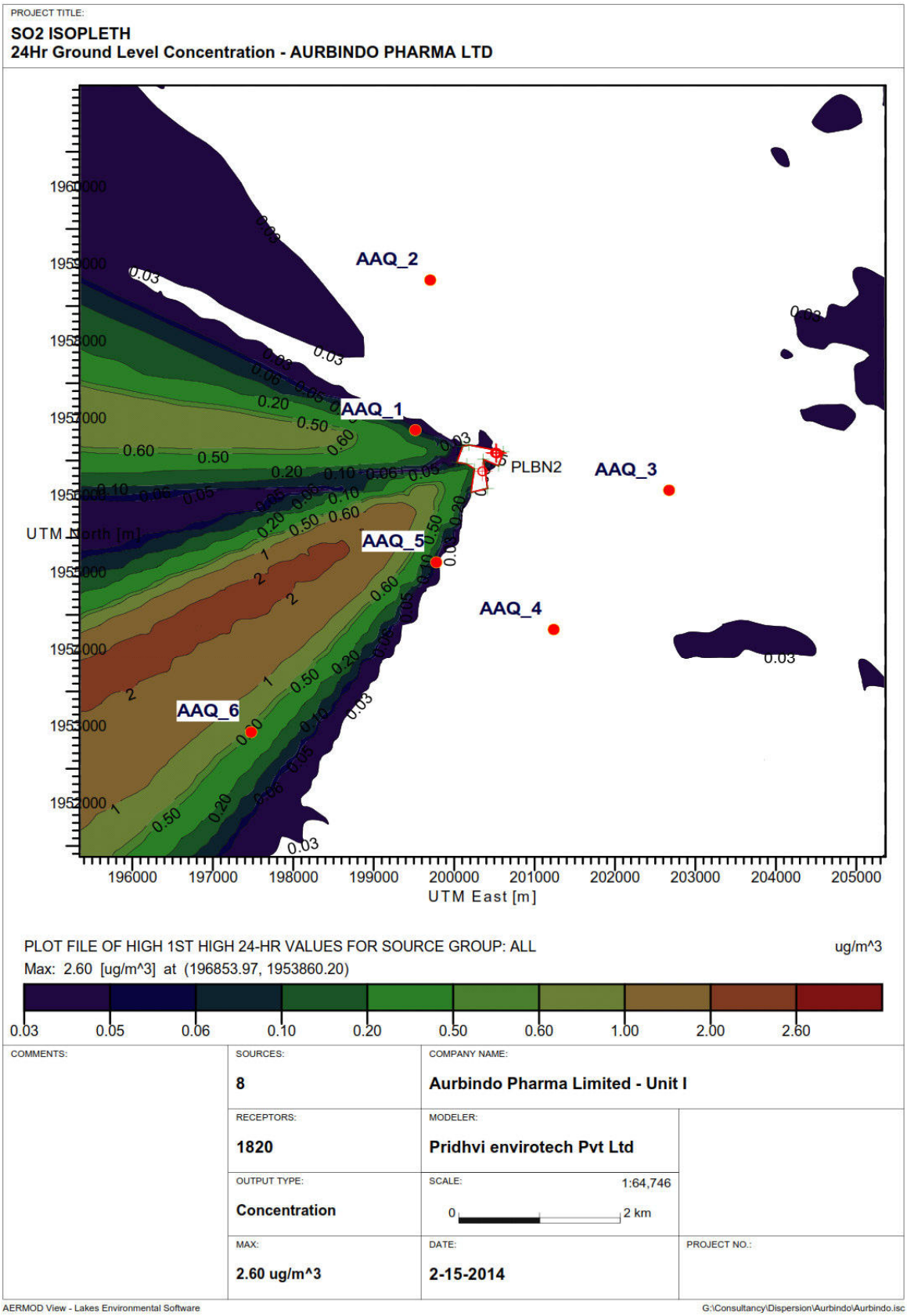
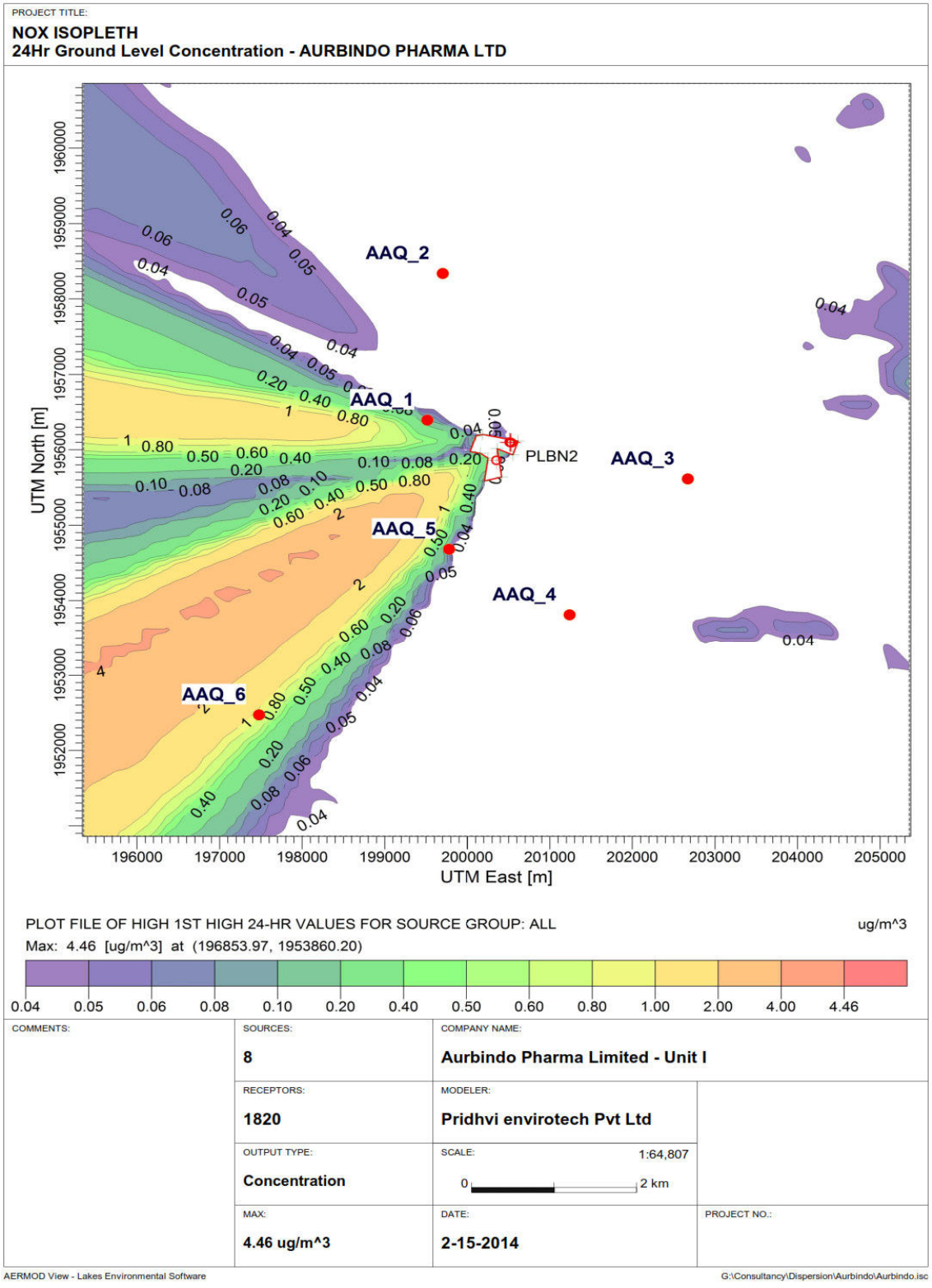


Fig. 5.9 Isopleths Showing 24 Hourly GLC's of NO_x



5.6.5 Data Analysis – Predicted Results

Predictions were carried out as per CPCB guidelines "Assessment of impact to Air Environment: Guidelines for conducting air quality modeling". The predicted result for PM_{10}, SO_2 and NO_X for the study period is given at the end of the chapter.

From the predictions it can be observed the maximum GLC's were found to lie within 4.0 to 6.0 km radial zone surrounding the center of the Plant. And all the values at monitoring stations are within the permissible limits of national air quality standards

5.6.6 Prediction of impacts from fugitive sources

Solvents are used in the process. Solvents are transported and stored at the site also. During the handling and use of solvents and during the reactions, possibility of fugitive emissions entering into environment is predicted. A list of solvents used in process, solvents are recovered and total solvents losses are estimated and presented in the **Table 5.10** below

Table 5.10 Solvents use and Recovery

S.No.	Name of solvent	Qty Used Kgs/day	Qty Recovered Kgs/day	Air Borne Loses Kgs/day	% Air borne Loss
1	Acetone	30842	29102	1386	4.49
2	Absolute Alcohol	5045	4752	239	4.74
3	Acetonitrile	4131	3920	159	3.86
4	Anisole	1466	1393	59	4.00
5	Butyl acetate	2521	2363	114	4.54
6	Chloroform	1287	1221	58	4.47
7	Cyclo hexane	28632	27277	1262	4.41
8	Di isopropyl Ether	2579	2446	108	4.18
9	Diglyme	450	430	20	4.44

10	Dimethyl form amide	3928	3706	167	4.26
11	Ethanol	44659	41857	2042	4.57
12	Ethyl Acetate	31656	30099	1271	4.02
13	Hexane	1962	1834	90	4.60
14	IPA	20189	19016	905	4.48
15	MDC	10956	10311	505	4.61
16	Methanol	37037	35064	1445	3.90
17	MTBE	2079	1957	16	0.78
18	Methyl isobutyl ketone	378	356	22	5.97
19	Methylene chloride	53561	49972	2385	4.45
20	N-Butanol	1952	1851	81	4.16
21	N- Heptane	1974	1877	85	4.34
22	n- Propanol	296	284	9	3.16
23	N,N- dimethyl acetamide	3859	3665	175	4.55
24	N,N-Dimethyl formamide	11510	10925	483	4.19
25	n-butyl amine	221	147	8	3.73
26	n-hexane	939	891	48	5.13
27	o- xylene	8504	8041	351	4.12
28	Phenol	417	397	17	4.15
29	TEA	100	96	4	4.37
30	THF	11236	10557	496	4.42
31	Toulene	21917	20723	980	4.47
32	1,4- Dibrobutanate	139	133	2	1.20

5.6.7 Predictions of fugitive emissions

A Simple Box Model (EVAPMOD) was used to calculate the solvent concentration in the indoor environment. The methodology adopted was to calculate the concentration to the product group which has the largest amount of solvent losses.

General Box Model

Indoor air pollution models developed and used by USEPA and others consider the conservation of air contaminant mass in a volume or "box" of work room air. Air borne concentrations derived by solving the following general equation (Jay jock, 1988):

$$C = (A_{in} - A_{out})/ \text{Volume of Box} \quad \text{--------} \quad (1)$$

Where: C = Concentration at time ti (assume C=0 @ t_0=0)

A_{in}=Mass of contaminant that went in to the box during time interval t_i-t_0

A_{out} = Mass of contaminant that left in to the box during time interval t_i–t_0

The diffusion coefficient and the generation rate of the contaminant were calculated to arrive at the air borne concentration in the environment.

For the general Ventilation Model, the overall estimate of the air borne concentration of a contaminant is obtained by use of following equation.

$$C_v = (1.7*10^5)\ Ta*G/M*Q*m$$

Where C_v = Contaminant concentration in work place (ppm)

Ta = Ambient temperature of the air (^{0}K)

G = Vapor generation rate (gm/sec)

M = Molecular Weight (gm/gm-mole)

Q = Ventilation rate (ft^3/min)

M = Mixing Factor (dimensionless)

Higher Solvent Loss and the Predicted airborne concentrations of the various solvents are tabulated in the **table 5.11**

Table 5.11

Predicted air borne PPM levels of solvents

S.No.	Name of solvent	Air borne Losses Kgs/day	Predicted PPM	TLV Value (TWA)
1	Acetone	1386	4.49	500
2	Absolute Alcohol	239	4.74	1000
3	Acetonitrile	159	3.86	20
4	Anisole	59	4.00	Not Available
5	Butyl acetate	114	4.54	150

6	Chloroform	58	4.47	10
7	Cyclo hexane	1262	4.41	100
8	Di isopropyl Ether	108	4.18	500
9	Diglyme	20	4.44	25
10	Dimethyl formamide	167	4.26	10
11	Ethanol	2042	4.57	1000
12	Ethyl Acetate	1271	4.02	400
13	Hexane	90	4.60	50
14	IPA	905	4.48	200
15	MDC	505	4.61	50
16	Methanol	1445	3.90	200
17	MTBE	16	0.78	40
18	Methyl isobutyl ketone	22	5.97	200
19	Methylene chloride	2385	4.45	50
20	N-Butanol	81	4.16	20
21	N- Heptane	85	4.34	400
22	n- Propanol	9	3.16	100
23	N,N- dimethyl acetamide	175	4.55	10
24	N,N-Dimethyl formamide	483	4.19	10
25	n-butyl amine	8	3.73	5 (STEL)
26	n-hexane	48	5.13	50
27	o- xylene	351	4.12	100
28	Phenol	17	4.15	5
29	TEA	4	4.37	5
30	THF	496	4.42	50
31	Toulene	980	4.47	50
32	1,4- Dibrobutanate	2	1.20	Not Available

*** Source: American conference of Governmental Industrial Hygienists (ACGIH)**

5.7 Prediction of Impacts on Water Environment

Water is partly drawn from ground water resources and partly purchased from outside. Detailed hydro geological studies are carried out and ground water potential is estimated.

Below table gives water requirement for the expansion project

Table 5.12

Water Balance of the proposed expansion

S. No	Stream	Water Consumption in KLD	Waste Generation
1	Process	310.7	343.8
2	Reactor & Floor Washings	25.0	20.0
3	Scrubber	25.0	25.0
4	QC and R&D	20.0	15.0
5	DM/Softner (Regeneration)	25.0	25.0
6	Solvent Recovery plant	25.0	20.0
7	Boiler	325.0	32.5
8	Cooling Towers	350.0	25.0
9	Ro Back Wash	35.0	35.0
10	Domestic	65.0	60.0
11	Garment washings	10.0	10.0
12	Gardening	50.0	Nil
13	Ash handling (Water sprinklers)	15.0	Nil
Total		**1280.7**	**611.3**

It is proposed to treat the effluents in ZLD (Zero Liquid Discharge) plant and re-use to the maximum extent. It is proposed to recycle 394.3 KLD of water from Effluent treatment facilities and fresh water requirement will be 886.4 KLD. It is proposed to utilize the existing Sewage Treatment Plant (STP) of capacity 100 KLD to treat domestic effluents and garment washings and treated wastewater will be utilized for gardening.

Total fresh water requirement after expansion would be 886.4 KLD. Currently the unit obtained permission for withdrawal of ground water to a tune of 370 KLD from three existing bore wells from state Ground water Board.

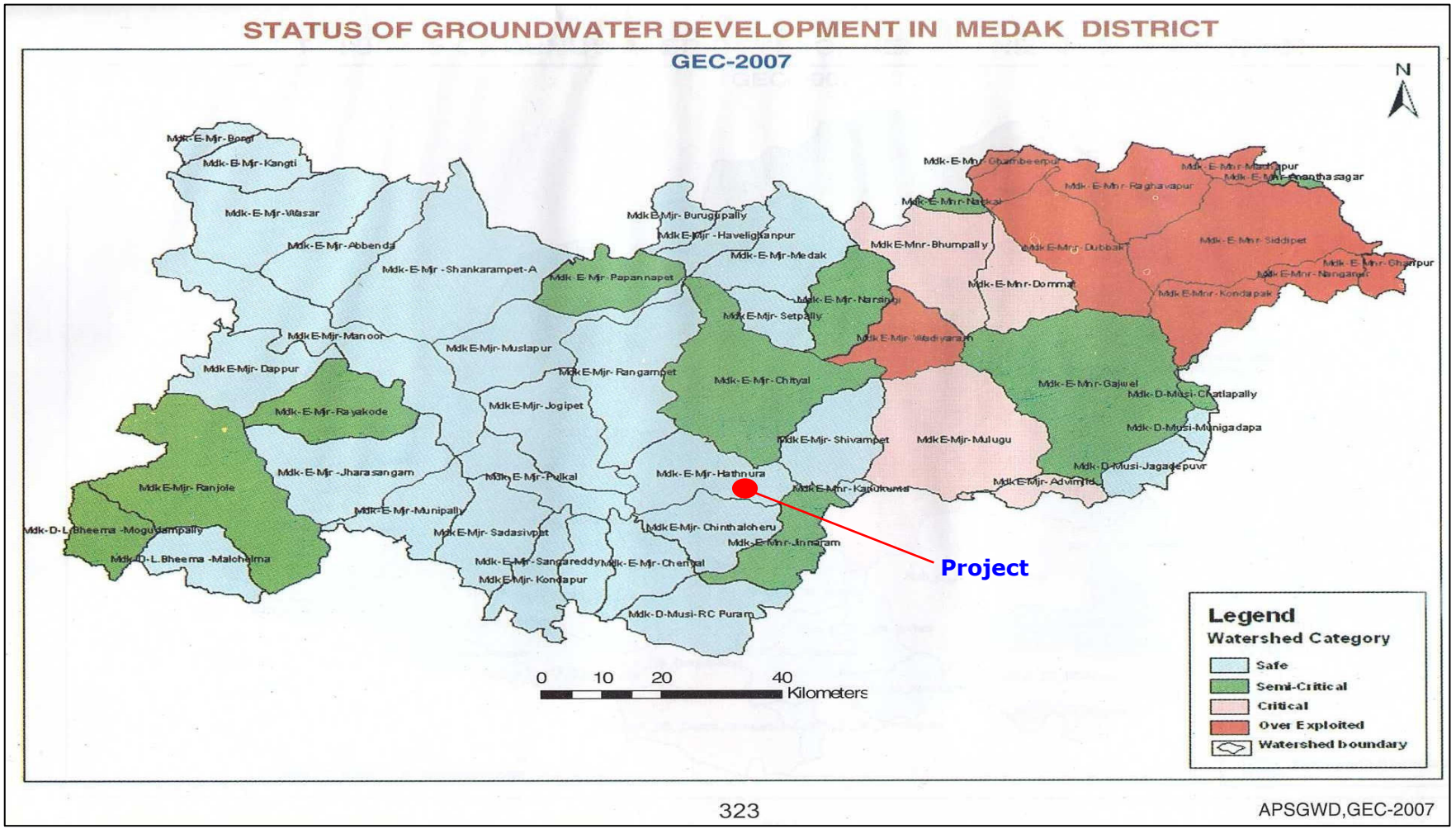
5.7.1 Ground water potential of the area

Monsoon rainfall is the chief source of ground water recharge. In the irrigated ayacut areas recharge through unlined canal network, return recharge from the water applied for irrigation is significant. Surface water reservoirs, ponds, check dams and all other man made obstructions on the natural drainage courses also contribute to certain extent. In the existing natural environmental conditions, a known volume of ground water is always available for extraction, which otherwise will be lost as out-flow from the area. This is dynamic recharge, which goes into storage of aquifer zones occurring below, in each hydrological cycle. The long term average annual replenish able dynamic recharge can be exploited without causing any adverse impact on the ground water regime.

Ground Water Resources Estimation Committee GEC 1997 at National level revised the earlier norms of 1984 and circulated the new methodology in the year 1997. Following the revised methodology basin / watershed wise assessment has been carried out by the A. P. State Ground Water Department in association with the Central Ground Water Board. Medak District is divided into 53 ground water assessment units. The Plant area of Aurobindo Pharma Ltd falls in the Hathnoora Watershed Assessment Unit Mdk-Mjr-Hathnoora as shown in the **Figure–5.10**

Figure 5.10

Status of Ground water conditions in project area



In the revised estimates Command and Non-command areas, rainfall recharge in the monsoon and Non-monsoon periods, recharge from other sources are distinguished and factors to be taken into consideration for recharge estimation are also indicated. In addition, pre and post monsoon water level declines are to be followed in categorization of Assessment units into Safe, Semi-Critical, Critical and Over Exploited Categories.

Total Annual Ground Water Recharge of the Watershed Assessment Unit is 2646 ham. After leaving Non Monsoon Discharge of 233 ham Net Ground Water availability is 2381 ham. The existing Ground Water draft for Irrigation and Domestic purposes respectively are 1271 ham and 117 ham. After allocating 263 ham for Domestic and Industrial purposes the Net Ground Water Availability for future irrigation is 730 ham. The stage of Ground Water Development in the Water shed is 58% and Categorization of the Unit is **Safe**. The detailed estimates are presented in the **Table–5.13**

Table 5.13

Ground Water Resource Potentials of Hathnoora Watershed

1.	Ground Water Assessment Unit	:Mdk-Mjr-Hathnoora
2.	Type of rock formation	: Granites
3.	Area extent of Assessment Unit	: 19,550 ha
4.	Command Area	: Nil
5.	Ground Water Recharge:	
	i. Recharge from Rainfall during monsoon season	: 1836 ha m
	ii. Recharge from other sources during monsoon season	: 221 ha m
	iii. Recharge from rainfall during non-monsoon season	: 356 ha m
	iv. Recharge from other sources during non-monsoon season	: 233 ha m
	v. Total annual ground water recharge	: 2646 ha m
6.	Natural discharge during non-monsoon season	: 265 ha m
7.	Net ground water availability	: 2381 ha m

8. Existing ground water draft for irrigation : 1271 ha m
9. Existing ground water draft for domestic consumption : 117 ha m
10. Existing gross ground water draft for all purposes : 1389 ha m
11. Allocation for domestic and industrial purposes at 2025 : 263 ha m
12. Net ground water availability for future irrigation Dev. : 730 ha m
13. Stage of ground water Development : 58%
14. Categorization of assessment Unit : **Safe Category**

There is potential to tap ground water provided permissions are obtained from state Ground Water Board. As the unit adopted ZLD approach it is proposed to recycle effluents after treatment. Additional requirement of water can either be purchased from outside through tankers or drawn from ground water with proper measures to augment ground water resources through harvesting

5.7.2 Impact on quality of surface and ground water resources:

No impact on water quality is anticipated as the unit proposed ZLD "Zero Liquid discharge treatment system" and proposed to re-use water after the treatment. Suitable measures are proposed to avoid ground and surface water contamination during handling and treatment of waste water so that impact is minimized.

5.8 Prediction of Impacts on Land Environment

The overall impact on soil is negligible as the treated effluent is reused in the plant and balance is used for greenbelt after treatment. The solid waste generated is disposed to TSDF/Reused. 24.5 acres of green belt and lawns were developed in the plant site and it helped to improve the soil quality and surrounding ecology and aesthetic appeal of the area. Trees will absorb specific air pollutants, reduce noise pollution, reduce soil temperature, help in holding moisture in the soil, attract more birds and overall will help in maintaining the homeostasis of the environment.

5.9 Prediction of Impacts on the Noise Environment

The sound pressure level generated by noise sources decreases with increasing distance from the source due to waved divergence. An additional decrease in sound pressure level with distance from the source is expected, due to atmospheric effect or its interaction with objects in the transmission path.

For hemispherical sound wave propagation through homogeneous loss free medium, cane and estimate noise levels at various locations, due to different sources using model based of first principle as per the following equation:

$$Lp_2 = Lp_1 \text{ Log } (r_2/r_1) - \text{Area} \quad \ldots\ldots\ldots (1)$$

Where Lp_1 and Lp_2 are sound pressure levels at points located at distances r_1 and r_2 from the source and $Ae_{1.2}$ is the excess attenuation due to environmental conditions. Combined effect of all the sources can then be determined at various locations by logarithmic addition.

In the first approximation one can assume that for all general population in the villages, every noise source in the plant is a point source. The average equivalent sound power level of such a point source can be estimated for different distances and directions from hypothetical source by applying equation:

$$Lp = L_w - 20 \text{ Log } r\, A_e - 81 \quad \ldots\ldots\ldots (2)$$

Where L_w is the sound power level3 of the source, L_p is the sound pressure level at a distance of a r and A_e Is environmental attenuation factor. A combined noise level L_p (Total) of all the sources at a particulate place is given by:

$$L_p \text{ (Total)} = 10 \text{ Log } (10^{(Lp1/10)} + 10^{(Lp2/10)} + \ldots..) \quad \ldots\ldots (3)$$

Various sources of noise from the M/s. Aurobindo Pharma Limited, Unit-I are given in **Table 5.14**

Table 5.14
Average typical Noise Levels from Existing Industrial Units

No	Source	Noise Level – dB(A)
1	DG Sets	80 – 85
2	Pumps	70 – 75
3	Air Compressor	75 – 80
4	Chilling Compressors	75 - 80

The DG sets are used only during power failure for controlling emergency operations.

Predictions have been made taking into account all operations and utilities thus reflecting the worst – case scenario. Noise level at a distance of 0.3 km radius of the plants is predicted to be around 40-45 dBA, which would fall well within the individual plant boundary.

5.9.1 Prediction of Impacts on Community

At the plant boundary was outside the factory the level of noise is expected to about 40-45 dBA as predicted above. Day and night sound pressure levels L_{dn} is often used to describe the community exposure which includes 10 dBA night time penalties.

The noise levels at a distance of 0.3 km and above from the boundary would be less than 40 dBA. The nearest human settlement is at about 1.4 Kms away from the project site and thus the impacts on general public are predicted to be insignificant. The recommendations given by CPCB with respect to noise are given in **Table 5.15**

Table 5.15

Noise Level standards (CPCB)

Type	Noise Level for Day Time Leq dB(A)	Noise level for Night Time dB(A)
Industrial area	75	70
Commercial area	65	55
Residential area	55	45
Silence zone	50	40
Day time – 6.00am-9.00pm (15 hours) Night time – 9.00pm- 6.00am (9 hours)		

5.10 Impacts on Socio-Economic Environment

The socio-economic impacts of the proposed project could be assessed in terms of demand-supply aspects for goods and services in the area, pressure on natural resources and infrastructure, growth of industry, sustainability of livelihoods and employment.

Some indirect impacts can also be understood in terms of public health and safety, preserving local culture and aesthetics of the archaeological monuments and heritage precincts.

Based on a close understanding and assessment, the socio-economic impacts of APL Unit-I's expansion project are predicted as follows:

Positive Impacts	Negative Impacts
i) There is no loss of land and consequential livelihoods, as no land acquisition is contemplated. Surplus land already exists on the factory premises to meet expansion needs.	i) Depletion of groundwater as a consequence of increased water consumption by the project.

ii) Creation of employment opportunities for about 50 local skilled and semi-skilled workers during project construction phase. iii) Creation of sustainable employment for an additional 100 skilled workers in project operational phase, in production as also auxiliary activities. iv) Multiplier effect due to induced growth during construction and operational phases in downstream and upstream project activities for about 300 persons, majority of them local women and youth. v) Development/upgradation of vocational and soft skills of about 500 local youth over the next five years thus enhancing their employability. vi) Emergence of local entrepreneurs in complementary activities such as small business, transportation, education, housekeeping, repairs and maintenance etc. vii) Improvement of money incomes of locals by an average 10% p.a. viii) Strengthening of physical infrastructure such as roads, power and water distribution network. ix) Strengthening of social infrastructure especially schooling, healthcare and recreation.	ii) Air pollution through release of obnoxious gases and odors leading to incidence of respiratory diseases, irritation of eyes and nose etc., for people living in the core impact zone. iii) Increased influx of vehicular traffic putting pressure on roads

There are no heritage precincts and archaeological monuments in the project site vicinity that would be adversely impacted by APL Unit-I's proposed expansion.

The overall impact on the socio economic status is very positive, as the accrued benefits are both direct and indirect. The direct benefits are, increase in employment, escalation of land prices due to increased activities and

improved infrastructure, which in turn have a bearing on the productivity, industrialization and socio economic status of the area in particular and the state in general.

5.11 Prediction of Impact on Vehicular Traffic

The plant is located 0.5 km from the SH-13 which connects Sangareddy (District Headquarters) to Narsapur. SH 13 connected to NH 9 Hyderabad – Mumbai National High Way. The site is connected through 40 Feet road from SH 13. The traffic density of the adjacent National high way is consisting mainly of transport, and passenger vehicle traffic. There will be marginal increase in the traffic density from the expansion of the project. Number of transportation vehicles from and to the plant currently around 15 vehicles/day for transportation of materials, 20-30 cars/day & 10 Shift Buses for plant people and visitors. Rest will be only two wheelers. Due to expansion of the capacity, there will be increase of another 15 PCU for transportation of raw material and Finished material. There will be increase of another 4-5 shift bus trips due additional man power. There will not be any significant impact on road network due to capacity enhancement of the plant

5.12 Prediction of Impact on Ecology

A logical and systematic approach has been taken for impact identification based on the guidelines evolved by IAIA. The aim is to take in to account all the important environmental impacts and interactions, making sure those indirect and cumulative effects, which may be potentially significant, are not inadvertently omitted. The likely impacts are analysed in greater detail in accordance with terms of reference specifically established for this purpose.

Over time, a number of EIA methodologies and tools have been developed for use in impact identification. In practice, relatively simple methodologies and tools are applied to impact identification. Checklists, matrices, networks, overlays and geographic information systems (GIS), expert systems, and

professional judgment are the most common formal methods used for impact identification.

The impacts of the proposed plant may be divided in to two base when the impacts are likely to occur:

1. Impacts during construction or establishment and
2. Impacts during operation

The impacts may further be divided in to reversible or irreversible; direct or indirect; serve, moderate or light depending on duration of impacts. Prediction of impacts is based both on the direct and indirect; short-term as well as long-term; irreversible and irreversible impacts that are most likely to occur owing to the propose port activity during establishment and operation. The ecological factors that are considered most significant as far as the impact on flora and fauna concerned are:

1. Whether there shall be any reduction in species diversity?
2. Whether there shall be any habitat loss or fragmentation?
3. Whether there shall be any additional risk or threat to the rare or endangered or endemic or threatened (REET) species?
4. Whether there shall be any impairment of ecological functions such as (i) disruption of food chains, (ii) decline in species population and or (iii) alterations in predator-prey relationships?
5. Whether it is possible to attain the global objectives of 'no net loss' of biodiversity?
6. Whether it is possible to attain the biological diversity through the proposed activity?

The direct impacts of the proposed expansion of the plant shall be limited to an area of about 11.96 Acres only. There are no trees except those along the boundaries. All the trees present along the boundaries will be protected. But on account of the proposed industry and its activity there is no direct threat to

any rare or endangered or threatened biological species as indicate by the baseline data. The project is not going to cause any fragmentation of habitat or disruption of food cycles or destruction of breeding grounds or blockade of migratory routes. Production and discharge of toxic and hazardous chemicals is not anticipated. The major impacts of the project are mainly during construction and subsequently on account of atmospheric pollution. The industry is required to limit it its emissions as per the NAAQ of 2009. It has to strictly adhere to the conditions stipulated by the regulatory bodies. The project authorities are going to take all steps and measures in order to strictly comply with national Ambient Air Quality Standards of 2009. The project may not have impacts on terrestrial flora and fauna.

Further, as there are no rare or endangered or threatened (RET) species within the core or buffer area, the project does not pose any direct threat to the survival of any rare species. Hence, the proposed project activity is unlikely to pose any additional threat to REET species either in the core or buffer area. There shall be no diversion of drains or canals and no filling up of ponds or lakes is anticipated. The ecological sensitivity of the core and buffer areas has been evaluated and the results are show in **Table 5.16**. The data clearly indicates that the area is not ecologically sensitive as the evidenced by an impact score of 100 out of 700.

Table 5.16
Assessment of the Eco-sensitivity of the core and buffer areas

Parameter	Importance scale	Weightage	Impact of Unit	
			Core area	Buffer area
Wildlife importance (Threatened species)	Number of Schedule-I & II (>20 numbers)	100	None	None
	Number of Schedule-I & II (10-20 numbers)	50	None	None
	Number of Schedule-I & II (<10 numbers)	25	<25	<25

Endemic flora	High (>10 species)	100	None	None
	Medium (5-10 species)	50	None	None
	Low (<5 species)	25	<25	<25
Endemic fauna	High (>10 species)	100	None	None
	Medium (5-10 species0	50	None	None
	Low (<5 species)	25	<25	<25
State of	Relatively undisturbed forest	100	--	--
Terrestrial vegetation	(Govt. / private)		--	--
	Totally managed estate with three type of vegetation	50	--	--
	Totally managed estate such as coffee and cardamom	25	--	--
	Agricultural land with crops such as coconut	0	0	0
State of wetland vegetation	Relatively undisturbed wetland visited by migratory waterfowl	100	--	--
	Relatively undisturbed wetland not known to be visited by migratory waterfowl	50		
	Other wetlands with frequent human activity	25		
	Agricultural land with crops such as paddy	10	10	10
Lega Status	National Park	100	--	--
	Wildlife sanctuary	50	--	--
	Reserve forest/ wetland	25	--	--
	Agricultural land	0	0	0
Conservation importance	Location unique in terms of habitat (world heritage site) or species	100	--	--
	Habitat although present elsewhere is under threat in those places	75	--	--
	Habitat present elsewhere and is not under any serious threat	50	--	--
	Habitat is very common elsewhere	25	<25	<25
Total (700 Max)			**110**	**110**

6.0 Environmental Monitoring

6.1.1 Introduction

The environmental monitoring programme provides such information on which management decision may be taken during construction and operation phases. It provides basis for evaluating the efficiency of mitigation and pollution control measures and suggest further actions that need to be taken to achieve the desired effect.

- Visual observations;
- Selection of environmental parameters at specific locations;
- Sampling and regular testing of these parameters.

6.1.2 Objectives

The objectives of the environmental monitoring programme are:

- Evaluation of the efficiency of mitigation and pollution control measures;
- Updating of the actions and impacts of baseline data;
- Adoption of additional mitigation measures if the present measures are insufficient;
- Generating the data, which may be incorporated in environmental management plan in future projects.

6.1.3 Methodology

Monitoring methodology covers the following key aspects:

- Components to be monitored;
- Parameters for monitoring of the above components;
- Monitoring frequency;
- Monitoring standards;
- Responsibilities for monitoring;
- Direct responsibility;
- Overall responsibility
- Monitoring costs

The proposed expansion project M/s. AurobindoPharma Limited, Unit I involves manufacturing of Bulk Drugs & Bulk Drug Intermediates.

Environmental monitoring of the parameters involved and the threshold limits specified are discussed below.

6.1.4 Ambient Air Quality (AAQ) Monitoring

Ambient air quality parameters recommended are PM_{10}, $PM_{2.5}$, Oxides of Nitrogen (NO_x) and sulphur Dioxide (SO_2) & VOC (Volatile Organic Compounds). These are to be monitored at designated location Data should be generated at all identified locations in accordance to the National Ambient Air Quality Standards (**Table 6.1**) location, duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan

Table 6.1

National Ambient Air Quality Standards

S. No	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Area (µg.m3)	Ecological Sensitive Area (Notified by Central Government) (µg.m3)	Methods of Measurement
1	Sulphur Dioxide (SO_2)	Annual *	50	20	Improved west and Geake Ultraviolet fluorescence
		24 hours**	80	80	
2	Nitrogen Dioxide (NO_2)	Annual*	40	30	Modified Jacob &Hochheiser
		24 hours**	80	80	(Nn-Arsenite) Chemiluminescence
3	Particuate Matter (Size Less than 10 µm) or PM_{10}	Annual *	60	60	Gravimetric
		24 hours**	100	100	TOEM Beta Attenuation
4	Particulate Matter (Size Less than 2.5 µm) or $PM_{2.5}$	Annual *	40	40	Gravimetric TOEM Beta Attenuation
		24 hours**	60	60	

5	Ozone (O_3)	8 hours** 1 hour**	100 180	100 180	UV Photometric Chemiluminescence Chemical method
6	Lead (Pb)	Annual * 24 hours**	0.5 1.0	0.5 1.0	AAS/ ICP method after sampling on EPM 2000 or equivalent filter paper ED-XRF using Teflon filter.
7	Carbon Monoxide (CO)	8 hours** 1 hour**	02 04	02 04	Non Dispersive Infrared (NDIR) Spectroscopy
8	Ammonia (NH_3)	Annual * 24 hours**	100 400	100 400	Chemiluminescence Indophenol blue method
9	Benzene (C_6H_6)	Annual *	05	05	Gas Chromatography based continuous analyzer Absorption and Desorption followed by GC analysis
10	Benzo (o) Pyrene (BaP) Particulate Phase Only	Annual *	01	01	Solvent extraction followed by HPLC/GC analysis
11	Arsenic(As)	Annual*	06	06	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni)	Annual*	20	20	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

*Average Arithmetic mean of minimum 104 measurements in a year taken for a week 24 hourly at uniform interval.

**24 hourly/8 hourly values should meet 98 percent of the time in a year

6.1.5 Water Quality Monitoring

The physical and chemical parameters recommended for analysis of water quality relevant are pH, total solids, total dissolved solids, total suspended solids, oil and grease, COD, Chloride and other parameters as prescribed by the State PCB. The location, duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan. The monitoring of the water quality is to be carried out at all identified locations in accordanceto the standards specified.

6.1.6 Noise Level Monitoring

The measurements for monitoring noise levels would be carried out at all designated locations in accordance to the Ambient Noise Standards formulated by Central Pollution Control Board (CPCB) in 1989 (refer **Table 6.2)** Sound pressure levels would be monitored on twenty-four hours basis. Noise should be recorded at a "A" weighted frequency using a "slow time response mode' of the measuring instrument. The location, duration and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the environmental Monitoring Plan **(Table 6.3)**

Table 6.2

Noise Level Standards (CPCB)

Type	Noise Level for Day Time Leq dB(A)	Noise level for Night Time dB(A)
Industrial area	75	70
Commercial area	65	55
Residential area	55	45
Silence zone	50	40
Day time – 6.00am-9.00pm (15 hours) Night time – 9.00pm- 6.00am (9 hours)		

The monitoring plan along with the environmental parameters and the time frame is presented in the **Table 6.3**

Table 6.3

Environmental Monitoring Plan

S. No	Particulars	Monitoring Frequency	Standards	DurationOfSampling	Important monitoring parameters
Ambient Air Quality Monitoring					
1	3 locations	CAAQ/ As per PCB guidelines	Air (Prevention and control of Pollution) Rules, CPCB, 1994	24hrs	PM_{10}, $PM_{2.5}$, SO_2, NO_X, VOC
2	Work Place Monitoring	Monthly		8 hr	RSPM/ VOC
Stack Emissions Monitoring					
1	Stacks Connected to Boilers and DG set.	Online monitoring/ As per state PCB norms	Air (Prevention and control of Pollution) Rules, CPCB, 1994	-	Particulate matter recommended methods of CPCB
Water Quality Monitoring					
1	Ground water 3 locations and surface water 3 locations	Monthly	Water Quality standards by CPCB	Grab	As per state PCB specified norms
2	Treated effluent (ETP water)	Daily/ As per state PCB specified norms		Grab	pH, TDS,SS, BOD, COD and Oil & Grease Harness, chlorides/As per state PCB specified norms
Noise Quality Monitoring					
1	Noise Levels at 3 Locations with in plant site and 2 locations outside the plant site	Once a month	Noise standards by CPCB	Equivalent noise levels	Equivalent Noise levels in dB(A)
Soil					
1	Soil – 3 locations	Quarterly			pH, EC, CEC, Moisture, Texture, Bulk Density

6.1.7 Responsibility of Monitoring and Reporting System

The overall responsibility of monitoring the above parameters shall lie with the management of M/s. AurobindoPharma Limited, Unit I. The EHS department shall be responsible for day to day monitoring of effluent, raw water and treated water quality. The Ambient air quality, Stack emissions, soil, noise and water quality shall be monitored by either third party or by the Environment management department of the site.

Records shall be maintained for the analysis of raw effluents and treated effluents, ambient air quality data, stack emissions monitoring results, and noise levels. These records are not only required for perusal of the pollution control equipment as the objective of the project proponent is not only compliance with statutory regulations, but also a serious commitment towards clean environment.

The EHS department shall maintain the records as per the hazardous waste regulations and EPA regulations and apply for the annual consents for air and water, and renewal of authorization for the storage of hazardous waste as per Hazardous Waste (Management, handling and trans boundary Movement) Rules, 2008 and The records of hazardous waste manifest will be maintained.

Reporting system provides the necessary feedback for project management to ensure quality of the works and that the management plan is in implementation. The rationale for a reporting system is based on accountability to ensure that the measures proposed as part of the Environmental Management Plan get implemented at the site.

6.2 Environmental Monitoring Budget

The estimated environmental budget for the various environmental management measures in the EMP is detailed in **Table 6.4**. There are several other environmental aspects that have been addressed as part of good engineering controls and practices

Table 6.4

Estimated Environmental Monitoring Budget

S. No	Environmental Attribute	Frequency	Total No of Stations/ No. of Samples per year	Total Cost (Rs. In lakhs) per annum
I	**3rd Party**			
1	Air Emissions & Air Quality Assessment			
	Ambient Air Quality	As per AAQ monitoring guidelines	312	4.68
	Boiler Stacks	Monthly once	12	0.36
	DG Stacks	Monthly once	12 x 7	1.68
	Process Scrubbers	Monthly once	12 x 2	0.24
2	Water Quality			
	Ground Water& Surface water	Monthly once	12 x 3	0.9
3	Soil Quality	Quarterly	4 x3	0.3
4	Hazardous Waste	Variable	Variable	1.0
5	Noise Monitoring (at the periphery of the plant premises	Monthly	12 x3	0.18
II	**In-house**			
1	Air Emissions/AAQ Assessment			
	Boiler Stack	Continuous	Continuous	4.0
	CAAQMS	Continuous	Continuous	7.5
2.	Wastewater Monitoring	Daily	Continuous	6.0
III	**Regulatory (Monitoring done/Samples collected by APPCB)**			
	All the attributes (Air, Water and Solid Wastes and miscellaneous (average)	Variable	Variable	4.0
	Total			**30.84**

CHAPTER 7.0: RISK ASSESSMENT AND DISASTER MANAGEMENT

7.0 Introduction

M/s. Aurobindo Pharma Limited, Unit I proposed to expand the production capacity of existing Bulk Drugs and Bulk Drug Intermediates manufacturing plant at Sy. No. 379, 385, 386, 388 to 396 & 269, Borapatla(V), Hathnoora Mandal of Medak District in Telangana. The site is situated Between $17^0$40'01.1" N Latitude and $17^0$40'21.1" N Latitude and $78^0$10'21.4" East Longitude and $78^0$10'41.0" East Longitude. The total land area of the plant is 71.0 acres.

7.1 Objectives and Scope

The production of Bulk Drugs and Drug Intermediates involves usage of many chemicals which are both hazardous and non-hazardous in nature. Risk analysis has been carried out to identify the hazardous materials and quantify the hazards to arrive at safe disaster management plan and emergency preparedness plan for storage and handling of the potentiality hazardous material also. The purpose of carrying out risk assessment study for **M/S. Aurobindo Pharma limited, Unit I.** Industries is to obtain clearance from the Ministry of Environment and forests (MOEF) which calls for a study on nature of hazards due to proposed location of process and storage units and also to study whether any accident, if occurs, leads to any off-site disaster. In this endeavour, the study objectives are outlined here under.

1. **Hazard identification and Visualization of Maximum Credible Accident Scenarios.**

To identify major hazards relating to fire, explosion and toxicity due to chemicals, processes and storages of the proposed units.

2. **Hazard Analysis and Risk Assessment**

Hazard analysis is the process of determining the release probabilities and quantities, emission or release rates, the routes/pathways by which the released substances could reach the receptors, the fate of the substances in

environmental media through which they are transported or moved and the characteristics of the receptors at risk.

3. Disaster Management

To provide guidelines for Disaster Management Plan(DMP) for on-site emergencies and Emergency Preparedness Plan(EPP) for off-site emergency, based on above 1& 2 studies of proposed plant.

7.2 Hazard Analysis and Risk Assessment

7.2.1 Introduction

Hazard analysis is the process of determining the release probabilities and quantities, emission or release rates, the routes/pathways by which the released substances could reach the receptors, the fate of the substances in environmental media through which they are transported or moved and characteristics of the receptors at risk. The basis of risk estimation is to determine the dose-effect relationship between an indicator chemical and receptor. Estimation of risk follows only when the hazard analysis shows a frequency or occurrence, which is significant.

Risk evaluation is the process of identifying, whether the estimated level of risk is tolerable. Tolerable risk is not equated with acceptability; it refers to a willingness to live with a risk so as to secure certain risk benefits, and in the confidence that the risk is being properly controlled.

Hazard analysis involves the identification and quantification of the various hazards (unsafe conditions) that exist in the plant. On the other hand, risk analysis deals with the identification and quantification of risks, the plant equipment and personnel are exposed to, due to accidents resulting from the hazards present in the plant.

Hazard and risk analysis involves very extensive studies, and requires a very detailed design and engineering information. The various hazard analysis techniques that may be applied are hazard and operability studies, fault-tree analysis, event-tree analysis and failure and effects mode analysis.

Risk analysis follows as extensive hazard analysis. It involves the identification and assessment of risks; the neighbouring populations are

exposed to as a result of hazards present. This requires a thorough knowledge of failure probability, credible accident scenario, vulnerability of population's etc. Much of this information is difficult to get or generate. Consequently, the risk analysis is often confined to maximum credible accident studies.

The common terms used in risk Assessment and Disaster Management are elaborated below:

"Risk" is defined as a likelihood of an undesired event (accident, injury or death) occurring within a specified period or under specified circumstances. This may be either a probability depending on the circumstances.

The term **"Hazard"** is defined as a physical situation, which may cause human injury, damage to property or the environment or some combination of these criteria.

"Hazardous substance" means any substance or preparation, which by reason of its chemical or physic chemical properties or handling is liable to cause harm to human beings, other living creatures, plants, micro-organisms, property or the environment.

"Hazardous process" is defined as any process or activity in relation to an industry which may cause impairment to the health of the persons engaged or connected therewith or which may result in pollution of their general environment.

"Disaster" is defined as a catastrophic situation that causes damage, economic disruptions, loss of human life and deterioration of health and health services on a scale sufficient to warrant an extraordinary response from outside the affected area are community. Disasters occasioned by man are factory fire explosions and release of toxic gases or chemical substances etc.

"Accident" is an unplanned event, which has a probability of causing personal injury or property damage or both.

"Emergency" is defined as a situation where the resources out pass the demand. This highlights the typical nature of emergency; it will be after

experiences that enough is not enough in emergency situations. Situations of these kinds are avoidable but it is not possible to avoid them always.

In the sections below, the identification of various hazards, probable risks in a process industry manufacturing optical brighteners, maximum credible accident analysis, consequence analysis are addressed which gives a broad identification of risks involved in the plant.

7.2.2 Hazard Identification

Identification of hazards in the synthetic chemicals organic plant is of primary significance in the analysis, quantification and cost effective control of accidents involving flammable compounds. A classical definition of hazard states that hazard is not in fact the characteristic of system/plant/storage that presents potential for an accident. Hence, all the components of a system/plant/process need to be thoroughly examined to assess their potential for initiating or propagating an unplanned event/sequence of events which can be termed as an accident.

Typical schemes of predictive hazard evaluation and quantitative risk analysis suggest that hazard identification step plays a key role. Estimation of probability of an unexpected event and its consequences from the basis of quantification of risk in terms of damage to property, environment or personal. Therefore, the type quantity, location and conditions of release of a toxic or flammable substance have to be identified in order to estimate its damaging effects, the area involved, and the possible precautionary measures required to be taken.

Some of the hazard identification procedures are as follows:

1. Fire Explosion and Toxicity Index(FETI) Approach;
2. HAZOP studies
3. Maximum Credible Accident and Consequence Analysis(MCACA);

7.2.3 Hazards Related to Materials

The manufacturing capacities of the proposed products are presented in **Table 7.1** and Raw Material inventory is presented in **Table 7.2**

Table 7.1

Manufacturing Capacity of Proposed Products

S. No.	Name of the Product	Quantity in TPM
1	Amisulpride	0.50
2	Aripiprazole	0.50
3	Atorvastatin	4.00
4	BisprololFumarate	0.50
5	Bupropion HCl	0.50
6	Candesartan Cilexetil	1.00
7	Cefaclor Monohydrate	1.00
8	Cefadroxil	3.00
9	Cefalothin Acid	2.00
10	Cefazolin Sodium	3.00
11	Cefdinir	2.50
12	CefditorenPivoxil	0.50
13	CefepimeHCl	2.00
14	CefiximeTrihydrate	1.50
15	Cefotaxime	3.00
16	Cefoxitin Sodium	0.50
17	CefpiromeDihydroiodide	0.20
18	CefpodoximeProxetil	3.00
19	Cefprozil	3.00
20	Cefradin	2.00
21	Cefsulodin Sodium	0.50
22	CeftazidimeDiHydrochloride	2.00
23	CeftibutenDihydrate	2.00
24	CeftiofurHCl	3.00
25	Ceftizoxime Acid	0.50
26	Ceftriaxone Disodium Hemiheptahydrate	3.00
27	Cefuroxime Axetil	23.50
28	Cephalexin Monohydrate	15.00
29	CephapirinBenzathine	0.50
30	Ciprofloxacin HCl	7.00
31	Citalopram Hydrobromide	2.50
32	Donepezil Hydrochloride	0.50
33	DoxazosinMesylate	0.50
34	Entacapone	3.00
35	Escitalopram Oxalate	2.00
36	Famciclovir	2.00
37	Florfenicol	5.00
38	Fluvastatin	0.50
39	Gabapentin	40.00
40	Gemfrozil	10
41	Glyburide	2.50

42	Irbesartan	5.00
43	Lamivudine	1.00
44	Lisinopril	1.00
45	Losartan Potassium	5.00
46	Metformin HCl	200.00
47	Metoprolol Succinate	2.00
48	Metoprolol Tartrate	10.00
49	Mirtazapine	2.00
50	Modafinil	1.00
51	Nevirapine	5.00
52	Ondansetron	0.20
53	Pantoprazole Sodium Sesquihydrate	3.00
54	Paroxetine HCl	3.00
55	Perindopril tert-Butylamine	0.50
56	Rabeprazole Sodium	0.50
57	Ritonavir	2.00
58	Ribavirin	0.50
59	Risperidone	0.50
60	SevelamerHCl/Carbonate	1.00
61	Simvastatin	7.00
62	Stavudine	1.00
63	Telmisartan	2.00
64	Terazosin HClDihydrate	0.30
65	TerbinafineHCl	3.00
66	Topiramate	5.00
	Total	**421.20**

Table 7.2

Inventory and hazard characteristics of key raw material

S.No	Raw material	Inventory-MT	Physical form	Type of hazard	Storage method
1	Absolute Alcohol	66.46	Liquid	flammable	Drums
2	Acetic Acid	33.46	Liquid	flammable	Drums
3	Acetic Anhydride	1.08	Liquid	flammable	Drums
4	Acetonitrile	64.20	Liquid	flammable	Drums
5	Acetone	452.46	Liquid	flammable	Tank form
6	Ammonia	42.96	Gas	flammable	Cylinder
7	Boron Trifluoride	2.69	Gas	Non- flammable	Cylinder
8	Bromine	0.25	Liquid	Non- flammable	Drums
9	potassium Hydroxide flakes	0.89	Solid	Non- flammable	Drums
10	Caustic Soda Flakes (Sodium Hydroxide flakes)	1.48	Solid	Non- flammable	Drums
11	Chloro Hexane	51.65	Liquid	flammable	Drums
12	Chloroform	19.30	Liquid	Non-flammable	Tank form
13	Cyclo hexane	181.4	Liquid	flammable	Tank form
14	Di isopropyl Ether	38.68	Liquid	flammable	Drums

15	Diethyl Amine	0.308	Liquid	flammable	Drums
16	Dimethyl Formamide	78.59	Liquid	flammable	Tank form
17	Epichlorohydrine	0.87	Liquid	flammable	Drums
18	Ethyl Acetate	471.86	Liquid	flammable	Tank form
19	HBr	1.08	Liquid	Non- flammable	Glass Bottles
20	Hydrogen Chloride	0.105	Gas	Non- flammable	Cylinder
21	Hexane	29.42	Liquid	flammable	Tank form
22	Hydrochloric Acid	168.67	Liquid	Corrosive	Tank Form
23	Hydrogen	3.16	Gas	Flammable	Cylinders
24	Hydroquinone	0.0007	Solid	Non- flammable	drums
25	Isopropyl Alcohol	275.56	Liquid	flammable	Tank form
26	Methanol	555.53	Liquid	flammable	Tank form
27	Methyl Isobutyl Ketone	5.67	Liquid	flammable	Drums
28	Methylene Chloride	797.57	Liquid	Toxic	Tank form
29	Mono Isopropyl Amine	0.282	Liquid	flammable	drums
30	N-Butanol	28.608	Liquid	flammable	Tank form
31	N-Butylamine	3.31	Liquid	flammable	Drums
32	N-Heptane	29.61	Liquid	flammable	Drums
33	N,N-Di isopropylethylamine	0.15	Liquid	flammable	Drums
34	N,N-Dimethyl Acetamide	66.11	Liquid	Combustible	Drums
35	N,N Dimethyl Formamide	172.66	Liquid	flammable	Drums
36	O-Xylene	127.55	Liquid	flammable	Tank form
37	Paraformaldehyde	0.077	Solid	flammable	Drums
38	Phenol	6.25	Solid	Non-flammable	Drums
39	Phosphoric acid	7.94	liquid	Non-flammable	Drums
41	Phosphorus Pentachloride	0.59	Solid	Non-flammable	Drums
42	Phosphorus Oxychloride	0.64	liquid	Non-flammable	Drums
43	Tributylamine	1.30	Liquid	Combustible	Drums
44	Triethylamine	9.82	Liquid	Flammable	Drums
45	Trimethylamine	0.33	Gas	Flammable	Drums
46	Toluene	279.67	Liquid	flammable	Tank form

7.2.3.1 Hazardous Characteristics of Raw Materials

Out of the total 303 raw materials, 35 chemicals were listed in Part II of Schedule I of MSHIS Rules, 1989. None of the chemical inventories are exceeding threshold quantities listed in schedule III of MSHIS Rules. Out of the 35 chemicals listed bulk storages proposed is only for 14chemicals. List of Hazardous chemicals and Hazardous characteristics of key raw materials are given in **Table 7.3**. List and quantities of bulk Storages proposed at the site are given in **Table 7.4**

Table 7.3

List of Hazardous Chemicals (Listed in Part II of Schedule I)

S.No.	Hazardous Chemicals	Physical Form	Maximum Inventory Kgs/day
1	Acetic Acid	Liquid	1637
2	Acetic Anhydride	Liquid	72
3	Acetone	Liquid	30164
4	Acetonitrile	Liquid	4280
5	Ammonia	Liquid	2864
6	Boron Trifluoride	Liquid	179
7	Chloroform	Liquid	1287
8	Cyclohexane	Liquid	26914
9	DMS	liquid	9
10	Di Methyl Amine Hydrochloride	Liquid	4394
11	Diethylamine	Liquid	20
12	Ethanol	Liquid	44661
13	Ethyl Acetate	Liquid	31457
14	Ethyl Bromide	Liquid	14
15	Hydrogen Gas	Gas	3168
16	Hydrochloric Acid	Liquid	11245
17	Hydroquinone	Solid	0.1
18	Hexane	Liquid	1961
19	Iodine	Liquid	7
20	IPA	Liquid	18371
21	Methanol	Liquid	37035
22	Methylene Chloride	Liquid	53171
23	Methyl Iso butyl Ketone	Liquid	378
24	N-Butanol	Solid	1907
25	Para Formaldehyde	Liquid	5
26	Phenol	Liquid	416
27	Phosphoric acid	Liquid	529
28	Phosphorous Pentachloride	Liquid	39
29	Phosphorus oxychloride	Solid	42
30	Potassium Hydroxide	Solid	194
31	Pyridine	Solid	80
32	Sodium Hydroxide	Liquid	1151
33	Sulphric Acid	Liquid	835
34	TEA	Solid	655
35	Toulene	Liquid	18644

Physical properties& Hazard characteristics of Key Raw materials

S.No	Name of the Material	Boiling point	Flash Point in °C	Explosive Limits volume % in air	NFPA Rating		
					Health	Fire	Reactivity
1	Toluene	110.6	4.4	1.2-6.7	2	3	0
2	Methanol	65.5	16	6.7-36	1	3	0
3	Ethyl acetate	77	7.2	2.2-9.0	1	3	0
4	Ethanol	78	16.6	3.3-19.0	0	3	0
5	Methylene chloride	39.75	-	16-66	2	1	0
6	Isopropyl alcohol	82.5	12.77	2-12.7	1	3	0
7	Caustic soda lye	145	-	-	3	0	1
8	Acetone	55.6	-17.8	2.5-12.8	1	3	0
9	Cyclo Hexane	80.7	-18	1.3-8.4	1	3	0
11	DMS	37	-38	2.2-9.7	2	4	0
13	N-Butanol	117	34	4-11	1	3	0
14	Hexane	68	-23	1.2-7.7	1	3	0

Table 7.4

List of Bulk storages & Quantities proposed

S.No.	Name of the Solvent	Capacity KL	MOC
1	Acetone	170.76	MS
2	Chloroform	30.87	MS
2	Cyclohexane	150.86	MS
3	DMF	90.79	MS
4	Ethanol	91.08	MS
5	Ethyl Acetate	180.84	MS
6	Hexane	31.21	MS
7	Isopropyl Alocohol	77.39	MS
8	Methanol	171.79	MS
9	Methylene Chloride	211.09	MS
10	N-Butanol	52.05	MS
11	O-Xylene	30.87	MS
12	THF	90.79	MS
13	Toluene	62.41	MS
14	Butyl Acetate	14.97	MS

7.3 Fire& Explosion Index (F&EI)

7.3.1 Methodology

Dow Chemical Company issued a guideline for hazard determination and protection. By this method a chemical process unit is rated numerically for hazards. The numerical value used is the Fire and Explosion Index (F&EI) which is most widely used for hazard evaluation in chemical process industries.

The guide applies to process unit only and not to auxiliary units such as power generating stations, plant water systems, control rooms, fired heaters, structural requirements, corrosive nature of material handled and personal safety equipment. These are regarded as basic features that do not vary according to the magnitude of the fire and explosion hazard involved. The guide also does not cover the processing and handling of explosives such as dynamite, TNT etc.

7.3.2 Computation of F&EI

The computation of fire and explosion index of each unit is based on the material factor. This is a measure of the intrinsic rate of potential energy release from fire explosion of most hazardous material or mixture of materials present in significant quantity, whether it is raw material, intermediate, product, solvent etc., by combustion or chemical reaction. "In significant quantity" here means such quantity that the hazard represented by the material actually exists. The Nationality Fire Protection Agency of USA (NFPA) have specified standard values for material factor which should be used for F&EI calculations and are available in DOW's hazard classification guide.in case it is not readily available, it can be calculated using the heat of combustion, flammability indices etc.

General process hazard are factors that play a primary role in determining the magnitude of loss of incident. It takes into account the nature of the reaction, ventilation of the unit, accessibility of the unit, drainage facilities etc., special process hazards are factors that contribute primarily to the probability of a loss incident. They consist of specific process conditions that have shown themselves to be major causes of fire and explosion incidents.

It takes into account toxicity of the material, operatingpressure, operation near flammable range, quantity of material, joints and packing, use of hot oil exchange system etc., The F&EI calculated as a product of material factor, general process hazard factor, and special process hazard factor.

7.3.3 Hazard Ranking

The hazard ranking based on F&EI value is as follows

Table 7.5

Degree of Hazard for F&EI

F&EI Index Range	Degrees of Hazard
1-60	Light
61-96	Moderate
97-127	Intermediate
128-158	Heavy
159 & above	Severe

The estimated values of F&EI reflect light hazard in view of the low volume of chemicals.

The fire and explosion index evaluation can be very useful in developing plant layouts or adding equipment and buildings to existing plants. Evaluation of the F&EI calculations and layout considerations will result a safe operable, maintainable and cost effective arrangement of equipment and buildings.

Table 7.6

Fire & Explosion Index for Tank farm

S. No.	Name of the Solvent	Fire & Explosion Index (F1*F2*MF)	Degree of Hazard
1	Acetone	75.12	Moderate
2	Cyclohexane	85.76	Moderate
3	DMF	27.30	Light
4	Ethanol	62.40	Moderate
5	Ethyl Acetate	66.00	Moderate

6	Hexane	84.48	Moderate
7	Isopropyl Alocohol	65.76	Moderate
8	Methanol	64.80	Moderate
9	Methylene Chloride	27.30	Light
10	N-Butanol	60.00	Light
11	O-Xylene	63.12	Moderate
12	THF	79.60	Moderate
13	Toluene	65.76	Moderate
14	Butyl Acetate	60.00	Light

Table 7.7

Heat Radiation Damage Distances – Tank Farm

S.No	Name of Raw material	Storage Tank Details				Scenario Details				
		Tank Capacity (KL)	No.s	Diameter (m)	Height (m)	Hole Dia (mm)	Release Rate (Kg/sec)	Heat radiation damage distances in m for KW/m2		
								37.5	12.5	4.0
1	Acetone	170.76	6	3.14	5.10	50	8.90	<1	10	18
2	Cyclohexane	150.86	3	3.30	5.60	50	10.35	<1	11	21
3	DMF	90.79	2	3.22	5.28	50	11.15	…	10	16
4	Ethanol	91.08	2	3.22	5.30	50	9.42	<1	10	17
5	Ethyl Acetate	180.84	5	3.22	5.26	50	10.63	<1	12	17
6	Hexane	31.21	1	3.00	4.39	50	5.05	<1	12	21
7	Isopropyl Alocohol	77.39	3	2.78	4.18	50	5.66	…	11	18
8	Methanol	171.79	5	3.02	4.55	50	7.19	<1	11	15
9	Methylene Chloride	211.09	5	3.18	5.06	50	14.52	…	...	11
10	N-Butanol	52.05	2	3.00	4.36	50	6.92	…	12	18
11	O-Xylene	30.87	1	3.00	4.34	50	7.50	…	12	21
12	THF	90.79	2	3.22	5.28	50	10.57	<1	12	20
13	Toluene	62.41	3	2.66	3.96	50	5.31	<1	12	21
14	Butyl Acetate	14.97	1	2.35	3.77	50	4.00	…	11	19

The storage is a small capacity facility and accordingly the F& E index value is found to be moderate reflecting the threshold limits as prescribed in MSHC rules. Both MSHC rules and F & E index indicate that the present facility does not require a detailed risk assessment.

7.4 Hazard and Operability Study (HAZOP)

Safety and reliability of modern processing plant can be improved by using procedures that recognize and eliminate potential problems in the design stage. This is especially important because of the increasing need to operate the different units, for economic reasons, more closely to known risk situations. Hence, it requires refined methods like HAZOP study technique for identifying hazardous situations and problems and eliminating them at the design stage.

Based on process reactions, a list of process reactions were identified for taking additional care precautions and presented in **Table 7.9**

7.4.1 Hazard and Operability Study (HAZOP)

Safety and reliability of modern processing plant can be improved by using procedures that recognize and eliminate potential problems in the design stage. This is especially important because of the increasing need to operate the different units, for economic reasons, more closely to known risk situations. Hence, it requires refined methods like HAZOP study technique for identifying hazardous situations and problems and eliminating them at the design stage.

The HAZOP study technique normally based on a word model. The procedure of conducting the study involves examining the flow sheet or line diagram of the process unit section by section or line by line(depending on the level of detail required)looking for inadequacies in design.

A checklist of guide words is applied to each stage of the process in turn thereby generating deviations opposite of all conceivable eventualities.

Table 7.8

Checklist of guide words in HAZOP

NO,NOT,NONE The activity is not carried out of ceases	No activity or operation takes place. There is no forward flow when should be. A task may not be done, something may not be done, something may not be delivered or be there. There may be no action in response to activating signal. A check is omitted.no catalyst present.
MORE OFF A quantitative increase in an activity	There is more of something. More of any physical quantity than there should be. For example, of Temperature, pressure quantity of flow. More of a task can be carried out.An activity is done for a longer time
LESS OFF A quantity decrease in an activity	There is loss of something present. Less of an activity is carried out. Less time is taken
PART OF Incomplete Performance of an activity	Only part of an action is carried out. There might be a transfer of part of a load or batch. More components or an extra phase or impurities might be present.
REVERSE Inversion of an activity	Something happens backwards. A back siphon occurs. Heating rather than cooling occur. This keyword can also be used to generate ideas as to how to recover from a situation
OTHER(THAN)	A gas X can be sent down the line instead of gas Y.An operator might press the wrong bottom or open the wrong valve. This key word is also used to identify what needs to happen other than normal operation—for example, start-up, shutdown, regeneration, maintenance.
AS WELL AS Another activity occurs as the original activity	Can button A and B pressed only A was meant be pressed? Can both gas X and gas Y be sent down the line? What happens if the operator eats his lunch at the same time as packing cyanide?
SOONER/LATER THAN An activity occurring at the wrong time/relative to others	Every system has its running clock. What happens if task G is done before task K? what if batch reaction is not completed in the normal time

For a major new project the study team should include representatives from production/operation department i.e. production/operations Manager (or designate); from the technical department i.e. project engineer together

with an instrument engineer to advise on the instrumentation and to deal with any control problems and all aspects of plant operation are considered and also force consideration of the unexpected or obscure.

Potential problems as represented by the consequences of the deviation should be evaluated as they arise and a decision reached on whether they merit further consideration or action. Except for major risk areas where a fully quantitative assessment is required this decision is made semi-quantitatively on the consequence (usually scaled as trivial, important or very probable)

There are no temperature and pressure conditions in this process. Hence only flow is considered for the HAZOP. The sheets of HAZOP study are presented below;

7.4.2 HAZOP Work Sheets

Process Parameter: Raw material flow

Table 7.9

HAZOP Work Sheet – Raw Material Flow

S. No	Deviation	Causes	Consequences	Safety Features/Measures	Remarks
1	No Flow	No supply Malfunctioning of pump Power failure	No Reaction	Operation control devices and emergency plant shut down procedure, alarm system etc. Alternative Automatic power source	Inspect Operations Frequently
2	Less Flow	Malfunctioning of pump Malfunctioning of Shut off valve Valve on charging line not opened	Operational trouble in reactors	Operation control devices and emergency plant shutdown procedure, alarm systems etc.	Check the shut off valve. Ensure the feed valve is opened
3	More Flow	Malfunction of control valve	Operational trouble in reactor	Flow regulators, Excess flow diversion devices to Alternative storage or Flare etc.	Flow control devices inspection and examination and maintenance will be continuous

II) Process Parameter: *Pressure*

Table 7.10

HAZOP Work Sheet - Pressure

S.No	Deviation	Causes	Consequences	Safety Features/Measures	Remarks
1	No Pressure	--	--	--	Not Envisaged during operation
2	Low Pressure	Malfunctioning of pump Malfunctioning of Shut off valve Valve on charging line not opened Leakages in pipe line	Operational trouble in reactors	Periodic inspection &Examination, Maintenance Leak detect system Shut off valve Low pressure alarm/indicators shall be provided	Pipe line and flow control devices examined frequently
3	High Pressure	High Temperature Excess supply Malfunction of control valve	Operational trouble in reactor Rupture of pipe line Fire or Explosion	Periodic inspection &Examination, Maintenance Pressure relief system Automatic flow diverter Alternative storage system	Pipe line and flow control devices examined frequently

(III) Process Parameter: *Temperature*

Table 7.11

HAZOP Work Sheet: Temperature

S.No	Deviation	Causes	Consequences	Safety Features/Measures	Remarks
1	No Temperature	--	--	--	Not envisaged during operation
2	Low Temperature	Malfunctioning of Temp. Indicator External cooling	--	Calibration of Temperature indicators, periodic Inspection Examination	Examine the pipe line and control devices working conditions frequently
3	High Temperature	Malfunctioning of Temp.Indicator External fire/Heating	Rupture/ failure in pipe line	Calibration of Temp.Indicator, periodic Inspection Examination Thermal Insulation Around the pipe Radiation Detectors/Sensors will be provided	Examine the pipe line and control devices working conditions frequently

7.4.3 Hazardous Processes identified in the unit

Following process steps are identified as potential process hazards based on temperature, pressure, run away reactions. Below table gives process hazardous identified, mitigative measures suggested and Emergency equipment required at the place of work

Table 7.12

Hazardous Process reactions

S.No	Product	Process stage	Brief process reaction	Potential hazard	Mitigative measures	Emergency equipment installed any
1	Amisulpride	1	4-Amino-5-(ethylsulfonyl)-2-Methoxy benzoic acid is reacted with ethyl chloroformate to yield a mixed anhydride, which is reacted with 2-(Aminomethyl)-1-Ethyl pyrrolidine to obtain Amulsulpride crude. Crude Amlsulpride is purified by recrystallization from acetone to yield pure amusulpride.	Skin burns and fire	Usage of PPE, Nitrogen blanketing, and interlocks for centrifuges	
3	Atorvastatin	1	t-butyl [(4R,6R)-6-cyanomethyl-2,2-dimethyl-1,3dioxan-4-yl] acetate is subjected hydrogenation in rany nickel catalyst and methanolic ammonia	Fire	Adequately designed hydrogenator with safety features	Dump tank as secondary containment. Flame arrestors
4	BisprololFumarate	1	Bisoprolol phenol is treated with epichlorohydrin in presence of sodium hydroxide to produce bisoprolol epoxide	Hazardous decomposition	Steam pressure control to operate in safe limits	Fire hydrant system
5	Citalopram Hydrobromide	1	1-Bromo 4-Flurobenzene is reacted with megesium, to obtain Grignard-1 and similarly n,n-dimethyl 3-chloropropylamine is reacted with magnesium to obtain Grignard-2. 5-Cyanothalide is reacted with Grignard-1 and then Grignard-2 to obtain Citalopram diol	Run away reaction	Controlled addition of reagents, high temperature alarm, high reliable utilities	
6	Donepezil Hydrochloride	2	Dehydrodonepezil is hydrogenated over palladium and charcoal in presence of hydrogen in toluene to yield debenzylated Donepezil	Fire	Adequately designed hydrogenator with safety features	Dump tank as secondary containment. Flame arrestors

7	Escitalopram Oxalate	1	1-Bromo 4-Flurobenzene is reacted with magnesium, to obtain Grignard-1 and similarly n,n-dimethyl 3-chloropropylamine is reacted with magnesium to obtain Grignard-2. 5-Cyanothalide is reacted with Grignard-1 and then Grignard-2 to obtain Citalopram diol	Run away reaction	Controlled addition of reagents, high temperature alarm, high reliable utilities	
8	Famciclovir	2	N-(2-amino-4,6-dichloro-5-pyrimidinyl) formamide is reacted with 4-amino-2-hydroxymethylbutan-1-ol HCl in ethanol and the product is subjected to dechlorination using Pd/C and hydrogen	Fire	Adequately designed hydrogenator with safety features	Dump tank as secondary containment. Flame arrestors
9	Fluvastatin	1	t-Butylacetate is reacted with NaH and n-butyl Lithium in THF and Indole-2E-propenal to t-butyl-3-keto-5-hydroxy fluvastatin	Fire	Operational controls to avoid water ingress into the area. Flame arrestors	
10	Gabapentin	1	1-isocyanatomethyl-1-cyclohexane acetate is hydrolysed by refluxing with aqueous hydrochloric acid in presence of methylene dichloride and acetone medium to give 1-aminomethyl-1-cyclohexane acetic acid hydrochloride	Exothermic reaction	Emergency low temperature cooling system	
11	Gemfibrozil	2	2,5-dimethyl phenol is treated with sodium hydroxide in a mixture of o-xylene and DMSO to get sodium-2,5-dimethyl phenoxide which is reacted with methyl-5-chloro-2,2-dimethyl pentanoate to get gemfibrozil methyl ester which is subjected to alkaline hydrolysis to get gemfibrozil	Exothermic reaction	Emergency low temperature cooling system	
12	Irbesartan	2	Irbesartan nitrile is treated with sodium azide in presence of tributyl tin chloride in o-xylene to afford irbesartan crude	Harmful to skin, eyes &respiratory tract, water reactive	LEV system and scrubber connection	

13	Lamivudine	1	S-I: Lamivudine coupled ester is reduced using sodium borohydride and salt formation with salicylic acid in buffered methylated spirit medium to get lamivudine salicylate	Hydrogen gas liberation and fire	Flame arrestors and suitable electrical fittings	
14	Lisinopril	4	N6-(trifluoro acetyl)-L-Lysyl-L-proline is condensed with ethyl-2-oxo-4-phenyl butyrate in presence of molecular sieves in methanol and resulting imine is concomitantly hydrogenated with hydrogen in presence of raney nickel	Fire	Adequately designed hydrogenator with safety features	Dump tank as secondary containment. Flame arrestors
15	Losartan Potassium	1	S-I: Trityl losartan base is reacted with sulphuric acid and sodium hydroxide in presence of acetonitrile, methanol and toluene to give losartan stage-I product S-II: Losartan base on salt formation with potassium hydroxide in presence of methanol and acetone media gives losartan potassium	Chemical burns	Defined handing procedure and personal protective equipment	
16	Metformin HCl	1	Dimethylamine hydrochloride is reacted with cyano guanidine in presence of isopropyl alcohol to give metformin hcl crude	Exothermic	Defined operating procedures and safety interlocks	
17	Mirtazapine	3	Mirtazapins stage-II material is cyclized in presence of conc.sulphuric acid and sodium hydroxide in methylene dichloride, diisopropyl ether and methanol solvent media to produce mirtazapine stage III material	Fire and skin burns	Closed handling systems, nitrogen and defined operating procedures	
18	Perindopril tert-Butylamine	2	hydrogenation	Fire	Adequately designed hydrogenator with safety features	

19	Ribavirin	1	1,2,3,5-tetra-O-acetyl-β-D-ribofuranose is reacted with methyl-1H-1,2,4-triazole-3-carboxylate at molten temperature in presence of catalytic amount of trifluoromethane sulfonic acid	Fire and chemical burns	Trained operators and defined operating procedures	
20	Sevelamer HCl/ Carbonate	2	Poly allylaminehcl reacts with epichlorohydrin in presence of sodium hydroxide/ sodium bicarbonate to give sevelamerhcl/ carbonate	Decomposition and run-away reaction	Safe operating limits and process controls	
21	Simvastatin	3	Diprotected lovastatin amide reacts with NBL & methyl iodide in presence of THF &Hcl	Fire and chemical burns	Closed handling system for NBL and adequate PPE	
22	Telmisartan		Biphenyl acid is treated with sulphuric acid in presence of methanol followed by aqueous sodium bicarbonate to obtain biphenyl esterwhich is diluted with methylene chloride and directly taken for bromination reaction with n-bromosuccinimide followed by AIBN to obtain bromobiphenyl methyl ester	Chemical burns	Closed handling system and PPE	
23	Topiramate	1	2,3,4,5, bis-O(1-methylethyledene)-β-D-fructopyranose is reacted with sulfuryl chloride in presence of tri-n-butyl amine to form S-I material	Chemical burns	Defined operating procedures and LEV	

7.4.4 Hazard Factors

A study of past accident information provides an understanding of failure modes and mechanisms of process and control equipment and human systems and their likely effects on the overall plant reliability and safety.

Some of the major contributing factors for accidents in chemical industries are:

Table 7.13

Contributing factors for accidents

S.No	Contributing Factor	Per cent Loss
1	Equipment design faults	41
2	Process design faults	10
3	Operator errors	31
4	Maintenance deficiencies	12
5	Material Hazards	6

A study AICHE (1972) indicates that majority of equipment of component failures involve compressors, furnaces and heat exchangers as there are lesser opportunities to take them off for maintenance. The frequency of equipment or component failures is observed as follows:

Table 7.14

Failure frequency statistics of key equipment

S.No	Equipment	Frequency (%)
1	Compressors	30
2	Furnaces	18
3	Heat Exchangers	17
4	Process Vessels	18
5	Others	17

However, failures of storage vessels and those during transportation have been reported more frequently than cases of plant failures. The failure rate of various equipment in a typical power plant is provided in the following table.

7.4.5 Equipment Failure Rates

(Data from reliability Technology by A.E.Green and J.R Bourne, Copyright C,1972,reproduced with permission of John Wiley and Sons,Inc)

Table 7.15

Equipment failure rates

Equipment	Failure Rate(Failures/10^6h)
Electric Motors	10
Transformers(<15 kv)	0.6
Transformers(132-400k V)	0.7
General, (33k V)	2
Circuit breakers	10
Pressure vessels(general)	3
Pressure vessels (High standard)	0.3
Pipes	0.2
Pipe joints	0.5
Ducts	1
Gaskets	0.5
Bellows	5
Diagrams(metal)	5
Diagrams(Rubber)	8
Unions and junctions	0.4
Hoses(heavily stressed)	40
Hoses(Lightly stressed)	4
Ball bearings(heavy duty)	20
Ball bearings(Light duty)	10
Roll bearings	5
Sleeve bearings	5
Shafts(heavily stressed)	0.2
Shafts(Lightly stressed)	0.02
Relief valves leakage	2
Relief valves blockage	0.5
Hand-operated valves	15
Control valves	30

Ball valves	0.5
Solenoid valves	30
Rotating seals	7
Sliding seals	3
'O' ring seals	0.2
Couplings	5
Belt drives	40
Spur gears	10
Helical gears	1
Friction clutches	3
Magnetic clutches	6
Fixed orifices	1
Variable orifices	5
Nozzle and flapper assembles: blockage	6
Nozzle and flapper assembles: breakage	0.2
Filters: blockage	1
Filters: Leakage	1
Rock and pinion assembles	2
Knife edge fulcrum: wear	10
Springs(heavily stressed)	1
Springs(Lightly stressed)	0.2
Hair springs	1
Calibration springs: creep	2
Calibration springs: Breakage	0.2
Vibration mounts	9
Mechanical joints	0.2
Grub Screws	0.5
Pins	15
Pivots	1
Nuts	0.02
Bolts	0.02
Boilers(all types)	1.1
Boilers feed pumps	1012.5
Cranes	7.8

7.4.6 Common Causes of Accidents

Engineering and Instrumental

Based on the analysis of past accident information, common causes of major chemical plant accidents are identified as:

- Poor house keeping
- Improper use of Tools, equipment, facilities
- Unsafe or defective equipment facilities
- Lack of proper procedures
- Improving Unsafe procedures
- Failure to follow prescribed procedures
- Jobs not understood
- Lack of awareness of hazards involved
- Lack of proper tools, equipment, facilities
- Lack of guides and safety devices
- Lack of protective equipment and clothing

7.4.7 Failures of Human Systems

Na assessment of past chemical accidents reveals human factor to the cause for over 60% of the accidents while the rest are due to other plant component failures. This percentage will increase if major accidents alone are considered for analysis. Major causes of human failures reported are due to:

- Stress induced by poor equipment design, unfavourable environmental conditions, fatigue, etc.
- Lack of training in safety and loss prevention
- Indecision in critical situations.
- Inexperienced staff being employed in hazardous situations

Often, human errors are not analysed while accident reporting and accident reports only provide information about equipment or component failures. Hence, a great deal of uncertainty surrounds analysis of failure of human systems and consequent damages.

The number of persons/materials are potentially exposed to a specific hazard zone is a function of the population density and distribution near the

accident location. The failure rate data and ignition sources of major fires are presented in the following **Tables 7.15 & 7.16**

Table 7.16

Ignition Sources of Major Fires

S. No	Ignition source	Percent
1	Electrical (wiring of motors)	23%
2	Smoking	18%
3	Friction	10%
4	Overheated material	8%
5	Burner flames	7%
6	Combustion sparks	5%
7	Spontaneous ignition	4%
8	Cutting & Welding	4%
9	Exposure (fires jumping into new areas)	3%
10	Incendiarism (fires maliciously set)	2%
11	Mechanical sparks	2%
12	Molten substances	1%
13	Chemical actions	1%
14	Static sparks	1%
15	Lightening	1%
16	Miscellaneous	1%

7.4.8 Suggested safety measures for storage of chemicals

Following measures are suggested for safe handling of chemicals in Aurobindo Pharma Limited, Unit-I.

- Containers shall be labelled and level indicators shall be installed.
- Appropriate Safety signs shall be posted.
- Material safety Data sheets shall be made available.
- Chemical safety training shall be provided and an inventory of hazardous chemicals is maintained.
- Proper preventive measures on electrostatic hazards.
- Follow good CGMP and dispensing practices.

- Regular inspection and checking to assure risk control (proper earthling, functioning of safety interlocks, bonding, transferring in closed system and no spillages).
- Dykes shall be provided for all storage tanks as per the statutory norms.

Preventive maintenance of storage vessels shall be followed

7.4.9 Toxic Chemicals & handling

In regards to toxic chemicals, 3 chemicals comes under the definition of toxic chemicals (MSHIS Rules) based on LD 50 values. List and quantities handled are given in the **Table 7.17** below

Table 7.17

List of Toxic Chemicals & handling quantities

S.No	List of Hazardous Chemicals	Form Liquid/solid	TLV	LD 50 (mg/kg)	Quantity used	Maximum quantity stored
1	Chloroform	Liquid	2 PPM	36	1287 Kgs	In drums; 25 drums of 200 L capacity
2	Ammonia	Gas	25 ppm	Not applicable	2864 kgs	In cylinders; 25 Cylinders in cylinder storage shed
3	Formaldehyde	Liquid	0.3 ppm	42	5.16kgs	In drums; 25 drums of 200 L capacity

All chemicals are stored in tank form and all precautions applicable for bulk storage tanker shall be applied.

Following precautions are suggested for handling of these chemicals

- All the chemicals shall be stored in isolated place in stores with proper labelling
- MSDS shall be made available to workers
- All workers in the area of handling and use shall be trained
- Personnel protective equipment shall be made mandatory to handle the chemicals.
- Detailed safety instructions shall be placed at the place of use

- All the reactors where these chemicals are used shall be connected to wet scrubber
- Periodical health check shall be made mandatory for work force involved in handling of these chemicals as per the provisions of the Factory Act
- All containers and container liners shall be de-toxified and certified by production in –charge before sending to disposal area

7.5 Disaster Management Plan

7.5.1 Introduction

A disaster is a catastrophic situation in which suddenly, people are plunged into helplessness and suffering and, as a result, need protection, clothing, shelter, medical and social care and other necessities of life.

Disasters can be divided into two main groups In the first, are disasters resulting from natural phenomena like earthquakes, volcanic eruptions, storm surges cyclones, tropical storms. Floods, avalanches, landslides, and forest fires. The second group includes disastrous events occasioned by man, or by man's impact upon the environment. Examples are armed conflict. Industrial accidents, radiation accidents, factory fires, explosions and escape of toxic gases or chemical substances, river pollution, mining or other structural collapses, air, sea rail and road transport accidents and can reach catastrophic dimensions in terms of human loss.

There can be no set criteria for assessing the gravity of a disaster in the abstract since this depends to a large extent on the physical, economic and social environment in which it occurs. However, all disasters bring in their wake similar consequences that call for immediate action, whether at the local, national or international lever, for the rescue and relief of the victims. This includes the search for the dead and injured, medical and social care, removal of the debris, the provision of temporary shelter for the homeless, food, clothing and medical supplies, and the rapid re-establishment of essential services

An emergency may be said to begin when operator at the plant or in charge of storage of hazardous chemicals cannot cope up with a potentially hazardous incident, which may turn into an emergency. The emergencies

could be a major fire or explosion or release of toxic gas or a combination of them

The proposed plant will store fuels, which are flammable in nature, and the storage will be as per the Controller and the project is still in the initial stages of designing. Hence a tentative disaster management plan is prepared to be suitably modified before commissioning of the plant.

7.5.2 Objectives of Emergency Management Plan (On-Site)

A quick and effective response during emergency can have tremendous significance on whether the situation is controlled with little loss or it turns into a major emergency therefore, the objectives of this onsite emergency plan (ONSEP)

During Emergency: 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.

- To localize the emergency and if possible eliminate it;
- To minimize the consequences of an emergency;
- To prevent spreading of the damage in other areas
- To give necessary warning to plant personnel and neighbourhood;
- To maximize resource utilization and combined efforts towards the emergency operations;
- To mobilize internal resources and utilize them in the most effective way;
- To arrange rescue of persons, transport and treatment of causalities;
- To seek necessary help from industries in neighbourhood or local authorities;
- To provide information to government agencies and to provide information to public

During Normal Time

- To keep the required emergency equipment in stock at right places and ensure their working condition;
- To keep the concerned personnel fully trained in the use of emergency equipment;

- Preserving records, evidence of situation for subsequent emergency etc.

7.5.3 Scope of ONSEP

This ONSEP is prepared for industrial emergencies like fired, explosions, toxic releases, asphyxia and does not cover natural calamities and societal disturbances related emergencies (like strikes, bomb threats, civil Commissions etc.). Also, the scope this ONSEP is limited to onsite emergencies and does not include measures for offsite Emergency Management.

Necessary information with regards to Off Site Emergency Management will be furnished to district authorities.

7.5.4 Methodology of Development ONSEP

The consideration in preparing this Emergency Plan includes the following steps:

- Identification and assessment of hazards and risks;
- Identifying, appointment of personnel & Assignment of Responsibilities;
- Identification and equipping Emergency Control Centre;
- Identification of Assembly, Rescue points, Medical facilities;
- Training, Rehearsal & Evaluation;
- Action on site.

Earlier, a detailed Hazards Analysis and Risk Assessment were carried out for the plant facilities and the hazards are quantified. The likely location of hazards and consequences are evaluated, duly following the standard procedure.

7.5.5 Elements of onsite Emergency Plan

Important elements considered in this plan are:

- Identification of emergencies
- Emergency organization
- Emergency facilities
- Emergency procedure
- Communications during emergency

- Rescue, Transport and Rehabilitation
- Roles and responsibilities of key personnel and essential employees
- Mutual aid

7.5.6 Emergencies Identified

Following are the typical emergencies anticipated from this type of industries

- Fire accidents at Bulk solvent storage &HSD areas
- Fire accidents at Boiler area, DG area
- Fire in reactors area
- Food /Water Contamination..
- Fire accidents in QC Laboratory.
- Major Spillage of solvents & HSD.
- Fire accident in scrap yard.
- Electric shocks.
- Reaction hazards in Hydrogenation area
- Hydrogen Cylinder explosion
- Catalyst fire

The other emergencies are asphyxiation of persons, apart from risks due to cyclonic conditions, earth quake, lightning, floods (natural calamities), sabotage, bombing (social and other reasons) etc. which are not under the management control.

Priority of protection in the event of an emergency is; Life and Safety of personnel, preservation of property, restoration of normalcy.

7.5.7 Emergency Organization

The project employs people in 3 shifts. The general shift will be for the administrative employees, while the three shifts of 8 hours each are for technical employee's Key personnel and essential employees are identified and are assigned emergency responsibilities. The organogram of the essential organization are presented below:

Security personnel, all operators, filters, electricians etc. in the shifts are designated essential employees. During emergencies, their services are drafted for essential operations.

7.5.8 Emergency Facilities

The design criteria for this facility encompasses the latest concepts and technology in-terms of layouts, flow of materials, Production and personnel, Heating Ventilation and Air Conditioning (HVAC) systems, Water treatment system and other utilities. National Quality Assurance Limited has accredited the manufacturing facility for ISO 9001:2008 & ISO 14001:2004 and Central Drugs Standards Organization has accredited with World Health Organization's GMP Certification.

The immediate environment around the locations is free of any population. Nearest village to the location is about seven hundred meters. There is no other Pharmaceutical, chemical or heavy industrial production units within the immediate locality.

a) Emergency Control Centre (ECC)

Security office is designated as emergency control centre. The emergency control centre is provided with intercom-100 and land line facility also.

Security people are available round the clock to take control over the emergency and they will act as communication team to inform all concern.

The other infrastructures provided in the Emergency Control Centre are:

a. Onsite emergency plan.
b. MSDS of chemicals and Products.
c. List of Important telephone Number.
d. List of both ERT, Fire squad and trained first aiders.
e. Plant Layout showing emergency assembling point, wind socks and Escaping route.
f. Fire alarm panel.
g. Hand speaker.
h. Emergency lamp.

b) Assembly Points

Around Six safe locations are identified and display boards are arranged for assembling people during emergency. The following are the different locations identified:

1. Main Security
2. F & G Security
3. K. Block Security Gate
4. D & E road
5. I Block Road
6. L&M Block road

c) Emergency control systems present

The following emergency control systems are in place in M/s. Aurobindo Pharma Limited, Unit I

1. Lightening protection for all buildings and high raised chimneys.
2. Earthing & Bonding for electrostatic hazards.
3. Closed arrangement for solvent transferring.
4. Safety interlocks for equipments
5. Pressure Relief system & Rupture Discs etc.
6. Earth Rite system for road tanker loading and unloading.
7. Nitrogen blanketing system with breather valve arrangement for all the bulk storage tanks.
8. Dust collection system with proper measures from electrostatic hazards.
9. Closed circuit Powder Transferring System for Granulation/blending/milling equipments.
10. Laminar air flow booths for raw materials dispensing and weighing operations.
11. FLP fittings at Flammable materials handling areas.
12. Product containment booth at raw material sifting.
    - ❖ Addressable fire detection system.
    - ❖ Fire detectors
    - ❖ Beam detectors
    - ❖ Smoke detectors
13. PLC operating system for critical equipment/operations.
14. Fire protection systems :
    - ❖ Portable Fire Extinguishers

- ❖ Fire Hydrant System

15. Occupational Health Centre.
16. Ambulance (Round the clock)
17. Safe handling procedures.
18. Spill Control kits.

d) Location of First Aid Boxes

First aid centre is functioning round the clock. Trained male nurse are available to take care of the victim. Intercom number for Occupational Health centre is 3104.

e) Fire protection system

A well equipped fire hydrant system is available with two separate water tank of capacity 400 KL. Water tank is interconnected with two separate pump houses having Jockey pump (10.5 m3/hr, electrical driven pump (171 m3/hr, and diesel pump (171 m3/hr). The mode of operation of the pump house is auto. All the process buildings are provided with ring mains with single hydrant points and Monitors. Escape hydrants are provided based on the requirements. Pump house will be provided with DG supply during emergency.

f) Emergency Siren

Emergency siren will be provided with 1.0km range of audibility and the location will be time office. The siren will operate on regular supply and also on emergency electrical supply.

g) Emergency Escapes

Emergency escapes in the plant area and floor wise emergency are conspicuously marked.

h) Wind Sock

Wind socks are provided in different location to identify wind direction during emergency.

Sl. No.	Location	Wind Sock number.
1	On D & E block	1
2	On Ceph SRP	2

3	Opp G block M - III	3
4	On I - block	4
5	Near Hazard Material storage	5
6	On C Block	6
7	Old SRP	7
8	L & M SRP junction	8
9	Near 27.5 T Boiler	9
10	Opp ETP RO plant	10
11	MEE	11

7.6 Organisation

Aurobindo Pharma Limited (APL), a center of excellence was inspired by the passionate belief that "Every man, woman and child is entitled to affordable medical care and freedom from pain and suffering", Mr. P.V. Rama Prasad Reddy along with a team of dedicated professionals, established Aurobindo Pharma Ltd in Hyderabad, India in the year 1986.

Aurobindo Pharma Limited, unit-I committed to manufacture Intermediates and Active Pharmaceutical Ingredients (APIs) of the highest quality. The total area consists of 71 acres, out of which 17.5 acres is built-up area. Schematic lay out of the site is enclosed as **Appendix-1**.Address of the site is Survey. No:379, 385, 386, 388 to 396 & 269, Borpatla Village, Hatnoora Mandal, Medak (District), Telangana - 502 296, INDIA.

The Drug Control Administration of Telangana (India) has given the license for the manufacture of the API and intermediate vide the license No. 47/MD/AP/95/B/R dated 06.04.1993 and 31.03.1998.

7.7 Man Power

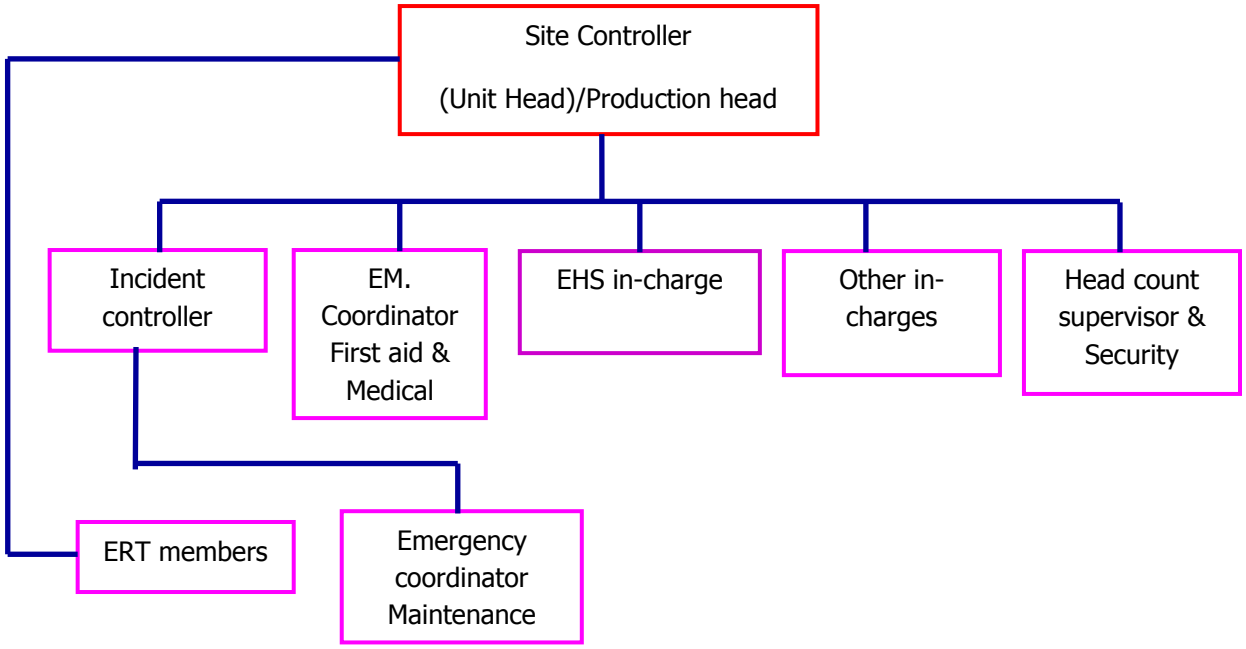
All Chemists/Executives/Assistants/Managers are well qualified and experienced in Chemical Industry. Experience is varying from 2 to 15 years in the similar field.

SHIFT TIMINGS

A Shift	06 Hrs - 14 Hrs
B Shift	14 Hrs – 21:30 Hrs
C Shift	21:30 Hrs - 06 Hrs
General Shift	09.00 Hrs – 17.30Hrs

7.7.1 Emergency Organization

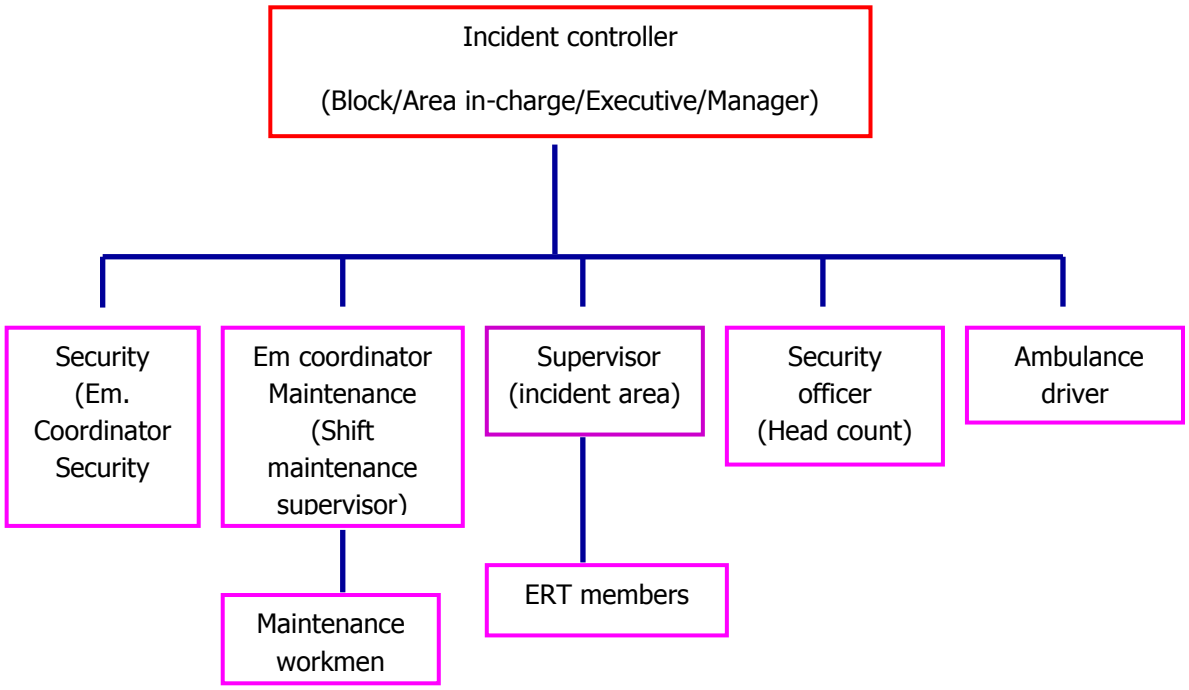
7.7.1.1 GENERAL SHIFT (09.00 to 17.30 hrs)



7.7.1.2 NON GENERAL SHIFT HOURS (17.30 to 09.00 hrs)

EMERGENCY ORGANISATION DURING

17.30 to 21.30, 21.30 to 06.00 & 6.00 to 9.00 HOURS



Incase of emergency during 18.00 to 21.30, 21.30 to 06.00 & 6.00 to 9.00 hours, Emergency coordinator-Security & transport member should communicate regarding on site emergency to minimum one or two of the following:

Site controller (Unit Head/Production Head), Incident controller (Location Head/In-charges) & EHS team.

7.7.2 Emergency Organization-Roles and Responsibilities

7.7.2.1 Functions of Site Controller

Site Controller who will retain overall responsibility for the factory and its personnel. As soon as he is informed of the emergency, shall rush to the emergency control Centre based on the situation and in touch with incident controller accordingly. The duties of the site controller will be

- Site main Controller is who will retain overall responsibility for the factory and its personnel.
- As soon as he is informed of the emergency, he will rush to the control room based on the situation and in touch with incident controller and other team members.
- He will arrange for messengers if any other mode of communication is not available.
- He will assess the magnitude of the emergency and decide the total course of action including the help from outside.
- He will arrange for necessary supply of fire fighting materials, manpower, neutralizing materials, ambulance, first aiders etc. to incident controller.
- He will give instructions for shutting down of other plants and operations after assessing the situation from time to time.
- He ensures effective evacuation of all people and proper attention to the casualties.
- He ensures effective head count of all the people present on the site.
- He continuously reviews and assesses the situation.
- When emergency is over he asks security to give all clear siren.
- He communicates the emergency details to senior management and statutory authorities if necessary.
- He chairs the meeting after the emergency is called off and prepare report on the incident and the details of action initiated.

7.7.2.2 Functions of Incident Controller

The person who identifies incident is called "Incident Identifier". He has to take following actions immediately:

a. Sound "Fire! Fire! or Leak! Leak!

b. Inform area shift in charge. The area shift in charge will assess the situation and inform to emergency control center by dialing 100 to declare emergency. In case of worst scenario the identifier himself is authorized to inform emergency control center to declare emergency then inform to area shift in charge.

c. Information to be given:

i. Name and Emp.Code.

ii. Location and Area.

iii. Nature of incident.

7.7.2.3 Role of Emergency Response Team

Unit Head is the Emergency main controller. After receiving information either by alarm or through phone, he will immediately arrive to the Emergency Control Centre (Main Security Gate) and takes full charge. He directs all the efforts at the site. The main responsibilities during an emergency are:

- Assess the situation, decide and activate the emergency procedure
- Takes actions for controlling the incident, securing the safety of personnel and minimizing damage to environment, plant and material through incident controller.
- Direct the rescue and fire fighting operations at site
- Search for causalities and arrange for proper first aid for them
- Ensure treatment of causalities and accounting of personnel
- Evacuate non essential persons from site to safe location
- Direct shutting down of plants and evacuation of personnel
- Ensure good communication with emergency control center
- Ensure proper communication to inside and outside emergency services
- Take direct operational control of works area not affected by the incident
- Preserve evidence for enquiry.

To perform the entire above responsibilities emergency main controller is assisted by Dy. Emergency controller.

7.7.2.4 Team Functions

7.7.2.5 Shut – down Team

Leader : Production Officer

Member : Chemist, Maintenance Charge man

To shut down the unit/section of the plant as directed by the site controller or as situation demands, as per emergency shutdown procedure.

* If approach is difficult take help of ERT members.
* Co-ordinates all actions of the control room to control emergency

7.7.2.6 Control Team – MAINTENANCE

Leader : Executive – Maintenance

Members : Fitters and Electricians.

- To identify source of leak and arrest it.
- To neutralize spillages/leaks.
- Attend to all repair jobs, which are needed for emergency control operations eg. Changing gaskets, replacing pipe sections, repairing of motors, pumps, valves, etc.
- To install additional pumps, blowers or other equipment for decanting, evacuating and draining as needed.
- To give temporary electrical connections as needed.
- To minimize damage to plant & environment and loss of material by segregation, covering, salvaging, diverting/stoppage of fire water by canal gate closing etc.,
- To retrieve and protect plant records (log books, indicator charts, drawings, manuals, inventory documents etc.) form destruction / damage during emergency control operation.
- Inform the message to in-charge (Safety Dept./Security in-charge) of fire hydrant pumps and operation.
- Arrange for shut down of non-essential utilities as per instruction of incident controller
- In consultation with incident controller, arrange power supply cut-off to the affected area. Ensure that emergency power and water

supply is on.

- Consult incident controller and with the help of maintenance supervisor and emergency squad, execute leakage control operations

7.7.2.7 Fire Fighting & Rescue Team

Leader : EHS Head/Safety officer

Member : Emergency Response Team Members

- To rush to the incident spot and start fire-fighting operations by wearing appropriate PPE.
- To attend fire pumps and maintain adequate water pressure in the hydrant system.
- To maintain supply of fire extinguishing media and equipment as necessary.
- To guide outside firefighting agencies.
- To rescue the injured personnel.
- To transport injured personnel to first-aid post or safe places.
- To guide employees to reach Assembly point.
- To search for missing personnel.

7.7.2.8 Male Nurse/Ambulance Driver/First aid members

- To render first aid.
- To administer O2 in case of toxic gas inhalation.
- To arrange stretchers to the FF & Rescue team.
- To arrange for sending the injured person to Hospital. On the advice of these Hospitals, arrange for, if necessary, transportation of patients to any of the specialty hospitals as needed.
- Arrange for anti-dotes to all effected people

7.7.7.2.9 Team – Admin

- Contacting other industries for help.
- Notifying the emergency to civil/local authorities as per the advice of the emergency controller/site controller.
- Giving necessary details to statutory bodies regarding emergency and keeping them abreast of the development.
- Informing kith and kin of injured

- Arranging alternate transportation in case of breakdown of transport vehicles, ambulance, etc.
- Arranging for relievers and catering facilities.
- Arranging transportation of injured to hospitals.
- Contacting medical centers/ hospitals identified for mutual aid.
- Arranging transportation (I) for persons connected with emergency functions including relieving staff if emergency prolongs (ii) transportation of materials / equipment needed from outside.

7.7.2.10 Security Officer

- On receiving the information blow the main siren after getting approval from site controller.
- Communicate location of the incident, Safe Escape Routes, wind direction & assemble location by mega phone with the help of incident controller.
- Depute required number of security guards to close the main gate to bar the entry of unauthorized persons.
- Ensure transport of injured and ensure transport for additional injuries in absence of Admin personnel.
- Keeps security guards at the gate and move to the emergency area.
- Ensure all the security guards (near main gate, other designated places) are reporting to Incident controller/site controller.
- Permit minimum delay in the entry of authorized personnel and outside agencies, vehicles, etc., who have come to help.
- If needed on the advice of incident controller, he rushes to emergency control center and reports to site controller, with the attendance record of employees, list of contract workmen and visitors.
- To direct all drivers of vehicles / tankers which are waiting outside the main gate for entry into the plant to remove the vehicles away from the factory.
- After arrival of all statutory bodies, co-ordinate with them for permitting entry/exit of vehicles related to emergency. Collect work

permits issued on the day from Safety Dept. to identify possible locations of deployment of contract laborers for the purpose of reconciling any missing employees.

- After the mitigating emergency situation on the advice of site controller/incident controller all clear siren will be blown for two minutes on which the normalcy will be restored.

7.7.3 Duties of Employees

Duties of Employees other than KEY Personnel

- On hearing the emergency siren, contact the shift supervisor for necessary action.
- Alert other employees in concern section.
- If he/she is not an employee of affected area, close down operations safely before leaving to assembly point.
- If he/she is not an employee of the adjacent location of the mishap area, should close down operations/ plant / equipment.
- Be ready to go to nearby assembly point. Those who are not involved directly in the plant operations should assemble at assembly point.
- If he/she is present in an area, which is not your regular work place, inform the shift supervisor of that area about your presence and follow his advice.
- Pending advice from shift supervisor, if you hear announcement over megaphone, act according to such announcement especially in respect of evacuation and escape route.
- If you do not get any directions from shift supervisor or by megaphone and if you happen to get affected at any stage by the spreading toxic vapor or fire, act as indicated. Position yourself upwind side of source of leakage and if you don't get any directions over the megaphone, leave the place in cross wind direction and proceed to the assembly point located in that direction.
- Warn nearby employees, if possible by shouting.

7.7.4 Duties of Section in charges/Engineers/supervisors General approach:

- As soon as the emergency siren is heard, alert the visitors in your area of jurisdiction and ask them to stand by for further instructions from you. Do not permit them to move out of your area.
- Await directions over megaphone with the help of security regarding emergency shut-down of your unit/section or regarding evacuation.
- Meantime, select two of your plant operators and instruct them to be ready for shutdown if necessary.
- If evacuation is announced over megaphone or otherwise, or pending announcement of evacuation if you observe spread of toxic vapor or fire so as to affect persons in your unit, direct and guide them to the assembly point.
- If escape routes are not announced, guide the persons to follow the routes not involved in the wind direction.
- Permit members of Control Team, FF & Rescue Team to report to the respective team leaders.
- If the emergency occurs in your area or jurisdiction
- Immediately direct your trained employees to put out fire and arrange to report to Site Controller /EC.
- Note: If toxic materials are involved in fire, do not allow employees to fight fire without use of SCBA.

7.7.5 EHS Head/Safety In Charge

- As soon as he hears about the emergency, he rushes to the incident site.
- He advises incident controller and site controller for managing on site emergency
- Fire extinguishers, hoses, nozzles, mechanical foam compound located in various points shall be provided to ERT members.
- Be drawn and arranged for firefighting.
- Coordinate with fire brigade group and help them.

7.7.6 Driver- Ambulance

- Upon hearing the warning signal, he should observe wind direction proceed to the vicinity of spot and reverse the vehicle.
- Keep engine in running condition
- Open the back door of ambulance
- Go back to the seat
- Take the injured to first aid center / Prime Hospital, Road No:1, KPHB, Hyderabad.
- (as directed by emergency coordinator- first aid & medical)

7.7.7 Emergency Coordinator (First Aid & Medical) /Male Nurse:

- Available at / Rush to first aid center.
- Stay on alert for first aid and medical treatment for chemical poisoning and other injuries.
- Receive the injured, examine and quickly assess the condition and treat.
- Report to the hospitals and make arrangements for likely more cases of injuries.
- Shift the injured to Prime Hospital, Road No:1, KPHB, Hyderabad
- Stay put in first aid center for subsequent injury cases if any.
- Gather feedback from hospital and communicate to site controller.

7.7.8 Head Count Supervisor

- At assembly point, take the head count and compare with the attendance
- Records of the day/ shift. In case of missing people, informs site controller.
- Hold on till all clear signal is received or act as per instructions of site controller

7.7.9 The task summary includes

- Assessment of potential impact based on systematic risk identification program for both fire & exposure hazardous substances.
- Assessment of potential impact on harm to the environment by spill or release of harmful vapor/material.

- Essential need for evacuation
- Areas to be evacuated
- Information sharing
- Alert communication mode
- Transportation/Medicare/Safe Sheltering and Security aspects with concerned authorities.

Post Emergency Procedures should include:

- Incident review.
- Identification of remedial measures and implementation.
- Information dissemination within the Site to prevent recurrence.
- Reporting to Statutory authorities as applicable.

7.8 Risk Control Procedures

7.8.1 Hazard Communication Program

The department head or his/her designee is responsible for compliance with the provisions of the hazard communication program, systematic risk identification and control measures with the help from EHS department. Training program for all operators/executives on operational/equipment risk control measures includes preventing flammable atmospheres by engineering controls. Specific responsibilities include the periodic review of department operations that use or store and handle hazardous chemicals to ensure that

- Containers are properly labelled
- Appropriate signs have been posted
- Material safety Data sheets are available
- Chemical safety training has been provided and an inventory of hazardous chemicals is maintained.
- Proper preventive measures on electrostatic hazards
- Follow good CGMP and dispensing practices.
- Regular inspection and checking to assure risk control (proper earthling, functioning of safety interlocks, bonding, transferring in closed system and no spillages) The EHS Department will coordinate the implementation of the hazard communication program.

Chemical manufacturers, importers, or distributors are required to ensure that each container for hazardous chemicals is labeled with hazardous warning signs, and the name and address of the chemical manufacturer, importer or other responsible party. The individual Departments will ensure that chemicals they receive are labeled with the identity of the hazardous chemical(s) and appropriate hazardous warning signs, and the name and address of the chemical manufacturer, importer or other responsible party. The user shall ensure that the indented chemicals are received along with the MSDS from the supplier with the help of Supply Chain Management (SCM) /Purchase.

- All employees who work in areas where there are hazardous chemicals will receive chemical safety training at the time of initial employment and documented
- chemical safety training includes the following essential information:
- Location of hazardous materials in the work place
- Location and availability of material safety data sheets
- Acute and Chronic effects of chemicals
- Safe handling procedures
- Personal protective equipment's (PPE)
- Emergency procedures and how to obtain First Aid.
- Spill clean – up and Waste disposal

7.8.2 Detailed Action Plan to mitigate in case of Emergency:

- When the emergency observed the operator/supervisor to operate manual call point in case of emergency.
- Operator will move to safe distance and also ask nearby personnel to move to safe place (Assembly point).
- Security will inform to site controller, incident controller & EHS head.
- Incident controller (concern area head) will rush to the site and ask ERT members to approach the site with SCBA and inform to site controller to declare emergency.
- Site controller will inform to security to declare emergency by

hooting emergency siren based on the report received from incident controller.

- Security will declare emergency based on site controller instruction and request to evacuate by using a megaphone. Wind direction also to be informed.
- Meanwhile incident controller will initiate the control procedure with the help of ERT members (Spill control procedure/operating fire hydrant system etc.).
- Help from maintenance dept. will be sought if necessary to cut off power supply/ close the valves to receivers and any temporary power connections to emergency appliances.
- Site controller will assess the situation from Emergency control centre and will send ambulance, spill content/firefighting equipment's and required PPE.
- Care shall be taken that no vehicle shall be allowed in the close vicinity of the spill/fire (about 50 meters) and movements shall be from upwind directions only.
- Incident controller will ask explosive meter to monitor the area with the help of ERT member/Safety in-charge.
- Incident controller will inform site controller of requirement of outside help, if any.
- When the situation is under control incident controller will inform to site controller.
- Incident controller will ensure that,
- The spilled material, spill control materials and other wastes are disposed off properly.
- Area washed with water thoroughly
- PPE are washed and kept at their respective locations.
- Spill control materials, fire extinguishers are replenished.
- Evidence recorded and maintained for further investigations.
- Site controller will ask security to give "all clear" siren and employees will be allowed to go to their respective work places, if head count is complete.

- A meeting will be called in conference room with all block in-charges, maintenance engineers, ERT members, security officer, incident controller and site controller.
- The incident will be discussed in detailed and minutes will be maintained for future improvements.
- A detail report will be prepared by site controller and incident controller and submitted for management review.

7.8.3 Control Measures

- A current inventory of all chemicals and hazardous chemicals present in the workplace is maintained, the inventory of flammable materials are maintained in less quantities.
- Lightening protection provided at diesel storage tanks area.
- Flammable solvents are handling at FLP areas.
- Flammable solvents are transferring by using metallic hand operated pumps into metal containers. Proper earthing and bonding provided for solvent handling equipments.
- Equipment's only wiping with lint free cloth instead of cleaning with flammable solvents.
- Dispensing carried out at FLP zone.
- Spill control kits are provided at flammable solvents handling areas. Spill control procedures are also displayed to control risk.
- Explosion flaps provided for Air tray dryers to prevent explosion.
- Addressable fire detection system provided.
- Fire hydrant system provided with diesel driven backup.

7.8.4 Handling Spills

The risk assessment includes the following factors:

- The nature of the spilled chemical (high/low hazard material)
- The quantity spilled (large/small amounts)
- The location of the spill (difficult access, public site / bonded area)

When evaluating risks associated with chemical spills, the following points need to be considered:

Is special training required to handle the situation?

Is special equipment required to clean up the spill? (i.e. Self-Contained

Breathing Apparatus (SCBA), Personal Protective Equipment (PPE etc.)

Are special procedures required to clean up the spill? e.g. pumps, hoses etc.

Where the response is HIGH to any of the above factors then the spill must be considered as HIGH RISK.

7.8.4.1 Spill Controls (Risk Controls)

Engineering – Handling in closed system. Bund provided for storage area. Includes redesigning the work area, fixing rollover bund guard(s) or maintenance.

Administrative – standard operating procedure, supervision, training and signage.

Personal protective equipment – Includes PAPR/3M half face masks, safety shoes, goggles, safety glasses and gloves.

- Spill kits available for use where assessed as required. The contents of the spill kit should be relevant to the area and the potential spill, this may include such things as;
- Soda Ash available for spills of corrosive liquids.
- Sand to absorb spilt liquids
- Absorbent pillows or booms to contain larger liquid spills and prevent spills entering drains
- Heavy duty HDPE containers (with a lid) to contain hazardous material prior to disposal.
- Appropriate personal protective clothing (such as chemical resistant gloves, safety glasses)
- Spill kits are clearly labelled and located in an easily accessible position for all staff.

7.8.4.2 Spills Handling Procedure

- If spill involves personal injury, remove clothing, flush with water for 15 minutes.
- Alert people in the immediate area of spill.
- Wear protective equipment, including safety goggles, gloves while going near the spillage.

- Avoid breathing vapors from spills.
- If spilled material is flammable, turn off ignitions and heat sources.
- Confine spill to small area by creating a bund with soda ash and sand.
- Absorb with soda ash, dry sand or adsorbent. Collect the residue, place it in the empty container for disposal. Dispose as chemical waste.
- Mop the spill area with water.

7.9 Health Hazards from exposure to hazardous substances and control measures.

Existing hazards considered from operational/equipment manuals. Detailed Hazard identification and health based risk assessment of various operations and processes will be carried out. Risk assessment based on

Which substances are involved? In what way are they harmful? You can find out by:

Checking information that came with the product, eg a safety data sheet;

Asking the supplier, sales representative and your trade association;

Once exposed some substances can attack the nose, throat or lungs while others get into the body through the lungs and harm other parts of the body, eg the liver. Some dusts are irritating to eyes and skin.

When the task involves very small amounts of material, even if these are harmful, when there is little chance of it escaping, the risk is low. But the risk in a different task – such as cleaning up and disposal – will be higher because the harmful substance may be breathed in or get onto the skin.

When the task involves larger amounts of material, with obvious leaks, exposure is higher and so is the risk. Whether the substance is harmful or not, your need to control it is obvious.

7.9.1 Control Measures (Risk Control procedures) :

- Management process available for selecting suitable safe equipment.
- Engineering controls consideration on risk controls for preventing

or controlling exposure during procurement.

- Closed circuit Powder Transferring system where ever dust generation areas to prevent exposure and dust explosion.
- Laminar flow booths are provided at weighing and dispensing areas.
- Product containment booth provided at raw material sifting area.
- Dust collectors provided with proper prevention from electrostatic hazards.

- Wet mass charging into bowl by gravity by using PAPR/3M nose mask.
- Spill control kits and procedures are established.
- Good Manufacturing practices and housekeeping practices are established.
- Provide personal protective equipment (PPE) such as gloves, goggles and respirators.
- Operators trained on control measures by on job training/induction training.
- Carry out practice drills for cleaning up spills safely – do this before any spillages happen.
- Annual health checks are being carried out for all employees.

7.10 Drum Explosion

Reasons:-

Pressure build up due to heat or incompatible chemicals

Safeguards:(Existing)

- Weather protected.
- Run down gradient.
- No incompatible or decomposing contents in drums.
- Drum storage at designated places under shade.

Potential Impact Area:-

- Manufacturing area
- Stores
- On transporting area

Potential Impact:-

- Possible personnel harm
- Drum flying/leaking
- Leak of content with water
- Spread of hazardous contamination liquid of low flash point.
- Possible escalating fire

Onsite Measures:-

- Reports to assembly area.
- Take head count.
- Keep vigilance on unusual symptoms
- Keep in touch with Emergency Response team
- Proceed to safe shelter and confirm head count.
- Stay with people until all clear
- Do not wander or move about
- Await all clear and instruction from Emergency controller/Site controller.

7.11 Evacuation Of Personnel

On hearing the emergency siren all employees of the factory shall proceed to assembly point as directed by their department heads. Head count supervisor will take the head count at assembly point and report the same to Site controller. During emergencies the knowledge of exact direction of wind helps the plant personnel to decide on the escape route to be taken for safe evacuation of personnel and also the safe assembly points and emergency operations center. It is therefore necessary that the personnel get an idea of the direction of the wind by seeing the windsocks provided at the following.

Sl. No.	Location	Wind Sock number.
1	On D & E block	1
2	On Ceph SRP	2
3	Opp G block M - III	3
4	On I - block	4
5	Near Hazard Material storage	5

6	On C Block	6
7	Old SRP	7
8	L & M SRP junction	8
9	Near 27.5 T Boiler	9
10	Opp ETP RO plant	10
11	MEE	11

7.12 Information To Relatives Of Injured

The relatives of injured will be informed by emergency coordinator (security/transport). The employees residential address file is available at emergency control Centre and also in the residence of emergency coordinator (security/transport). The communication to the relatives of injured will be passed on through telecom or by a messenger with car. The clear address of the injured person (Local residential address/address of hospital if hospitalized) will be communicated to The Relatives.

7.13 Information to Local Authorities

In case of onsite emergency, the Dy. Chief inspector of factories and inspector of factories will be informed immediately. The information will be passed on over telecom, telegram or through a messenger deputed by Emergency Controller.

After consulting Dy. Chief Inspector of factories and inspector of factories, the information will be sent to Chief inspector of factories also. The company will implement the advice of local authorities in improving the safety in dealing with the event.

State Pollution Control Board authorities will be informed in case of accidents like toxic gas release, spillage of hazardous chemicals.

7.14 Information to District Authorities

The Emergency controller/site controller/Head HR on advise of Emergency controller is authorized to inform the police. The inspector of Police Bollaram will be informed for the control of law and order situation at the Plant or in vicinity or at hospital where injured are under treatment.

Police department will be requested for protecting the lives of employees

and property of the company, evacuation of personnel outside the Plant. District Collector, Dist. Medical Officer and Superintendent of Police, Medak district will be informed by Site controller if required.

7.15 Mock Drill

In spite of detailed training, it may be necessary to try out whether, the OSEP works out and will there be any difficulties in execution of such plan. In order to evaluate the plan and its effectives of meeting the objective of the OSEP, occasional mock drills are contemplated. After a few pre-informed mock drills, few un-informed mock drills would be taken. All this is to familiarize the employees with the concept and procedures and to see their response. These scheduled and unscheduled mock drills would be conducted during shift change, public holidays, in night shift etc. to improve preparedness.

Emergency Coordinator (EHS) is responsible for organizing planned and unplanned mock drills.

Two types of mock drills are in practice. They are

1. Announced - Once in 3 months
2. Unannounced - Once in 6 months

Announced mock drill

Unit Head decides the date and time with the concurrence of safety in charge. A hypothetical incident identified is communicated to all concerned in the organization for action on onsite emergency and emergency is declared by plant manager.

Unannounced mock drill

Unit Head and Safety in-charge decides on the time and date. A hypothetical incident decided and it is not disclosed until the drill is announced. In this Plant manager and Safety in-charge enters the production block and hand over a written hypothetical incident to the shift in charge concerned for that area. Block in charge initiates action for onsite emergency.

Mock drill observation:

Mock drill observation team (ERT members) is constituted and they note

down the action of various coordinators in chronological order. The time of arrival of each coordinator and their duties are detailed in a note. Immediately after mock drill, the advisory team and emergency coordinators meet and review the mock drill records in chronological order and take note of corrective action. The record of this meeting note is circulated for compliance of concerned.

Role of Mock drill observers

- Note readings of plant instruments
- Meteorological conditions
- Time of emergency declaration and time when the personnel responded/reported
- Ambulance reported and time when additional vehicles reported
- Collect information description of the event, estimated quantity of the gas release, fire, contamination and effected levels at various locations, injuries and equipment damage.

7.16 Review Of OSEP

The plan is to be reviewed once in a year or if any major changes happens in the process or building

OSEP would be reviewed periodically about the effectiveness, any changes to be made, based on actual need or whenever, there is a change in propositions made in the OSEP or change of key personal or essential employees etc. Whenever, changes are made, due notification of the changes to all concerned would be made, The OSEP will be discussed in plant meetings and employee participation in emergency planning would be ensured. Emergency Coordinator (Safety) is responsible for review of Onsite Emergency Plan and making it up to date.

CHAPTER 8: PUBLIC CONSULTATION

Public hearing was held on 10.12.2014 at 11.00 AM beside ZPHS, Borapatla (V), Hathnoora (M), Medak District. The minutes of the Public hearing & replies to representations received during public hearing are enclosed as **Annexure- I** of this chapter

ANNEXURE – I

Minutes of Public Hearing

and

Replies to Representations received during public hearing

TELANGANA STATE POLLUTION CONTROL BOARD
Regional Office – I: Sangareddy
5-1-28, Shantinagar, Sangareddy – 502 001, Medak District.

B. Bhikshapathi, M.Tech.,
Environmental Engineer.

Ph.No.08455-276795
Email:rndk1.ro.ee@pcb.ap.gov.in

Lr. No. 526/PCB/RO-I:SRD/PH/2014 - 1923 **Date: 23.12.2014**

To
The Director {IA-II(I)},
Ministry of Environment & Forest,
Govt. of India, Paryavaran Bhavan,
CGO Complex, Lodhi Road,
New Delhi – 110003.

Sir,

Sub: Environmental Clearance for the proposed expansion of M/s. Aurobindo Pharma Limited, Unit-I for production capacity of existing bulk drug unit from 96 TPM to 421.2 TPM along with establishment of 3.95 MW captive coal based Co – generation power plant located at survey no. 379, 385, 386, 388 to 396 & 269 in Borapatla Village, Hatnoora Mandal, Medak District, Telangana State- Minutes of the Environmental Public Hearing Meeting held on 10.12.2014 Beside ZPHS, Borapatla (V), Hatnoora (M), Medak District - Communicated - Reg.

Ref: MoEF, GOI Terms of Reference (TOR) vide Lr. No. F.No. J-11011/289/2012-IA-II(I), dt 26th June 2013 issued to M/s. Aurobindo Pharma Ltd., Unit – I.

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It is to submit that the M/s. Aurobindo Pharma Ltd., Unit – I has submitted a draft Environmental Impact Assessment (EIA) / Environmental Management Plan (EMP) report for proposed expansion of M/s. Aurobindo Pharma Ltd., Unit – I for production capacity of existing bulk drug unit from 96 TPM to 421.2 TPM along with establishment of 3.95 MW captive coal based Co – generation power plant located at survey no. 379, 385, 386, 388 to 396 & 269 in Borapatla Village, Hatnoora Mandal, Medak District, Telangana State as per the TOR dated 26.06.2013 reference cited.

The Member Secretary, Telangana State Pollution Control Board, Hyderabad has fixed the date, time and venue for the Environmental Public Hearing (EPH) for the proposed project. Accordingly, press notifications were issued and the same were published in Eenadu daily news paper (Telugu) & Indian Express daily news paper (English).

The Environmental Public Hearing was conducted on 10.12.2014 Beside ZPHS, Borapatla (V), Hatnoora (M), Medak District as per the procedure laid down in Environmental Impact Assessment (EIA) Notification, 2006. A copy of the minutes of the EPH held on 10.12.2014 and unedited Video CD (1 No) along with the photos of recorded proceedings are

herewith submitted for kind information and further action. The written representations received during the public hearing are also enclosed for kind perusal.

Yours faithfully,

B. Bhikshapathi

ENVIRONMENTAL ENGINEER

Environmental Engineer,
TS Pollution Control Board,
Regional Office-I, SANGAREDDY

Encl: As above

1. Copy submitted to the District Collector, Medak at Sangareddy for kind information (Minutes of EPH to be accessible for the public).
2. Copy submitted to the Member Secretary, T.S. Pollution Control Board, Paryavaran Bhavan, A-3, Industrial Estate, Sanath Nagar, Hyderabad for kind information
3. Copy submitted to the Joint Chief Environmental Engineer, T.S. Pollution Control Board, Zonal Office, H. No. 25-35/11, 2nd Floor, Tulasi Reddy Complex, R.C. Puram, Medak District for kind information.
4. Copy submitted to the Executive officer, Gram Panchayat Office, Borapatla (V), Hatnoora (M), Medak District for kind information (Minutes of EPH to be accessible for the public).
5. Copy to Sri JVN Reddy, Associate Vice Pesident - EHS, M/s. Aurobindo Pharma Ltd., Unit – I, Plot No. 2, Maitrivihar, Ameerpet, Hyderabad – 500038 for information.

THE MINUTES OF THE ENVIRONMENTAL PUBLIC HEARING HELD ON 10-12-2014 AT 11.00 A.M. FOR THE PROPOSED EXPANSION OF BULK DRUGS & INTERMEDIATES MANUFACTURING FROM 96 TPM TO 421.2 TPM ALONG WITH 3.95 MW CAPTIVE COAL BASED CO – GENERATION POWER PLANT OF M/s. AUROBINDO PHARMA LIMITED, UNIT-I AT SURVEY NO. 379, 385, 386, 388 TO 396 & 269 IN BORAPATLA VILLAGE, HATNOORA MANDAL, MEDAK (D), TELANGANA

The following Panel Members were present:

S. No	Name of the panel member	Department
1)	**Sri B.S.V.V.S. MURTHY,** Additional Joint Collector & Additional District Magistrate, Medak District.	Representative of the Government – District Administration and **CHAIRMAN** - Environmental Public Hearing. Authorized by District Collector & District Magistrate
2)	**Sri B. Bhikshapathi,** Environmental Engineer, TS Pollution Control Board, Regional Office: Sangareddy-I	Representative of the Telangana State Pollution Control Board and **CONVENOR** - Environmental Public Hearing.

The following Officials took part in the Environmental Public Hearing:

1.	Sri M. Nagesh, Revenue Divisional Officer, Medak
2.	Sri P. Prathap Reddy, Tahsildar, Hatnoora.
3.	Sri G. Srivatsav, Asst Environmental Engineer, TSPCB

The following representatives of M/s Aurobindo Pharma Limited, Unit - I were present:

1.	Dr. J.V.N. Reddy, Vice Presidet-EHS
2.	Dr. B.N. Murthy, General Manager-Environment
3.	Sri P.S. Pavan Kumar, General Manager-Safety
4.	Sri P.V. Raju, MD, M/s. Pridhvi Envirotech (P) Ltd., Hyderabad

At the outset, the Environmental Engineer, APPCB, Regional Office: Sangareddy-I while welcoming the public and the Chairman explained briefly the salient features of the Ministry of Environment and Forests, Government of India's EIA Notification No. S.O. 1533 dated 14th September 2006 and its amendments. He stated that M/s Aurobindo Pharma Limited, Unit-I approached the PCB for conducting Environmental Public Hearing for the proposed expansion of their bulk drugs & intermediates manufacturing from 96 tons to 421 tons along with 3.95 MW captive coal based power plant at survey no. 379, 385, 386, 388 to 396 & 269 in Borapatla Village, Hatnoora Mandal, Medak District, Telangana State as per the TOR issued by the MoEF.

He added that the Environmental Public Hearing is made mandatory for this expansion project to obtain necessary Environmental Clearance as per the said notification. He also informed that the press notification pertaining to the present Environmental Public Hearing was published in Eenadu (Telugu) and Indian Express (English) daily news papers on 01.11.2014, i.e. 30 days in advance, inviting suggestions, views, comments and objections if any from the public with regard to the proposed expansion project. He also added that the copies of Environment Impact Assessment (EIA) report and Executive Summary in Telugu & English were placed at various offices for public access as mentioned in the press notifications. He further informed that the public hearing will be conducted in a transparent manner and the minutes of the hearing will be forwarded to the MoEF for further course of action. He then requested the Additional Joint Collector to preside over the public hearing process.

The Additional Joint Collector & Addl. Dist. Magistrate, Medak District welcomed the gathering and presided over the proceedings. He explained briefly about the environmental public hearing process. The public hearing is being conducted based on the industry's EIA report submitted to MoEF and TSPCB with respect to all environmental components. The panel is not empowered to approve the project on its own. He exhorted the people that the hearing is intended only to elicit the views, objections and suggestions of the participants regarding the proposed expansion project. He requested the gathering to express their views either in oral or written form. All the interested persons will be given an opportunity to offer their concerns.

Considering the views of the people is mandatory for taking decision on environmental clearance. He also informed that the proceedings will be recorded and video-graphed as

such the minutes of the hearing will be drawn conspicuously and the same will be communicated to the MoEF for further course of action. He requested the gathering to avail the opportunity and express their views freely without any fear in order to conduct the proceedings in a systematic manner. He further informed that the minutes copy will be made available for the people within seven days at concerned gram panchayat office or could avail under RTI. He then requested the management of the industry and their consultants to explain in detail, the salient features of the proposed expansion project and its summery EIA report.

Sri JVN Reddy, Vice President, ESH, M/s Aurobindo Pharma Limited detailed the proposed project stating that their company has proposed to expand the Unit-I, located at Borapatla Village, Hatnoora Mandal, Medak District, Telangana for increase in bulk drugs & intermediate manufacturing from 96 TPM to 421.2 TPM along with 3.95 MW captive coal based Co-Generation power plant in the excising plant area of 71 Acers located at survey no. 379, 385, 386, 388 to 396 & 269. He mentioned that 66 additional Bulk Drugs & their Intermediates along with 3.95 MW Coal based Captive Co- Generation Power plant and accordingly, applied to MoEF for obtaining necessary Environmental Clearance. He added that the draft EIA report has been prepared based on the approved Terms of Reference (TOR) and is subsequently submitted to TSPCB for conducting the Environmental Public Hearing as per the TOR. Also informed that they have appointed M/s Prithvi Enviro Tech,Hyderabad as their Technical consultant for the proposed expansion project and requested the Technical consultant to explain pollution impacts and control measures of the project to the public with the permission of the chair.

Sri P.V. Raju, MD, M/s. Pridhvi Envirotech (P) Ltd., Hyderabad presented the technical details as furnished below:

1) The industry proposed to produce 66 Bulk Drugs & their Intermediates within the existing project site of 71 acres. The proposal is to expand the manufacturing facility from 96.0 TPM to 421.2 TPA along with 3.95 MW coal based captive Co-Generation power plant.

2) It is proposed to invest Rs. 70 Crores on for the proposed project for expansion and establishment of Co-Generation power plant, out of which Rs. 15 Crores will be invested towards environment protection.

3) Industry developed 18.4 acres of Green belt for the existing activities and proposed additional green belt in an area of 6.0 acres.

4) There would be various chemical reactions for the proposed expansion and a Steam boiler of capacity 39.5 TPH, which consumes 195 TPD of coal, is proposed to install for Power plant.

5) The project requires about 1280.0 KLD of water out of which 485 KLD of water is recycled by implementing Zero Liquid Discharge System. Thus raw water requirement will be reduced to 886.4 KLD which will be met from the Ground water and tanker supply. The wastewater generation from the proposed activity is estimated to be 611 KLD out of total water consumption.

6) About 155 Tons of solid waste expected to generate out of which 111 Tons of is proposed to send to Cement plants and remaining will be send to Ramky Landfill for disposal. About 78 Tons of ash is expected to generate from the Boiler and it is proposed to dispose for Brick Making.

7) The EIA report included detailed characterization of various environmental components such as air, noise, water, land and socio-economic over 10 km radius around the industry during Actober 2013 &. December 2013.

8) The environmental consultancy conducted a micro meteorological study in order to assess the likely impacts of the proposed project as per the Terms of Reference given by MoEF & CC, GOI.

9) The baseline data collected at stations from core and buffer zones for PM $_{10}$, $PM_{2.5}$, SO_2, NOx and VOC levels indicated that all parameters are within the prescribed National Ambient Air Quality standards.

10) The process emissions will be controlled based on the nature of emissions so as to meet the norms of the CPCB & TSPCB. Soil Pollution impacts are also addressed in the draft EIA.

11) The power will be generated by turbine through steam generated from the newly proposed Boiler and the steam coming out of turbine will be used for drugs manufacturing process.

12) He informed that, proposed expansion will generate new direct and indirect employment to about 450 persons. The management will undertake corporate social responsibility activities in surrounding villages in tandem with the Government rules in force

13) The environmental consultancy conducted a micro meteorological study in order to assess the likely impacts of the proposed scheme as per the Terms of Reference given by MoEF & CC, GOI.

14) The EIA report included detailed characterization of various environmental components such as air, noise, water, land and socio-economic over 10 km radius around the industry during the period October 2013 to December 2013.

15) The baseline data collected at stations from core and buffer zones for the parameters PM_{10}, SO_2, NOx and Noise levels indicated that all the parameters are within the prescribed National Ambient Air Quality standards.

16) The industry has spent Rs. 63.64 Lakhs toward CSR activities and the management is committed to spend as per norms stipulated in Companies Act 2014.

Upon request of the AJC regarding provision of local employment, he elaborated and assured that the new direct & indirect employment generation of about 450 in various categories i.e. skilled, semiskilled, unskilled will be filled preferably with local villagers.

He concluded by welcoming the people offering their views on the project, so as to reflect the same in the EMP.

The Additional Joint Collector detailed the salient features of the proposed project and requested the public to elicit their views, suggestions and objections if any on the proposed project. He started inviting the people one after one as per their enrolments.

Smt N. Veena, Sarpanch, Borapatla Village welcomed the project with conditions to control the pollution and local development with CSR Funds and also to provide employment to the Local People.

Sri K. Vittal, Vice Sarpanch, Borapatla Village supported the project and requested the Management to provide 300 employments to the local people I all cadres and to treat the waste water properly and not to discharge outside the industry.

Sri Kistaiah R/o Borapatla Village while welcoming the project informed that they have both the problems of Air & Water pollution in their village and requested the management to crub the pollution. Also requested the management to see that no waste water to go out of their compound wall. The management shall also solve the air pollution problem being faced by the student of ZP High School, Borapatla which is located adjacent to the existing

industry and shall provide required infrastructure to the School. He requested the management to permanent the local contract employees those who have completed Four years of service. Management shall provide Retirement Scheme to the Contract Employees and to give pension to all the retired employees. The Management of the industry shall take complete maintenance of Lift Irrigation Scheme which is catering the Borapatla and surrounding villages.

Sri Ranjit Reddy R/o Borapatla Village, Opposed the project and said that proper information is not given in the EMP and the industry has not provided Green belt as furnished in the EMP. He informed that, inspite of direct complaint by the students, regarding air pollution problems to the District Collector on his visit to the ZP High School, the Management has not taken any action and the students are still suffering with the same problem daily. Also stated that neither Students are willing to study in the School not Teachers are willing to come to the School. Many news articles published in the dailies and no action was taken. Expressed his unhappy for not doing any welfare to the local people.

Sri Sunanda Reddy, Environmentalist, Hyderabad questioned the management for not addressing the issues related to adequacy of Six acres of Green belt for the manifold increase in production and requested the management to take-up social forest development in the surrounding areas. Asked the management to conduct Survey on Health status in the surrounding villages due to existing activities of the industry and to enclose the report with the EMP. Pointing out the effect on cultivation in the surrounding villages he sought the management to conduct study on Ground Water characteristics and effect on crop cultivation. Also pointed out the issue related to measures for control of Ground water depletion due to suction of 866 KL of water daily. CSR funds shall be utilized to the local area development with credibility.

Sri Surender Goud, Villager, Reddy Khanapur welcomed the project with request to the management to reduce Ground water contamination and provision of employment to the local people and to provide 25 days employment to the Lady workers instead of present scheme of 10-15 days employment. He also welcomed the industries to establish their units in all village of their assembly constituency and to provide employment not only to the local village but to all the constituency people. Also requested the management ot provide drinking water to their village. Suggested the PCB to take appropriate measures to control ground water contamination.

P. Srinivas, Ex-Sarpanch, Borapatla Village said that there is no problem with the industry but only with the PCB where they are not taking action against the industry for causing pollution in the surroundings. While showing a bottle of water taken from Patti kunta said that the three Kuntas abetting to the industry are polluted with industry and farmers are not cultivating their land. The Borapatla village and ZP High School are located within 500 mts from the industry are worstly effected with the air pollution from the existing activities. Also requested to permanent local employees those who have completed 5 years of service. Requested the management to adopt the Borapatla village and School for development in all respects and to conduct Health camps once in two months to the Villagers and School Children.

Sri B.V. Siva Sankara Rao, Villager, Hotnoora while supporting the proposed project, informed that the policy of Government of Telangana is to support industrialization to create more employment opportunities. He wanted the industry to take all measures to control pollution and comply with all acts and laws. He suggested provision of an ambulance (locating at police station) to cater to the needs of surrounding villages. He also suggested setting up of mineral water plants to the surrounding villages and to provide ESI & PF facility to the contract employees and to run a bus exclusively for the students to reach the school in time.

Sri Anjaneyulu, Villager, Gundlamachanoor demanded to control the odor nuisance to the villagers and students. He said that the three kuntas are not useful for irrigation. Requested the industry to install air pollution control equipment. He further requested to provide health centre and closed drainage in the village.

Sri Shanta Kumar, BSP Leader, Narsapur demanded the management to extend the minimum wages to the contract employees and to regularize them. Also said that labor contractors are dominating the local employees and threatening them in all respects for job security. Requested to provide vehicle arrangement to the contract employees attending night shifts and to provide permanent local employment.

Kumari Harika, 10th Standard along with group of School Children, ZP High School, Borpatla participate in the Public Hearing and complained that they are facing air pollution problem requested to curb the same.

Sri Konda Sankaraiah, Villager, Borpatla requested the management to provide employment to the Handicapped.

Sri Erra Pochaiah Madiga, District Leader, MRPS requested to protect the farmers by giving them provision of cultivation and requested the management to run the industry properly without polluting the surroundings.

Smt. Shamantha & few other ladies R/o Borpatla demanded duty for 26 days instead of existing 10-15 days. She further demanded the industry to operate without affecting or impacting school children.

Sri T. Murali R/o Borpatla said that industry has promised to buy his land which has 6 bore wells at Sy. No. 383 at the rate of Rs. 6.0 lakhs but the industry did not buy. He demanded the industry to buy the land.

Smt. Kistamma & Five others R/o Borpatla informed that they are kept continuously in civil works from years together and unable to take workload and requested to allocate sweeping work.

Munipally Pochaiah, Ex Vice President, Borapatla complained that 27 acres of his land effect with the industry waste water and unable to cultivate, Bore well motors effected and pipes & fitting are rusted due to contamination of ground water. Same was informed to District Administration but in vain.

Sri Goudicherla Sadanand, Villager, Borpatla stated that inspite of facing severe air, water & Soil pollution problems with the existing industry operation, the management is not providing permanent employment to the local people and none of permanent employee is working in the industry. Requested the management to provide permanent employment to the local people. His son studied ITI but industry has not provided no permanent job.

Sri Padma Rao, Villager, Palpanur stated that the public are getting hospitalized due to pollution problems and civil workers are facing problems. He demanded employment to Palpanur village and also demanded for permanent of local contract employees.

Sri Bantu Satyanarayana, Villager, Palpanur stated that surrounding villages are effected a lot with existing industry operations and requested the management to built Hospital to cater all the surrounding villagers and to bare the maintenance cost. While stating inability of cultivation in the surrounding agricultural fields due to contamination of soil with polluted water of the industry, requested to conduct detailed survey on land characteristic and support the farmers for growing crop suitable for the characteristics of present condition.

Sri Hanuman Goud, NGO has opposed the project reasoning pollution in the surroundings of the existing industry. Expressed unhappy against the industry for not taking action with regards to contamination of water tanks and air pollution in then surrounding villages. Also pointed out that the industry is violating the provisions of G.O.MS 62, which imposed ban for new establishments and expansion of existing industries, by the way of increasing the production capacities presently and now approaching the people for offering view by saying new expansion, which is injustice.

Sri Saidireddy, Green Corps & NGO alleged that the proponent failed in selection of suitable technical consultant by mentioning two different names of consultancies for MoEF submission and questioned how one can expect proper implementation of EMP. He pointed out that there are some mistakes in executive summary supplied to the people related to effluent generation quantities, elaboration of spending details of 64 lanks towards CSR activities etc. He also stressed need of developing a separate Website disclosing the details of all activities of the industry Viz. production details, exports of the company, waste water generation & disposal, solid waste, cadre wise employment in the industry and corresponding local employment, etc. He wanted to know the details of nos. of skilled workers employed from the village in the industry. He challenged the authority of AJC for conducting environmental public hearing.

The Additional Joint Collector clarified the provisions of EIA Notification and informed that the cadres of the Chair shall not be questioned, as all the legal compliance will be met before nomination for conducting public hearing.

Smt. Geetha R/o Borapatla requested the management to provide permanent instead of canteen work as she is facing financial problems.

Sri Ashok, Villager, Borpatla informed that people of 20 years experience and 2 years experience are given same salary and not regularizing their jobs. Bore water in the area is polluted and unable to drink. Demanded for pension for the retired an aged workers. Also informed that some production activities are effecting their health.

Sri Avula Mallesam, Villager, Palpanur opposed the project saying their villagers are effected with Air pollution from the industry and getting health problems. Alleged that the reduction in crop yield took due to ground water contamination and pollution effects from the industry. Also pointed out the Birth defects in their village. Also stated that, they are ready for every fight against the proposed expansion. He asked the industry to adopt Palpanur also.

Sri Kistaiah, Fishermen Association, Borpatla informed that they are unable to carry their professional work of growing fishes in the Kuntas due to pollution of water by the industry. He asked the industry to not to discharge polluted water into the kuntas located adjacent to their premises.

Ashok, Borapatla Youth Association, Borapatla village opposed the proposed project and stated that non papers related to the project were communicated to them and requested all the Grampanchayat people to oppose the project. He also said that the management is threatening the people who are complaining against the pollution problems with the existing operations of the industry. At present the management tried to restrain the School Children for attending the Public Hearing, as they are coming to tell about their problems due to operation of the industry.

He also informed that the management is not offering jobs to the Telangana residents and the people coming from other region with same qualifications were employed at the same time. He sought to have written commitment from the management to the Local Sarpanch regarding CSR activities, permanent employment to the local people and regularization of contract employees.

Sri Srinivas Reddy R/o Borapatla informed that he is not getting yield from the garden provided in Sy.No.391 & 397 due to pollution problems of the industry.

Smt Leelamma, Villager, Borpatla wanted permanent jobs and wanted Rs. 2,000/-

pension to the retired people.

Anjaiah R/o Borapatla requested the management to pay an amount of Rs.2000/- per month as pension to the Stopped workers having served the organization for more than 10 years.

Sri Venkatesh R/o Borapatla complained against the industry for not standing on their words for regularization of contract employees completed 5 years of service, as committed earlier. Also informed that they are unable to travel on the road adjacent to the industry due to severe air pollution problems and the surrounding ground water is contaminated with the present industry operations.

Sri Chandra Shekar Reddy, Farmer R/o Borapatla while opposing the project welcomed only Agriculture based industry and not for Bulk Drug industry. Also informed that they are protesting the unit expansion and ready for every fight to resist the expansion. He stated that Bore Wells in the surrounding area are getting rusted immediately due to ground water contamination.

Sri K. Chidambaram, R/o Patancheru introduced himself as representing Jana Vignana Vedika and also involved in anti-pollution activities, emphasized on awareness among the local people regarding pollution impacts of the Bulk Drug industries and they themselves failed in this aspect to educate the local people on pollution aspects. He also informed the public that the employment would not be a constraint for permitted the industry but to concentrate on pollution aspects due operation of industry. The Birds are best examples of having expertise in anticipating the problems and evacuated the place due to pollution problems and no birds are seen the area, human beings are not getting awareness on this aspects. Questioned the way the public hearing is being conducted. He flayed the presence of large police force and also barricading the place when there is no law & order problem, stating that it was against the Directive Principles. He termed the pollution as a life & death problem. He alleged that the management is causing environment pollution and is evident from the prevailing odour nuisance in the operation of the existing operations. He explained the Patancheru & Pashamilaram pollution problems, where the people are suffering with problems in Reproduction, Infertility, Nobody offering brides to these villages and Birth defects due to pollution impacts etc. Emphasized the local people to learn lesion from these effects while permitting new establishments. Also said that protection of Government land

and ground water contamination shall be given priority.

Sri Janardan Reddy, ZPTC, Sadasivpet insisted the officers to be strict in containing the pollution and asked the management to adopt local villages & School for providing necessary infrastructure development. Added to extend the employment to the local people and to take constant pollution control measures.

Sri Konda Veeraiah, Farmer R/o Borpatla requested for free supply of water and electricity to the village.

Sri Sriramulu R/o Borpatla informed that he met with an accident in the industry and not giving employment to him after it.

Smt. Palle Jayashree Shravan Kumar, ZPTC Member, Hatnoora stated that greenery reduced in the area and farmers are unable to cultivate the land due to pollution problems from the industry, reasons for which the industry shall provide employment to each family. Local people are suffering with health problems and need to conduct Health Camps and to construct a Health Centre to cater needs of the local people. Instead the industry not to take private bore wells for suction of ground water for industry needs. Requested the PCB officials to constantly monitor the industry to control the pollution problems without fail.

Smt. Vinoda and her son Sri Mahesh R/o Borpatla requested for monitory assistance in medical treatment for his son slipped in the industry and wanted permanent job for his son.

Smt Lakshmi representing a group of 30 villagers, Borpatla informed that they are working in housekeeping department and presently getting 10 days duty. The group demanded 25 duties per month.

Sri Bhadresh, Villager, Gundlamachanoor opposed the project and informed that severe pollution problems are being faced by surrounding villages with the existing activities. People in the surrounding villages are suffering from unknown diseases due to pollution. Inspite of ban imposed in the area for expansion and new establishments, the industry continuing expansion violating ban GOs. Complained that the management and the authorities concerned have failed to take action in control of pollution. He also alleged that

the industry encroached the Government Kunta and no action is initiated against the industry till date. Not furnished the details of Boiler proposed for Power plant. Not furnished the Details of Air Pollution Control measures proposed with additional investment of Rs.15 cores. Complained, that the industry is producing more than the permitted capacity.
He opposed the extraction of ground water for the expansion activities, which will lead to depletion of ground water in the surroundings. Looking into the present problems, He demanded that no department shall permit the industry for expansion.

Sri Narahari Reddy, Villager, Borpatla opposed the project and demanded for closure of existing activities, as the farmers, fishermen, villagers and all are affected with pollution problems form existing operations, and question why expansion. He also alleged that there is no reply from government agencies on the complaints given on pollution.

Sri Konda Suraiah, Villager, Borpatla informed that are facing many difficulties and if the industry is closed their livelihood is lost. He wanted permanent jobs.

Sri Vijayabhaskar Reddy, Villager, Borpatla opined that if the industry would have given permanent jobs to local people, the people would not have complained about pollution. He wanted technical people to be made permanent. They have submitted proposals for funds and requested for release of funds. CSR funds must be spent on the village. He requested reduction of pollution levels immediately before going for expansion. He informed that the management already committed for establishment of Health centre. He informed that decision will be taken in gram sabha for giving permission to new constructions.

Remarks of AJC

He summarized the responses both oral & in writing from all sections of public and industry workers and NGOs. The requirements from public are more on permanent employment for the Borapatla village & permanent jobs for contract employees, more working days from 10/15 to 25 man days for lady workers, school development, village development activities such as safe drinking water and hospital apart of lessened pollution on other side. The total public hearing programme is recorded and will be sent to Government of India for taking necessary appropriate decision. He requested the industry representative to offer their comments & feedback on the opinions expressed by different people.

Response by Dr. JVN Reddy, Vice President, Representative of Industry

He responded for all the queries & demands raised in the public hearing. He informed that employment will be given top priority to Borapatla village & surrounding people. All necessary equipment to control pollution in the existing and proposed set up will be installed. He also informed that 10 – 15 days duty is being given to maximize the no of women workers; however, this will be taken to the notice of management to increase employment further. Regarding permanent employment to technically qualified local people, the management is formulating guidelines to absorb the required people who are working since many years. Regarding School, the management is doing whatever is requirement and will do whatever additional is required. As far as the CSR funds it is clarified that, 2% of profit in accordance with the rules in forces shall be spent on the local village and surrounding villages in co-ordination with District Administration and Gram Panchayat representatives towards drinking water provisions, medical facility and road & drainage, etc., And he also proposed for skill development programs for technical people those who are coming from college for better opportunities.

The Addl. Joint Collector while concluding the Environmental Public Hearing summarized the proceedings based on the views expressed by different section people on the proposed project. Also informed that people expressed their views are on the aspects of air & water pollution, local employment, support & suggestions to CSR funds etc. He added that the management has given their version on the issues raised by the people. He explained that the public hearing proceedings accurately reflecting all the views and concerns are recorded. The minutes will be made available for the public. The proceedings, representations along with the video-graphy will be forwarded to MoEF for further course of action.

The representations received are annexed.

Sl. No	Name and Designation of the Panel Member	Signature
1.	**Sri B.S.V.V.S. MURTHY,** Additional Joint Collector & Additional District Magistrate, Medak District.	
2.	**Sri B. Bhikshapathi,** Environmental Engineer, TS Pollution Control Board, Regional Office: Sangareddy-I	B. Bhikshapathi

REPLIES TO THE OPINIONS OF PUBLIC EXPRESSED DURING THE PUBLIC HEARING FOR THE EXPANSION PROJECT OF M/s. AUROBINDO PHARMA LIMITED, UNIT - I

Date of Public Hearing : 10/12/2014

S. No.	Name of the Organisation/ Person	Issue Raised	Reply
1	**Smt N. Veena, Sarpanch, Borapatla Village**	Industry shall take steps to control the pollution	Industry took all steps to control pollution and handle the wastes with latest technologies
		She demanded CSR funds for development of villages	Aurobindo will allot CSR funds as per the Company'e Act 2014 and spend same in consultation with Village Representatives & District Authorities for Borapatla and surrounding villages
		She suggested to provide employment for local people	Top priority is always given to the Borapatla Village and surrounding villages on provision of employment . More than 700 people are employed in the plant from Borapatla village itself. Even in future this will continue.
2	**Sri K. Vittal, Vice Sarpanch, Borapatla Village**	Employment shall be provided for 300 local people	Top priority is always given to the Borapatla Village and surrounding villages on provision of employment . More than 700 people are employed in the plant from Borapatla village itself. Even in future this will continue.
		Treat Waste water properly and not to discharge waste water outside the industry	Company already established Zero Liquid discharge unit for treatment and re-use of of waste water. Treated waste water is recycled completed and no waste water is discharged outside
3	**Sri Kistaiah** ***R/o*** **Borapatla Village**	Childern in the nearby school are suffering from air pollution	Emissions from boiler, process and DG sets are controlled as per the emission norms. Company is regularly monitoring ambient & fugitive emissions in the school premises & vicinity and will ensure no inconvinience to childern of shool or village & surroundings
		Industry should not any waste water outside the company's premises	Company already established Zero Liquid discharge unit for treatment and re-use of of waste water. Treated waste water is recycled completed and no waste water is discharged outside

AUROBINDO PHARMA LIMITED INDIA HYDERABAD

S. No.	Name of the Organisation/ Person	Issue Raised	Reply
		Requested to provide Infrastructure for school	Company already contributed for development of infrastructure for school. Providing financial support for paying salaries to staff. The efforts will be continued from CSR initiatives in consultation with school authorities and local representatives
		Local contract employees those who completed 4 years service shall be made permanent and provide retirement scheme & pension to retired employees	Company's management will formulate guidelines to absorb technically qualified personnel working for many years. Applicable super annuation benefits are extended to contract employees also as per the Government norms
		Shall maintain the lift irrigation scheme which is catering the Borapatla and surrounding villages.	The management feels that this demand does not come under purview of the company's responsibility.
4	**Sri Ranjit Reddy R/o Borapatla Village**	Proper information is not given in the EMP about the green belt. The industry has not provided Green belt as furnished in the EMP.	Industry alreadey developed green belt in an area of 18.4 Acres and proposed to develop further 6.1 acres of green belt. This aspect is comprehensively addressed in draft EIA submitted for public consultations
		No Action has been taken regarding Air pollution inspite of direct complaint by the students of the school to the District Collector.	Emissions from boiler, process and DG sets are controlled as per the emission norms. Company is regularly monitoring ambient & fugitive emissions in the school premises & vicinity and will ensure no inconvinience to childern of shool or village & surroundings
		Not doing any welfare activities to the local people	Company already contributed significantly for laying CC Road in village, arrangement of bore will , provision of Street lights, construction of eye hospital etc for borapatla village
5	**Sri Sunanda Reddy, Environmentalist, Hyderabad**	Additional green belt of 6 acres proposed by the industry is not sufficient compared to manifold increase in production. Requested management to take up social forestory activity in the nearby villages	Company proposed this additional green belt in addition to existing green belt. This will be 34.5 % of total area of the plant which is as per MOEF norms. Aurobindo ready to provide assistance to local villages on development of social forestery
		conduct survey on health status of villagers and enclose the report im EMP	EIA and EMP were prepared based on TOR conditions
		Conduct study on ground water characteristics and effect on crop cultivation.	Ground water samples were tested as per the TOR condiions and presented in EIA report
		Measures to control ground water depletion	Aurobindo proposed Zero Liquid Discharge concept and proposed to re-use water completely. Water harvesting to capture rain water and use is also proposed in EMP. Detailed report on ground water potential of the area and current utilization levels are discussed in EIA Report
		CSR funds shall be utilized to the local area development with credibility	Aurobindo will allot CSR funds as per the Company'e Act 2014 and spend same in consultation with Village Representatives & District Authorities for Borapatla and surrounding villages

AUROBINDO PHARMA LIMITED
INDIA
HYDERABAD

S. No.	Name of the Organisation/ Person	Issue Raised	Reply
6	**Sri Surender Goud, Villager, Reddy Khanapur**	Reduce Ground water pollution	This is ensured. Proposal is based on Zero Liquid discharge concept. Measures are also outlined in EMP to avoid soil & Ground water pollution from handling of liquid and solid wastes
		Requested to provide work for 25 days to lady workers instead of 10-15 days in a month	Present 10-15 days per month of work to ladies is based on maxmimizing employment opportunities to more number of villages. About 80 lady workers are getting benifited. In future we will try to increase the working days or to provide employment to more workers in consultation with the group
		Provide drinking water to their Village	The proposal will be considered in consultation with District Administration from CSR funds
		Suggested PCB to take appropriate measures to control ground water contamination	No action is required from our side. We are ensuring all measures to avoid any ground water pollution
7	**P. Srinivas, Ex-Sarpanch, Borapatla Village**	There is no problem with the industry but only with the PCB . They are not taking action against the industry for causing pollution in the surroundings.	As we are ensuring regulatory compliance, this does not araise
		Three kuntas abetting to the indsurty are polluted with industry and farmers are unable to cultivate the land	Sample from nearby kunta was analysed and presented in EIA report in chapter II and water is found stuitable for agricultrual purposes
		Borapatla village and ZP school is 500 mts from the industry and are worst affected with air pollution from the existing activities.	Emissions from boiler, process and DG sets are controlled as per the emission norms. Company is regularly monitoring ambient & fugitive emissions in the school premises & vicinity and will ensure no inconvinience to childern of shool or village & surroundings
		Make the employees from local villages permanent who completed 5 years	Company's management will formulate guidelines to absorb technically qualified personnel working for many years. Applicable super annuation benefits are extended to contract employees also as per the Government norms
		Adopt Borapatla Village and School to develop in all respects and to provide the health camps once in 2 months to villagers and school children	The proposal will be considered in consultation with District Administration from CSR funds

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S. No.	Name of the Organisation/ Person	Issue Raised	Reply
8	**Sri B.V. Siva Sankara Rao, Villager, Hotnoora**	shall take all measures to control pollution and comply with all acts and laws.	This ensured by the company always
		ESI and PF facilities for all the workers	This is already implemented as per the Government nroms
		Shall provide Ambulance for local villages	The proposal will be considered in consultation with District Administration from CSR funds
		Shall setup Mineral water plants to the surrounding villages.	The proposal will be considered in consultation with District Administration from CSR funds
		Shall run a bus exclusively for the students to reach school in time	The management feels this is not under purview of company's role
9	**Sri Anjaneyulu, Villager, Gundlamachanoor**	Shall control odour nuisance to the villagers and students	Emissions from boiler, process and DG sets are controlled as per the emission norms. Company is regularly monitoring ambient & fugitive emissions in the school premises & vicinity and will ensure no inconvinience to childern of shool or village & surroundings
		3 Kuntas are not useful for irrigation	Sample from nearby kunta was analysed and presented in EIA report in chapter II and water is found stuitable for agricultrual purposes
		shall install air pollution control equipment	Already installed bag fitlers for existing boilers. Proposed to upgrade to ESP. For new boiler proposed ESP will be installed to meet the standards prescribed by MOEF/TS Pollution Control Board
		shall provide health centre and closed drainage in the village	The proposal will be considered in consultation with District Administration from CSR funds

AUROBINDO PHARMA LIMITED
INDIA
HYDERABAD

S. No.	Name of the Organisation/ Person	Issue Raised	Reply
10	**Sri Shanta Kumar, BSP Leader, Narsapur**	Demanded the management to extend the minimum wages to the contract employees and to regularize them	Minimum wages to contract employees is ensured as per the Government Rules and Regulations. Company's management will formulate guidelines to absorb technically qualified personnel working for many years
		Labor contractors are dominating the local employees and threatening them in all respects for job security	No such incidents came to the notice of the management. However if any such concerns are there, management will resolve such issues.
		To provide Bus facility for workers attending night shifts and to provide permanent local employment	Transport failities are provided as per the company's policy and permanent employment to local people will be considered based on company's policy
11	**Kumari Harika, 10th Standard along with group of School Children, ZP High School, Borpatla**	Complained that they are facing air pollution problem requested to curb the same.	Emissions from boiler, process and DG sets are controlled as per the emission norms. Company is regularly monitoring ambient & fugitive emissions in the school premises & vicinity and will ensure no inconvinience to childern of shool or village & surroundings
12	**Sri Konda Sankaraiah, Villager, Borpatla**	Requested the management to provide employment to the Handicapped	Being a chemical processing unit the opportunities are limited for handicapped personnel. However Management will consider employment to such people whereever feasible
13	**Sri Erra Pochaiah Madiga, District Leader, MRPS**	Requested to protect the farmers by giving them provision of cultivation and requested the management to run the industry properly without polluting the surroundings	Adopted Zero liquid discharge system and re-using all waste water. As a part of expansion, this will be further augmented
14	**Smt. Shamantha & few other ladies R/o Borpatla**		
		Demanded duty for 26 days instead of existing 10-15 days. She further demanded the industry to operate without affecting or impacting school children.	Present 10-15 days per month of work to ladies is based on maxmimizing employment opportunities to more number of villages. About 80 lady workers are getting benifited. In future we will try to increase the working days or to provide employment to more workers in consultation with the group
		She further demanded the industry to operate without affecting or impacting school children.	All measures are taken by the industry to meet pollution contorl norms. Ambient air quality in school area is regularly monitored by the company

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S. No.	Name of the Organisation/ Person	Issue Raised	Reply
15	**Sri T. Murali R/o Borpatla**	That industry has promised to buy his land which has 6 bore wells at Sy. No. 383 at the rate of Rs. 6.0 lakhs but the industry did not buy. He demanded the industry to buy the land	Currently this land is not required by the company
16	**Smt. Kistamma & Five others R/o Borpatla**	They are kept continuously in civil works from years together and unable to take workload and requested to allocate sweeping work	Employment/work is provided as per the company's needs and requirement.
17	**Munipally Pochaiah, Ex Vice President, Borapatla**	27 acres of his land effect with the industry waste water and unable to cultivate, Bore well motors effected and pipes & fitting are rusted due to contamination of ground water. Same was informed to District Administration but in vain	This land is not connected with company's existing and proposed expansion activity.
18	**Sri Goudicherla Sadanand, Villager, Borpatla**		
		Severe Air, Water and soil pollution problems	Industry is complying with all norms and directives of State Pollution Control Board and adequate infrastructure is developed to handle air, water and soil pollution from the unit
		Not providing permanent employment to the local people and requested to provide permanent employment to the local people	Top priority is always given to the Borapatla Village and surrounding villages on provision of employment . More than 700 people are employed in the plant from Borapatla village itself. Even in future this will continue.
		His son studied ITI but industry has not provided no permanent job.	Employment/work is provided as per the company's needs and requirement.
19	**Sri Padma Rao, Villager, Palpanur**	Public are getting hospitalized due to pollution problems and civil workers are facing problems.	As such no concerns received by the management. It looks it is perception of individual.
		He demanded employment to Palpanur village and also demanded for permanent of local contract employees	About 16 people from this village provided with employment/work opportunities in the company. As per the company's future requirement we will provide work opportunities to nearby villages

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S. No.	Name of the Organisation/ Person	Issue Raised	Reply
20	**Sri Bantu Satyanarayana, Villager, Palpanur**	Requested the management to built Hospital to cater all the surrounding villagers and to bear the maintenance cost.	The proposal will be considered in consultation with District Administration from CSR funds
		Due to soil pollution land is not suitable for cultivation	Soil studies are carried out and presented in EIA report. No abnormalities are found in soil characterstics in the surrounding villages
		Shall conduct detailed survey on land characteristic and support the farmers for growing crop suitable for the characteristics of present condition	Soil studies are carried out and presented in EIA report. No abnormalities are found in soil characterstics in the surrounding villages
21	**Sri Hanuman Goud, NGO**	contamination of water tanks and air pollution in the surrounding villages	Air and water qualtiy in the surrounding villages was assessed and presented in EIA
		The industry is violating the provisions of G.O.MS 62, which imposed ban for new establishments and expansion of existing industries,	No vioation is done by the company. Ban GO is lifted by the state Government through GO NO. 64 dated 25.7.2013 wih a condition adopt ZLD facilities and same is being followed for current and proposed epxansion plans
22	**Sri Saldireddy, Green Corps & NGO**	Proponent failed in selection of suitable Technical consultant	Consultant selected is accredited consultant
		He pointed out that there are some mistakes in executive summary supplied t'o the people related to effluent generation quantities,	It is gap of understanding on the part of individual. Details are presented in EIA and made available to public
		Elaboration of spending details of 64 laks towards CSR activities	Details are submitted to MOEF in half yearly reports and details are also availble with Pollution Control Board
		Website disclosing the details of all activities of the industry Viz. production details, exports of the company, waste water generation & disposal, solid waste, cadre wise employment' in the industry and corresponding local employment, etc	Relevant datails are submitted to state pollution control Board both on line and off-line as per the directives of the Board
23	**Smt. Geetha** ***R/o*** **Borapatla**	Requested the management to provide permanent instead of canteen work as she is facing financial problems.	Canteen activities are outsourced and not directly related to company
24	**Sri Ashok, Villager, Borpatla**	people of 20 years experience and 2 years experience are given same salary and not regularizing their jobs.	Company is following all norms related contract employees stipulated by the Government
		Bore water in the area is polluted and unable to drink	Samples of bore water in the vicinity are studied and presented in the EIA report. Borapatla village is already having protected water scheme for which company has supported financially
		Demanded for pension for the retired an aged workers. Also informed that some production activities are effecting their health.	Company is following all norms related contract employees by the Government. Employee health check ups are conducted periodically as per the provisions of Factory Act

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S. No.	Name of the Organisation/ Person	Issue Raised	Reply
25	**Sri Avula Mallesam, Villager, Palpanur**	Effected with Air pollution from the industry and getting health problems.	Emissions from boiler, process and DG sets are controlled as per the emission norms. Company is regularly monitoring ambient & fugitive emissions in the school premises & vicinity and will ensure no inconvinience to childern of shool or village & surroundings
		Reduction of crop yield due to ground water contamination and other pollution effects	There is no substantiation on this
		Birth defects in their Villagers	There is no substantiation on this
26	**Sri Kistaiah, Fishermen Association, Borpatla**	Unable to carry their professional work of growing fishes in the Kuntas due to pollution of water by the industry.	There is no substantiation on this. These are rain fed kunts which will sustain only few months
		Not to discharge polluted water into the kuntas	This is always ensured and company adopted ZLD system and recycling effluents after treatment
27	**Ashok, Borapatla Youth Association, Borapatla village**	Management is threatening the people who are complaining against the pollution problems with the existing operations of the industry	There is no substantiation on this
		He sought to have written commitment from the management to the Local Sarpanch regarding CSR activities	CSR activities will be taken up in consultations with District Administration from CSR funds
		Permanent employment to the local people and regularization of contract employees.	Company's management will formulate guidelines to absorb technically qualified personnel working for many years
28	**Sri Srinivas Reddy R/o Borapatla**	Informed that he is not getting yield from the garden provided in Sy.No.391 & 397 due to pollution problems of the industry.	There is no substantiation on this
29	**Smt leelamma, Villager, Borpatla**	Wanted permanent jobs and wanted Rs. 2,000/- pension to the retired people.	Company is providing employment to local villages on priority basis as per the company's norms and providing benefits to employees as per the Government regulations
30	**Anjaiah *R/o* Borapatla**	Requested the management to pay an amount of Rs.2000/- per month as pension to the Stopped workers having served the organization for more than 10 years.	Company is providing benefits and all employees as per the Government Regulations

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S. No.	Name of the Organisation/ Person	Issue Raised	Reply
31	**Sri Venkatesh *R/o* Borapatla**	The industry is not standing on their words for regularization of contract employees completed 5 years of service, as committed earlier.	Company's management will formulate guidelines to absorb technically qualified personnel working for many years. Applicable super annuation benefits are extended to contract employees also as per the Government norms
		Unable to travel on the road adjacent to the industry due to severe air pollution problems and the surrounding ground water is contaminated with the present industry operations	There is no substantiation on this. Ambinet air quality and ground water conditions are monitored and presented in EIA report
32	**Sri Chandra Shekar Reddy, Farmer *R/o* Borapatla**		
		Welcomed only Agriculture based industry and not for Bulk Drug industry	This is perception of individual
		He stated that Bore Wells in the surrounding area are getting rusted immediately due to ground water contamination	This is perception of individual and there is no substantiation on this
33	**Sri K. Chidambaram, *R/O* Patancheru**	Lack of awareness among the local people regarding pollution impacts of the Bulk Drug industries	No comments to offer from company's side
		Birds are best examples of having expertise in anticipating the problems and evacuated the place due to pollution problems and no birds are seen the area, human beings are not getting awareness on this aspects	There is no substantiation on this
		He alleged that the management is causing environment pollution and is evident from the prevailing odour nuisance in the operation of the existing operations.	There is no odor from the unit and all measures are being taken to control fugitive emissions
		People are suffering with problems in Reproduction, Infertility, Nobody offering brides to these villages and Birth defects due to pollution impacts etc.	There is no substantiation on this claim and it is perception of individual
34	**Sri Janardan Reddy, ZPTC, Sadasivpet**	Insisted the officers to be strict in containing the pollution	No action is needed from out side
		Asked the management to adopt local villages & School for providing necessary infrastructure development.	Company already provided infrastructure to school and took several welfare measures for Borapatla village.
		Extend the employment to the local people	Top priority on employment opportunities is given to local villages
		Take constant pollution control measures.	Ensured all air, water and soil pollution problems are addressed and developed adquate infrastructure for handling the same

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S. No.	Name of the Organisation/ Person	Issue Raised	Reply
35	**Sri Konda Veeraiah, Farmer R/o Borpatla**	Requested for free supply of water and electricity to the village.	This is not under the purview of Company's management
36	**Sri Sriramulu R/o Borpatla**	Informed that he met with an accident in the industry and not giving employment to him after it.	There is no such major incident occurred in side the factory
37	**Smt. Palle Jayashree Shravan Kumar, ZPTC Member, Hatnoora**	Greenery reduced in the area and farmers are unable to cultivate the land due to pollution problems from the industry	Company proposed this additional green belt in addition to existing green belt. This will be 34.5 % of total area of the plant which is as per MOEF norms. Aurobindo ready to provide assistance to local villages on development of social forestery
		Shall provide employment to each family	Top priority is given to Borapatla and surrounding villages in providing employment
		Conduct Health Camps and to construct a Health Centre	Will be considered in the consultations with District authorities and local elected representatives from CSR funds
		The industry not to take private bore wells for suction of ground water for industry needs.	Company is alredy established ZLD facilities and proposed to augment these facilities in expansion. All the effluents will be recycled and gound water extraction will be minimised
		Requested the PCB officials to constantly monitor the industry to control the pollution problems without fail.	No action is required from our side
38	**Smt. Vinoda and her son Sri Mahesh R/o Borpatla**	Requested for monitory assistance in medical treatment for her son slipped in the Industry and wanted permanent job for his son.	The incident had not happened in the industry
39	**Smt Lakshmi representing a group of 30 villagers, Borpatla**	Informed that they are working in housekeeping department and presently getting 10 days duty. The group demanded 25 duties per month.	Present 10-15 days per month of work to ladies is based on maxmimizing employment opportunities to more number of villages. About 80 lady workers are getting benifited. In future we will try to increase the working days or to provide employment to more workers in consultation with the group

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S. No.	Name of the Organisation/ Person	Issue Raised	Reply
40	**Sri Bhadresh, Villager, Gundlamachanoor**	Due to severe pollution problems surrounding Villagers are suffering from unknown diseases	This is perception of indivindual
		He also alleged that the industry encroached the Government Kunta and no action is initiated against theindustry till date.	The clamin is not true
		Not furnished the details of Boiler proposed for Power plant. Not furnished the Details of Air Pollution Control measures proposed with additional investment of RS.15 cores	These details are already incorporated in EIA report
		Expansion activities will lead to depletion of ground water in the surroundings.	Company is alredy established ZLD facilities and proposed to augment these facilities in expansion. All the effluents will be recycled and gound water extraction will be minimised
41	**Sri Narahari Reddy, Villager, Borpatla**	Demanded for closure of existing activities, as the farmers, fishermen, villagers and all are affected with pollution problems form existing operations	Company is complying all directives and guidelines of state PCB
42	**Sri Konda Suraiah, Villager, Borpatla**	Informed that are facing many difficulties and if the industry is closed their livelihood is lost. He wanted permanent jobs.	Employment is provided local villagers on priority basis and same policy will be continued
43	**Sri Vijayabhaskar Reddy, Villager, Borpatla**	He wanted technical people to be made permanent.	Company's management will formulate guidelines to absorb technically qualified personnel working for many years
		They have submitted proposals for funds and requested for release of funds. CSR funds must be spent on the village	Aurobindo will allot CSR funds as per the Company'e Act 2014 and spend same in consultation with Village Representatives & District Authorities for Borapatla and surrounding villages
		He requested reduction of pollution levels immediately before going for expansion	All directives and guidelines of state PCB are complied with

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II. Environmental Management Plan

1.0 Introduction

Environmental Protection is an issue that no organization can neglect and hope to survive. The by- products of civilization are being dumped upon the environment to a degree that the environment finds difficult to assimilate. The key to success of the integrated approach to pollution prevention and control is the management and operation of the organization. Effective committed management delivers a successful industry. As total commitment to the environment, not just for compliance with legal or regulatory compliance will be the essence of environment management of an industry. Many companies have recognized the benefits of implementing an effective environmental management system.

Environmental management Plan can be effectively implemented to mitigate the pollution levels by observing the following;

- Pollution will be prevented or reduced at the source,
- Pollution that cannot be prevented will be recycled in an environmentally safe manner,
- Pollution that cannot be prevented or recycled will be treated in environmentally safe manner, and
- Disposal and other releases into the environment will be used "only as a last resort" and will be conducted in an environmentally safe manner.

The management plan is drawn in consultation with the project proponents with reference to various potential monitored, identified and predicted in the previous chapters. And the necessary measures to be taken for the mitigation and control of the same presented, various pollution control measures adopted which are present in the proposed Expansion and measures identified for adoption are discussed in the Environmental Impact Assessment Report of the same are presented in appendix of the Environmental Impact Assessment Report. Review of the process is the essential component of Environmental management Plan. M/S. AurobindoPharma Limited, Unit I involved in

continuous R&D to optimise the consumption of rawmaterials and to increase the yield &purity of the product thus by reducing waste generation.

1.1 Environment Management PlanduringConstruction Phase

As the unit already exists and only few additional utilities and environmental infrastructure areadded, potential of pollution during the construction phase will be minimal when compared to the operational stage. However the industry will ensure to keep the pollution potential level in the construction phase to a minimum. Wherever applicable, detailed procedures will be developed for control of pollution during project execution phase. The following are few important parameters to be appropriately managed to minimize the pollution load.

1.1.1 Site Preparation

During the site preparation considerable amount of soil movement is involved due to slight levelling operations, which will be carried out. During construction it is necessary to control uplift of dust during the excavation, levelling and transportation by spraying water in the paths, and along the temporary roads. The clearing of plants, shrubs and trees will be kept to the minimum so as to leave sufficient space for erection of mechanical units and for civil constructions.

1.1.2 Sanitation

Considering the standards of hygiene, the workers involved in construction will be provided proper sanitation facilities. The facilities like toilets, drinking water shall be provided to the construction labour. As this is an existing plant there is no need for additional facilities

1.1.3 Noise

The site is located in a place where habitation is minimum and at distance of0.5 Km. thus there will be no significant impact due to noise generated on the inhabitants. The construction workers on site will be provided with

necessary noise protection devices like earmuffs whenever they have to work near the noise generating equipment/ sources.

1.1.4 Wastes from Construction Equipment

The construction activity may involve movement of heavy vehicles for earth moving and to move the equipment like dozers and cranes, etc. the vehicles will be maintained properly so as to minimize the emissions from exhaust. In addition to the emissions, the waste oils, generated will be disposed off for reprocessing. Also care will be taken to avoid spillage, which may contaminate the surface and ground water resources. The hazardous wastes of oil and batteries will be sold to authorized buyers. The construction wastes will be used for levelling purpose.

1.2Environment Management PlanduringOperation Phase

During operation stage the major pollution from the proposed plant is from liquid effluents from process, utilities and domestic facilities, and air pollution from utilities and or combustion of fuels/ wastes. The effluent treatment system shall convert most of the liquid effluents to solids by way of Batch evaporation salts and ETP sludge. The environment management plan is drawn in consultation with the project authorities, R & D experts of M/S. AurobindoPharma Limited. And other technical consultants involved in preparing the project plan. The management, mitigation and enhancement measures identified for significant impact sources are presented as follows;

1.0 Source of Pollution from Manufacturing Process

The major contributions of pollution in the proposed expansion are effluent generation from process, utilities and domestic effluent and gaseous emission from process and utilities. The water pollution is due to the effluent generated from process, washings, Scrubber utility blow downs and domestic effluents. The majority of effluent generated will be from process and it will have considerable amount of COD and TDS load and suspended solids, which has to be effectively treated. The air pollution is caused due to combustion of both

fuels and solid/ gaseous wastes. The quantities and quality of effluents, emissions and solid wastes are identified and quantified in the environmental impact assessment study. The pollution control measures proposed are described as follows;

1.1 Water Pollution and Treatment Scheme

The effluents generated in the process, separation techniques and during purification contain organic residues of raw materials, solvents, and products. Some of the raw materials used in the process are also inorganic in nature. Hence the effluents contain both organic and in-organics in various quantities leading to high COD and TDS levels respectively. The quantity of effluents generated from process is presented in **Table 1.1** and Total quantity of Effluent generated is presented in **Table 1.2**.

Table 1.1

Effluent Generated from Process and Characteristics

S.No	Product	Effluent quantity in Litre/day	COD Kg/day	TDS Kg/day	COD mg/l	TDS mg/l
1	Amisulpride	281.75	25.80	0.00	91581	0.00
2	Aripiprazole	498.59	9.70	38.23	19455	76683
3	Atorvastatin	11596.16	149.81	618.01	12919	53295
4	BisprololFumarate	473.75	8.27	14.63	17465	3089
5	Bupropion HCl	638.13	44.29	56.09	69404	87900
6	Candesartan Cilexetil	3161.96	40.58	46.91	12834	14835
7	Cefaclor Monohydrate	696.38	75.10	46.31	107849	66498
8	Cefadroxil	2235.20	229.58	40.79	102711	18249
9	Cefalothin Acid	2403.81	82.28	30.49	34231	12684
10	Cefazolin Sodium	2778.60	186.39	82.91	67081	29838
11	Cefdinir	16980.85	316.00	235.40	186081	13863
12	CefditorenPivoxil	7366.67	79.17	0.00	107461	0.00
13	CefepimeHCl	1922.51	153.51	0.00	79848	0.00
14	CefiximeTrihydrate	846.79	50.11	4.62	59172	5458

15	Cefotaxime	668.01	0.00	81.41	0.00	121874
16	Cefoxitin Sodium	4259.00	87.29	127.02	20494	29823
17	CefpiromeDihydroiodide	891.81	1.66	6.87	1857	7707
18	CefpodoximeProxetil	10601.93	896.44	31.33	84555	2955
19	Cefprozil	1699.45	239.83	19.56	141123	11509
20	Cefradin	1781.32	20.40	16.73	11453	9394
21	Cefsulodin Sodium	1880.83	11.46	103.47	6092	55014
22	CeftazidimeDiHydrochloride	686.48	30.00	75.75	43701	110341
23	CeftibutenDihydrate	7336.48	278.18	542.47	37917	73941
24	CeftiofurHCl	11344.00	248.27	210.97	21886	18597
25	Ceftizoxime Acid	183.71	10.00	2.19	54432	11923
26	Ceftriaxone Disodium Hemiheptahydrate	7242.13	171.94	95.00	23741	13118
27	Cefuroxime Axetil	35928.23	134.34	647.24	3739	18015
28	Cephalexin Monohydrate	4727.50	800.29	214.54	169285	45382
29	CephapirinBenzathine	1455.80	117.93	36.15	81008	24834
30	Ciprofloxacin HCl	12233.59	285.31	353.68	23322	28911
31	Citalopram Hydrobromide	6043.16	42.97	1013.44	7110	167700
32	Donepezil Hydrochloride	385.30	12.26	21.32	31829	55332
33	DoxazosinMesylate	465.45	5.55	2.08	11924	4476
34	Entacapone	2064.93	206.48	22.73	99995	11006
35	Escitalopram Oxalate	15531.01	484.00	1162.15	31164	74828
36	Famciclovir	2191.55	512.38	56.81	233798	25921
37	Florfenicol	594.02	19.23	0.00	32374	0.00
38	Fluvastatin	1694.60	1.47	231.32	866	136502
39	Gabapentin	83507.14	2353.57	1576.19	28184	18875
40	Gemfrozil	7455.79	260.92	122.87	34996	16480
41	Glyburide	2409.26	28.99	61.92	12034	25701
42	Irbesartan	2063.74	253.27	137.75	122725	66749
43	Lamivudine	341.67	21.60	30.38	63219	88927
44	Lisinopril	6615.35	56.22	258.72	8498	39109

45	Losartan Potassium	3511.83	188.00	53.16	53534	15138
46	Metformin HCl	2376.80	124.62	0.00	52432	0.00
47	Metoprolol Succinate	119.26	2.96	0.00	24845	0.00
48	Metoprolol Tartrate	508.89	13.33	0.00	26201	0.00
49	Mirtazapine	2657.08	51.12	475.04	19240	178785
50	Modafinil	50.57	6.90	0.00	136364	0.00
51	Nevirapine	1942.18	74.33	184.30	38269	94893
52	Ondansetron	363.19	8.03	17.16	22117	47238
53	Pantoprazole Sodium Sesquihydrate	2620.74	28.10	320.69	10724	122365
54	Paroxetine HCl	4894.59	188.45	400.22	38501	81769
55	Perindopril tert-Butylamine	1308.57	73.97	0.00	56521	0.00
56	Rabeprazole Sodium	1120.50	4.58	98.39	4091	87812
57	Ritonavir	3236.84	143.26	106.67	44260	32954
58	Ribavirin	232.93	44.68	1.05	191806	4520
59	Risperidone	258.96	3.87	20.27	14941	78274
60	SevelamerHCl/Carbonate	4421.70	148.11	57.78	33496	13067
61	Simvastatin	17857.60	1044.72	466.14	58503	26103
62	Stavudine	292.51	85.23	0.00	291367	0.00
63	Telmisartan	2485.21	33.67	71.41	13549	28736
64	Terazosin HClDihydrate	134.52	2.79	4.76	20745	35346
65	TerbinafineHCl	1597.23	11.31	284.69	7081	178239
66	Topiramate	5619.41	345.69	455.62	61517	81079

Table 1.2

Quantity of Effluents

Description	Effluent –KL/day
Process	343.8
Reactor & Floor Washings	20.0
Scrubber	25.0
QC and R&D	15.0
DM/Softner (Regeneration)	25.0
Solvent Recovery plant	20.0
Boiler	32.5
Cooling Towers	25.0
Ro Back Wash	35.0
Domestic	60.0
Garment washings	10.0
Total	**611.3**

Table 1.3

High TDS and COD Effluent – Characteristics

Description	Quantity (KLD)	Characteristics (in mg/lit)
Process	343.8	COD: 33950 TDS: 33450
Reactor & Floor Washings	20.0	COD: 4500 TDS:10000
Scrubber	25.0	COD : 4500 TDS : 10000
QC and R&D	15.0	COD : 3500 TDS: 8000
DM/Softner (Regeneration)	25.0	COD : 2500 TDS : 15000
Solvent Recovery plant	20.0	COD : 10000 TDS :25000
Total	**448.8**	

Table 1.4

Low TDS and low COD Effluent – Characteristics

Description	Quantity (KLD)	Characteristics in mg/lit
Boiler	32.5	COD : 450 TDS :3000
Cooling Towers	25.0	COD : 350 TDS :2500
Ro Back Wash	35.0	COD : 150 TDS :3000
Domestic	60.0	COD : 450 TDS :1500
Garment washings	10.0	COD : 600 TDS :2600
Total	**162.5**	

2.2 Effluent Treatment

The main sources of effluent from the plant are process, washings, Scrubbers, blowdowns from utilities like cooling tower, boiler &domestic effluents. The process effluents are segregated on the basis on TDS and COD loads into high TDS, COD stream and low TDS and COD stream and low TDS and COD Stream. It is proposed to establish MEE, Stripper and ATFD with a capacity of 500 KLD. The effluent treatment system is based on zero liquid discharge plan. The details of current &proposedtreatment system are as follows;

Waste water treatment Facilities Existing & Proposed

Description	Existing	Proposed
Stripper, Multiple Effect Evaporator and ATFD Systems	1X300 + 1 X 120 KLD	1 X 500 KLD
Biological ETP	1 x 350 KLD 1 X 200 KLD	Up-gradation of existing 200 KLD Bio-ETP
RO Plant	1 X 300 KLD	1 X 500
STP	1 X 100 KLD	--

2.2.1 ETP for High TDS Effluent Treatment System

Effluent Process and washings are equalized in equalization tank followed by neutralization. The neutralized effluents are sent to stripper to remove the (volatile organic solvents present in the wastewater) organics. The distillate from the stripper upon further fractionation or enrichment of solvent is sent to cement industries/ TSDF for Co- processing or incineration or sold as mixed recovered solvent to down-stream industries. The stripped effluents are passed through MEE followed by ATFD. The salts from the ATFD are disposed to TSDF. The condensate from MEE and ATFD will be sent to ETP (Biological) for further treatment.

The design details for the proposed ETP are given below

Data for Design			
Designed Capacity	:	**350 + 200**	m^3/day
Average Flow	:	**500 ± 25**	m^3/day
BOD	:	**8620.5**	mg/l
COD	:	**34482**	mg/l
TDS	:	**34921**	mg/l
BOD load	:	**2963.6**	Kg/day
COD load	:	**11854.44**	Kg/day

TDS	:	**12005.42**	Kg/day
Neutralization Tank			Used for process & washes, R&D, and scrubber
Average flow	:	**12.0**	m3/hr
Hydraulic retention time	:	**14.0**	Hrs.at peak flow
Volume	:	**160**	m3
Tank	:	**RCC tank**	
Stripper			
The effluents contain wastes, which contribute to both the organic and inorganic loads, hence stripping technology has been identified to segregate the organic component of the wastes to reduce the COD. The condensate from the stripper shall be sent to incinerator, while the residue collected from the incinerator shall be sent to TSDF.			
Feed designed	:	**300**	m3 /day
Feed actual	:	**253**	M^3/day
	:	**15400**	Kg/hr
COD	:	**80000**	mg/l
Feed Temperature	:	**60 C**	Preheated fed from evaporator
LP Steam	:	**6.0**	Kg/hr
Height of Stripper column (packed section)	:	**10.0**	m estimated
Stripped product from bottom	:	**242 M3/day**	
Top distillate	:	**11 M3/day**	
COD removal efficiency	:		
Multiple effect Evaporator			
The evaporation system contains Multiple effect evaporators(MEE). Typically MEE will be a 3 effect evaporator. Effluent from the stripper column will be fed to MEE calendrias. The system operates under vacuum. The effluent is separated into condensate and concentrate. Condensate is further treated into biotreatment and RO for recycle, whereas concentrate is treated into ATFD wherein it is further concentrated and send to TSDF			
Design capacity	:	**300**	m3/day
Average flow	:	**15400**	Kg/hr
TDS in Feed	:	**40000** mg/l Estimated	

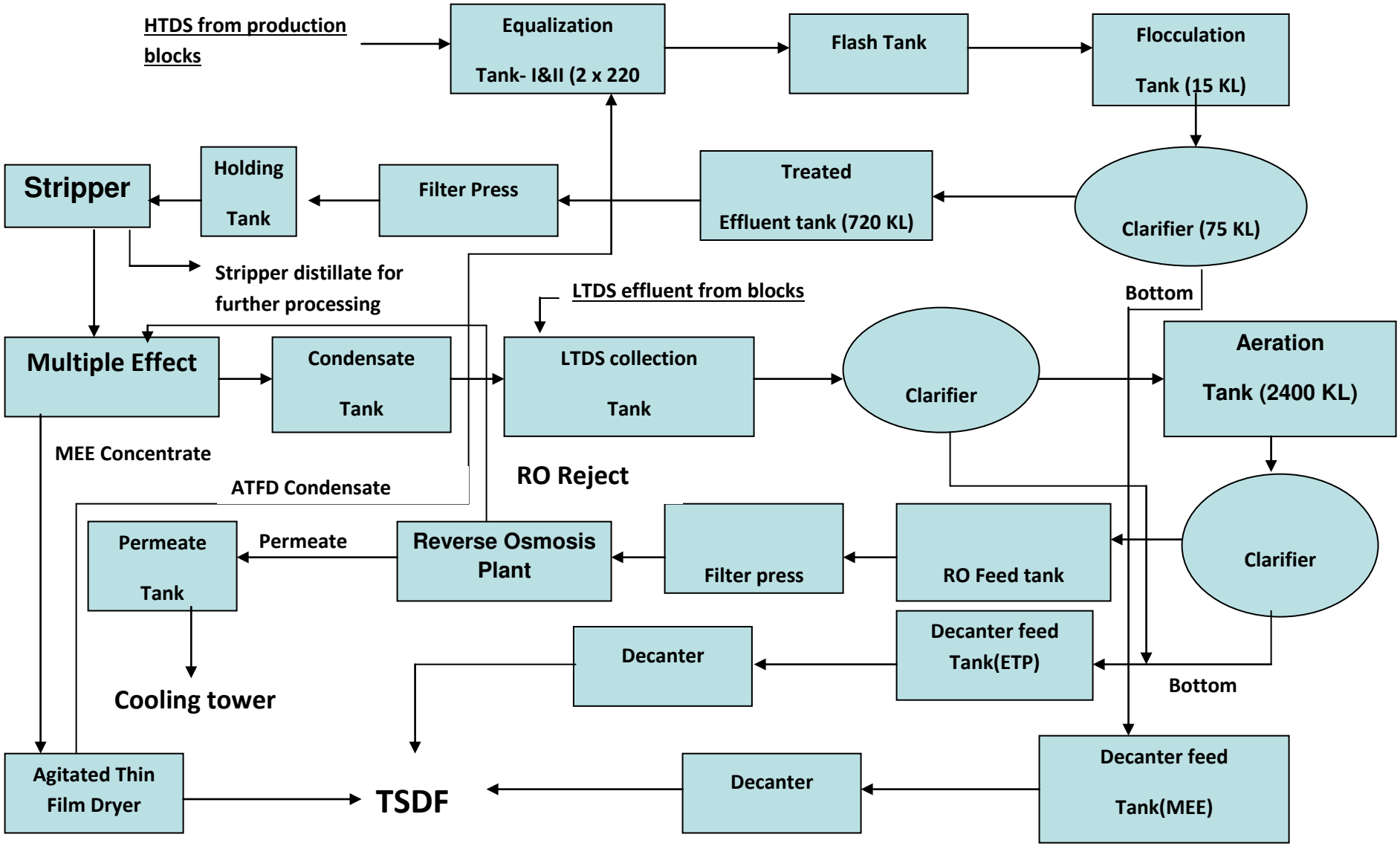
Feed Temperature to calendrias	:	**95 C**	
Utilities Required		**Cooling Towers**	
Specific Steam Consumption	:	**6000 kg/Hr**	Typical
LP Steam	:	**6.0**	Kg/cm 2 (Estimated)
Typical height of Calendrias	:	**9.0**	M
Approximate rejects from MEE	:	**46.0**	KLD send to ATFD for further concentration
Approximate condensate quantity from MEE	:	**217.0**	KLD send to Bio treatment (50 KLD used for CT, total =267.0 KLD)
Agitated Thin Film Dryer (ATFD)			
ATFD is to convert the concentrated effluents from MEE to sludge			
Design capacity	:	**40,000**	**KG/D**
Operating Capacity	:	**30,000**	**KG/D**
ATFD	:	**2 (20+20m2)**	Nos.
Feed rate	:	**1500(750+750)**	Kg/hr
Feed concentration	:	**30%**	Solids
Solids generation	:	**450**	Kg/hr (Sent to TSDF)
Solids M.C%	:	**3.9%**	
Water evaporation		**217**	Kg/hr (Sent to ETP (Biological))

2.2.2Low TDS Effluent Treatment System

The low TDS and COD effluents from blow downs along with the condensate from MEE and ATFD will be treated as is being done now in biological treatment plant followed by reverse osmosis. The Biological system consists of screens, equalization, neutralization, aeration tank and clarifier. The sludge from ETP, after dewatering in the decanter centrifuge the dry sludge will be disposed to TSDF. The filtrate is recycled to ETP for further treatment. It is seen from the above arrangements that the industry proposed for zero liquid discharge.

Waste water treatment scheme is presented in **Fig 1.1**

Fig1.1: Waste water Treatment Scheme



2.2.3 Sewage treatment plant based on Fluidized Aerobic Bio Reactor (FAB) technology

Process Description

The raw sewage will be collected in a collection sump and pumped to mechanical bar screen chamber for removal of large floating matter by grit removal in Grit chamber. The raw sewage Will then be collected in an equalization tank for homogenization of hydraulic load. The tank contents will be kept in suspension by means of course bubble serration through pipe grid. The equalization tank, with air flow indicator for continuous monitoring of air Supply to the tank in order to avoid septic conditions, will be covered from top (RCC or FRP) to avoid nuisance. The equalized effluent will then be pumped to two fluidized Aerobic Bio Reactors (FAB) in series where BOD/COD reduction can be achieved by virtue of aerobic microbial activities. The oxygen required will be supplied through coarse air bubble diffusers. The bio- solids formed in the biological process will be separated in the down stream Tube Settler. The clear supernatant will gravitate to the chlorine contact tank where sodium hypochlorite will be dosed for disinfection of treated water prior to disposal.

The biological sludge generated in the FAB and settled in the tube settlers will be collected in a sludge sump and then pumped to sludge drying bed for dewatering. The dried sludge will then be disposed off suitably as manure. The schematics of the process are shown. The two main components of the treatment system viz. the FAB reactor and tube settler are described in the following sections.

Fluidized Aerobic Bio reactor (FAB)

Conventional effluent treatment plants are large sized, power intensive and require a lot of monitoring. Scarcity of open space and rising land a power costs have forced the industries to look our for space saving, compact and efficient treatment options. This has led to the development attached growth processors where the bio mass is retained within the aeration tank obviating

the need for recycle. These plants are not only compact but also user friendly. The Endeavour to have a continuously operating, no clogging bio film reactor with no need for back washing, low head loss and high specific bio film surface area culminated in the most advanced technology of aerobic biological fluidized bed treatment where the bio film (biomass) grows on small carrier elements that move along with the water in the reactor. The movement is normally caused by aeration in the aerobic version of the reactor.

The reactor combines all the advantages and best features of Trickling filters, Rotating biological contractors, activated sludge process and submerged fixed film reactors while eliminating the drawbacks of these systems. The plants are more compact and more energy efficient.

The Fluidized Aerobic Bio Reactor (FAB) consists of a tank in any shape filled up with small carrier elements. The elements are made up of special grade PVC or polypropylene of controlled density (shown in plate). For media of specific gravity 0.92-0.96 the overall density could be expected to increase up to 9.5% when full of biomass such that they can fluidize using an aeration device. A bio film develops on the elements, which move along the effluent in the reactor. The movement within the reactor is generated by providing aeration with the help of diffusers placed at the bottom of the reactor. Then thin bio film on the elements enables the bacteria to act upon the biodegradable matter in the effluent and reduce the BOD/COD content in the presence of oxygen available from the air that is used for fluidization.

Design Criteria

The treatment plant is designed for the following duty conditions:

Inlet Conditions

Raw Sewage Quantity : 35 KLD

Expected average BOD 5 of Raw Sewage : 250 to 300 mg/L

Expected average COD of Raw Sewage : 550 to 700 mg/L

Expected Suspended Solids of Raw Sewage : 200 to 500 mg/L

Expected pH of Raw Sewage : 7.0 to 9.0

Outlet Conditions:

Treated Effluent pH : 6 to 8.5

Treated Effluent BOD 5 : Less than 20 mg/L

Treated Effluent COD : Less than 100 mg/L

Treated Effluent Suspended Solids : Less than 10 mg/L

Oil &Grease : Less than 2 mg/L

2.3 Air Pollution

2.3.1 Emissions from utilities

The sources of air pollution from the plant are existing 1 X 8 TPH Coal fired Boiler, 1X 27.5 TPH Coal fired boiler (existing Boilers will be kept as stand by) and proposed 1 X39 TPH Coal/Husk fired Boiler and use it for co-generation of 3.95 MW powerand DG set of 1 X 1000 KVA, 3 X 750 KVA, 2 X 500 KVA & proposed 3 X 750 & 4 X1010 capacities. The proposed air pollution control equipment for coal fired boilers is multi-cyclone followed by bag filter before letting out through a chimney. The major pollutants generated from the fuel combustion details the emission rates of above pollutants are calculated. The emission details are presented in **Table 1.5.**

Table 1.5

Emissions Details of Pollutants from Stack

EXISTING SOURCES								
S. No	**Stack attached to**	**Stack**	**Dia of stack at top (m)**	**Temp.of exhaust gases ^oC**	**Exit velocity m/S**	**Pollutant Emission Rate gm/Sec**		
						PM	**SO2**	**NOx**
1*	27.5 TPH CFB	30	1.4	169	8.26	1.32	2.67	1.106
2*	8 TPH Coal Fired Boiler	30	1.0	121	4.05	0.6	0.48	0.29
3*	6 TPH Oil fired boiler	30	0.8	138	5.21	0.16	2.8	3.2
3**	1 x 1000 KVA DG Set	6.3	0.3	350	14.5	0.165	0.25	0.40
	6 x 750 KVA DG Set	5.5	0.3	350	7.5	0.125	0.21	0.38
	1 X 1010 KVA DG Set	6.3	0.3	380	15.1	0.175	0.28	0.45
PROPOSED EMISSION SOURCES								
1	39 TPH Husk/CFB	50	1.4	175	10.45	1.84	4.82	1.607
2**	3 x 750KVA DG Set	5.5	0.3	350	7.5	0.125	0.21	0.38
	4 x 1010 KVA DG Set	6.4	0.3	380	15.1	0.175	0.28	0.45

** shall be kept as standby*

*** DG set will be used during load shut down.*

2.3.2 Other Emissions Control

The process emissions contain HCl, CO_2, Butane and Hydrogen. No specific objectionable gases are generated from the process. However all process reactors are connected to Vent condensers and scrubber

2.3.3Solvent Use and Recycle

S.NO	Details	Quantity in (TPD)
1	Total solvent requirement	346.43
2	Solvents used in process reactions	Nil
	Fugitive Loss	15.07
	Losses in Waste Water & Residues	4.69
3	Recovered solvents	326.66
Solvent re-use and disposal		
1	Re-usable solvents in process	196.0
2	Recovered solvents send to down stream industries	130.6
3	Fresh solvents requirement	346.43-196.0 =150.43

Solvent distillation facilities are available in the plant for distilling the solvents. Wherever solvents are distilled in reactors, vent condensers and chillers are provided to reduce fugitive losses of solvents. All solvent storage tanks are being provided with vent condensers

2.4 Solid Waste

Solid Waste are generated from the process, solvent distillation, salts from multiple effect evaporation, sludge from collection/neutralization tank, ash from boiler, waste oil, used batteries from DG sets. The solid wastes from the, ETP Sludge, Process residue and solvent residues from solvent distillation shall sent to TSDF, while the hazardous wastes of waste oil and used batteries shall

be sent to authorize recyclers. The other solid waste expected from the unit are containers, empty drums which will be used for packing product, and or returned to the product seller or sold to authorized buyers after detoxification, the ash from boiler is sold to brick manufacturers. The list of solid wastes generated from the process is presented in **Table 1.6**. The solid wastes quantities and disposal practices are presented in **Table 1.7**

Table 1.6

Solid Wastes Generated from Process

S.No.	Product	Organic Residue Kgs/day	Inorganic Salts Kgs/day	Spent Carbon Kgs/day
1	Amisulpride	10.40	0.00	1.97
2	Aripiprazole	6.49	45.17	2.22
3	Atorvastatin	313.06	0.00	46.95
4	BisprololFumarate	187.72	0.00	0.63
5	Bupropion HCl	41.18	0.00	4.67
6	Candesartan Cilexetil	98.80	0.00	9.33
7	Cefaclor Monohydrate	21.13	0.00	3.85
8	Cefadroxil	31.39	49.38	3.76
9	Cefalothin Acid	43.80	0.00	8.75
10	Cefazolin Sodium	75.20	0.00	11.41
11	Cefdinir	173.31	0.00	12.14
12	CefditorenPivoxil	259.91	377.55	24.31
13	CefepimeHCl	12.19	0.00	19.01
14	CefiximeTrihydrate	1.85	0.00	4.20
15	Cefotaxime	16.34	28.57	8.99
16	Cefoxitin Sodium	165.33	58.97	10.00
17	CefpiromeDihydroiodide	3.59	0.00	0.00
18	CefpodoximeProxetil	132.47	0.00	18.71
19	Cefprozil	47.18	0.00	5.90
20	Cefradin	6.48	0.00	3.24
21	Cefsulodin Sodium	8.47	11.39	2.78

22	CeftazidimeDiHydrochloride	168.63	0.00	13.33
23	CeftibutenDihydrate	206.52	0.00	114.67
24	CeftiofurHCl	351.74	17.09	28.21
25	Ceftizoxime Acid	27.74	0.00	1.55
26	Ceftriaxone Disodium Hemiheptahydrate	48.38	0.00	0.00
27	Cefuroxime Axetil	421.44	43.93	76.87
28	Cephalexin Monohydrate	543.92	0.00	27.69
29	CephapirinBenzathine	48.33	25.32	8.20
30	Ciprofloxacin HCl	272.10	0.00	54.58
31	Citalopram Hydrobromide	212.94	60.46	6.92
32	Donepezil Hydrochloride	16.71	0.00	2.31
33	DoxazosinMesylate	7.33	0.00	3.00
34	Entacapone	89.11	0.00	5.74
35	Escitalopram Oxalate	505.89	481.28	5.71
36	Famciclovir	256.91	0.00	32.46
37	Florfenicol	147.99	2.06	5.13
38	Fluvastatin	0.00	4.14	0.00
39	Gabapentin	854.76	0.00	0.00
40	Gemfrozil	400.08	335.12	23.84
41	Glyburide	46.53	0.00	0.00
42	Irbesartan	178.89	0.00	42.45
43	Lamivudine	47.33	102.00	0.00
44	Lisinopril	280.62	266.68	5.02
45	Losartan Potassium	114.78	34.90	6.51
46	Metformin HCl	1661.65	0.00	38.26
47	Metoprolol Succinate	14.32	0.00	1.85
48	Metoprolol Tartrate	102.49	0.00	6.73
49	Mirtazapine	41.11	98.04	4.75
50	Modafinil	5.89	0.00	2.00
51	Nevirapine	157.82	0.00	251.67
52	Ondansetron	30.53	0.00	0.91
53	Pantoprazole Sodium Sesquihydrate	79.05	180.47	4.89
54	Paroxetine HCl	83.55	0.00	6.69

55	Perindopril tert-Butylamine	11.11	107.76	17.59
56	Rabeprazole Sodium	16.88	0.00	3.93
57	Ritonavir	36.59	0.00	5.71
58	Ribavirin	30.78	0.00	3.59
59	Risperidone	19.83	0.00	3.57
60	SevelamerHCl/Carbonate	145.93	0.00	0.00
61	Simvastatin	522.14	90.05	14.97
62	Stavudine	45.87	79.02	9.10
63	Telmisartan	72.11	0.00	2.04
64	Terazosin HClDihydrate	13.23	0.00	1.76
65	TerbinafineHCl	140.50	40.37	4.04
66	Topiramate	451.72	280.00	6.67
	Total	**10588.05**	**2819.72**	**1057.70**

Table 1.7

Solid Wastes Generated and Mode of disposal

S. No	Description of Waste	HW Category No. as per rules	Unit	Quantity	Disposal Option
Disposal Option					
1.	Forced Evaporation Salts	34.3	TPD	18.7	TSDF, HWMP, Dundigal
2.	Process Inorganic Salts	28.1	TPD	2.82	TSDF, HWMP, Dundigal
3.	Sludge from waste water pre-treatment	34.3	TPD	5.4	TSDF, HWMP, Dundigal
4	Process organic residues	28.3	TPD	10.59	Cement Units/TSDF, HWMP
5	Spent Carbon	28.2	TPD	1.06	Cement Units /TSDF, HWMP
6	Inorganic residue from solvent	21.1	TPD	2.0	TSDF, HWMP, Dundigal

	recovery				
7	Evaporation salts (Low TDS)	34.3	TPD	0.5	TSDF, HWMP, Dundigal
8	Stripper waste	--	TPD	1.2	TSDF, HWMP, Dundigal
9	Mixed Spent Solvents &Stripper Distillate	28.5	KLM	80.0	Cement Unit
10	Solvents recovered from stripper & lab instruments	--	KLM	20.0	Cement Unit/TSDF, HWMP, Dundigal
11	Detoxified Containers and Container Liners	33.3	TPM	14.4	Sale after detoxification
12	Miscellaneous Wastes- Sparkler Filter Pads, Centrifuge Bags, FBD Bags, Nose Masks, Shoe Covers, Head Caps, Hand Gloves	--	TPM	8.5	TSDF, HWMP and/or sale as scrap after decontamination
13	Miscellaneous Wastes-- Discarded Molecular Sieves/Ion-exchange resin	34.2	TPM	2.5	TSDF, HWMP
14	Off specification raw materials/products	28.3	TPM	2.0	TSDF,HWMP, Dundigal/Cement Units

15	Used glass bottles from laboratories	--	TPM	0.5	Recyclers after de-contamination
16	Garbage from premises	--	TPM	1.2	Composted
17	Packing material	--	TPM	1.0	Sold to recyclers
18	Used PPE	--	TPM	0.6	Disposal to re-cyclers
19	Bio medical waste microbial culture	--	Kgs/ month	300.0	After autoclaving disposed to authorized CBWMTF
20	Waste from first aid centre	--	Kgs/ month	5.0	After autoclaving disposed to authorized CBWMTF
RECYCLING OPTION					
S.No	**Description of waste**	**Category**	**Units**	**Quantity**	**Disposal Option**
21	Used Oil/Waste Lubricating Oil	5.1	LPA	1000.0	Agencies authorized by APPCB
22	Used Lead Acid Batteries	--	Nos./ annum	50	Returned back to dealer/Supplier
23	Boiler Fly Ash	--	TPD	78.0	Brick Manufacturers

2.5 Noise Pollution

Noise is anticipatedfrom motors, compressors and DG set. The DG shall be kept in a separate enclosed room with acoustic enclosure. The motors and compressors shall be provided with guards and shall be mounted adequately to ensure the reduction of noise and vibration. The employees working in noise generating area shall be provided with earmuffs. The employees shall be trained in the mitigation measures and person protection measures to be taken to avoid noise related health impacts.

2.5.1 Measures to Control Noise Pollution

An effective hearing conservation program will be undertaken where exposure to industrial noise is capable of production hearing loss. The objective is to ensure that an employee hearing is not affected during his working life to an extent greater than that usually occurring with age and to preserve it at a level sufficient for normal speed perception.

The following engineering control aspects are identified for further implementation to reduce noise levels/exposure.

- The noise generating sources like motors and compressors will be provided with casings and guard to reduce the noise levels.
- Placing attenuating screens between the operators and the sources
- Adequate spacing between noise sources and operators will be provided. In free field conditions the sound levels roughly varies with the square of the distance
- Reflected noise is reduced by use of absorbent materials on roofs, walls and floors.
- By proper maintenance, which corrects vibrations and other imbalances, will be taken up.
- Training would be imparted to plant personnel to generate awareness about the damaging effects of noise.
- Personal protective equipment: ear plugs and muffs consisting of fine glass wool, ear muffs consisting of ear cups with a soft seal, fitted with a spring or adjustable headband. Comfort, maintenance and cleaning are important aspects of use.
- Plantation of tall as well as short trees around the plant area will protect the outside environment from any noise and dust nuisance.
- It is possible to reduce the noise levels by3-5 dB (A) as per 30-m width of the green belt.

2.6 Rain water Harvesting

2.6.1 Rain Water harvesting strategies

Fresh Water is elixir of life. It is not only required for life's survival and sustenance, but also its availability plays a vital role in the prosperity and in all the processes of modern day development. Fresh water, once in abundance is gradually becoming scarce. Population growth, increased demand has necessitated to conserve fresh water resources and also to protect the environment.

With a little effort, naturally falling precipitated rain water can be collected and stored for its use in subsequent periods. Every environmentally conscious citizen should realise the importance of rain water harvesting.It is an enlightened self-interest of an individual to save the money and resources spent for getting equivalent amount of fresh water from elsewhere.The Environment Ministry authorities have rightly mandated to harvest rain water in the Project Site vide **TOR.**

In the Project Site, rainwater harvesting methodology comprises of two components (A) the roof top rain water collection from the buildings, (B) overland flow collection from open areas within the project premises. Collected rainwater can be stored suitably for its use in subsequent periods or used simultaneously, during the construction stage or operation stage of the Industrial Unit. It requires careful planning in selection of appropriate design and suitable location in the beginning itself.

Harvested rainwater can either be used directly; a part or full can be utilized simultaneously for artificial recharge of ground water source. In the areas with deep water levels, and areas with long term declining trend in water levels and geological formations having adequate space for ground water storage at depth, harvested rain water can be fruitfully utilized for augmenting the source.

There are a number of buildings with large terrace space on which rain fall precipitated can be harvested and collected in to bins/storage tanks to use directly after initial wash from the first rains. Management has already started in implementing such collection and its use for washing and green belt development purposes.

2.6.2Ground Water Recharge Requirements-

In any environment to take-up ground water recharge, either any one or more of the following conditions are necessary in the site

1. Over- Exploitation: Ground water draft in any basin / water-shed should be limited to the long term average annual recharge. Where the draft exceeds the replenish-able recharge, the resources dwindle, water levels fall steeply, wells gets dried up and aquifers also lose their inherent storage capacity. In such situation it is desirable to adopt sustainable development strategy and

management of the available resource by adopting artificial recharge techniques.

2. Deep Water Levels: In a water shed / basin, where water levels are very deep, it is necessary to replenish the aquifer zones for further build-up of water levels. In the project site watershed area the water levels are very deep and vary beyond 10 meters below land surface. Hence there is scope for artificial recharge in such areas.

3. Long term Water Level Declining Trends &Fluctuations: Where**,** thereare long term declining trends in ground water levels either during pre-monsoon or post monsoon seasons and at places where there are large fluctuations between the pre and post monsoon water levels it becomes necessary to augment the resource by artificial recharge of ground water.

The observations show that pre monsoon – post monsoon water levels are deep and water level fluctuation of the Water-shed area is high. As such there is dire necessity of ground water recharge.

The project activity is manufacture of chemical drugs. It is likely that there will be unnoticed or accidental spillage of chemicals in the site area. Therefore, it is suggested not to implement any artificial ground water recharge structures with in the project site. It is recommended to undertake construction of water-shed development programs including check dams, percolation tanks, recharge bore wells and the like, in consultation with the neighbouring farming communities in their farm lands, covering the same water- shed in which the Project Site is located.

3.0 Occupational Safety and Health

Direct exposure to the Pharmaceuticals or raw materials may affect the health of the employees. Hence direct exposure to the product is eliminated by providing closed handling facilities with pumps and pipelines in the process plant. Personal protective equipment viz. Hand Gloves, Safety Goggles, Noise masks, and Safety Helmets are provided to all the employees working in the

plant. Company has a policy of providing protective equipment for all personnel including contract and casual workers.

In order to safe guard the health of the employees, all the employeesunder go periodic health check-up. All the employees will be trained and educated periodically about the hazardous nature of chemicals used in the process.

Worker exposure to chemicals can occur during manufacturing where workers are present. The most frequently reported industrial exposure occurs during the transfer of materials. The entry of workers in to systems, equipment, or enclosures that are contaminated may occur inadvertently, but routine servicing, non-scheduled maintenance, and process monitoring appear to be the kind of activities with potential for significant exposure.

All raw material, intermediates and finished products are handled in completely closed system. All precautions are taken during design stage itself, to completely to eliminate the risk of any kind of exposure. As an additional safety measure, Personal protective equipment viz. Hand gloves, Safety goggles, nose masks and Safety helmets are provided to all the employees working in the plant.

4.0 Prevention, maintenance and operation of Environment Control System

The pollution control equipment, and the effluent treatment systems and effluents will be monitored periodically will be checked for its performance and pro-active maintenancewill be adopted. The environmental monitoring results will be evaluated to identify the problems/under performance of the equipment. Necessary steps will be taken to rectify the identified problems/defects. The management agrees that the evaluation of the performance of pollution control measures and occupational measures to arrive at their efficiency and proposes to adopt new measures for efficient pollution control which will be a regular exercise.

All pollution control equipmentare adequately sized manner and operating staff of the pollution control equipment have good experience in the operation and

maintenance of the equipment. Standby equipment provided for all the critical equipment to ensure continuous operation of pollution control equipment and preventive maintenance is done as per the schedule to avoid break down. Characteristics of influent and effluent are monitored on daily basis by the industry and air emissions and effluent characteristics on monthly basis by third party.

5.0 House Keeping

Good House Keeping practices will be adopted. Floor washing is avoided and wet mopping will adopted to minimize liquid waste generation. Paper waste is minimized by adopting by intra office network. Sufficient work space and proper lighting will be provided.

6.0 Corporate social Responsibilities

The project provides an opportunity for the local people to get employment directly or in directly and helps in the up-liftment of the socio economic status of the area. The project proponents propose to involve in social activities of the stake holders/surrounding community by planning the betterment of neighbouring social conditions through awareness and welfare programs will ensure and improved relation, useful in the long run. The commitment of management can include up-liftment of social, health, basic needs of drinking water supply and provision of educational facilities. Many of the beneficiaries of such programs shall include own employees as well. The good will of the local populace can never be ignored. The channels employed may vary either through direct contact or by means of local organizations. Another important facet of social environment identified by the project proponent is a green appearance; hence the management will develop a green belt towards aesthetic beautification as the same is necessary to be considered as a responsible, neighbour

As a part of corporate social responsibility M/S Aurobindo Pharma Limited carried out following activities in the surrounding villages

- Health camps to own employees ,families and other villagers and blood donation camps
- Subsidised transport to local people
- Vocational training to local un-employed youth
- Sponsoring salaries to local viday volunteers and teachers in 3 high schools
- Construction roads in nearby villages
- Providing books, uniforms and bi-cycles to school children
- Contribution for construction new school building blocks

M/S Aurobindo Pharma Limited will continue CSR activities in future also in line with the provisions of new Companies Act 2014

7.0 Transport Emergency systems

All the raw materials and finishes products are transported by road. Sufficient parking facilities are provided for vehicles loading and unloading of goods. As the plant is located near the major road there will not be any unauthorized shop or settlements along the road connecting the plant site. There will be 5 truck trips per day to the factory. The vehicles are provided with parking space near the gate, and traffic signs are placed in the battery limit. All the drivers of the vehicles will be provided with TREM cards and will be explained the measure to be adopted during various emergencies.

8.0 Recovery-Reuse of Waste Products

The following measures are suggested for waste minimization: Reaction optimization- Alternative use of non-toxic/less toxic solvents and catalysts, Choice of catalysts that would provide highest reaction yields, Selection of

Reagents with lowest toxicity. Additionally the treated effluents are reused for cooling tower make up, first batch mother liquors are reused, solvents are recycled and reused where ever possible. Condensers are provided for storage tanks, reactors etc., to reduce emissions of volatile organic compounds.

9.0 Green Belt Development

Green belt is recommended as one of the major components of Environmental Management Plan. The proposed industry has green belt and the management emphasizes the development of further greening of the site to enhance environmental quality through: mitigation of fugitive emissions, attenuation of noise levels, balancing eco-environment, consumption of treated effluent, prevention of soil erosion, and creation of aesthetic environment.

The total area of plant is 71.0 Acres. Out of this, green belt is developed in 24.5acres.Proper attention and management is required to maintain the survival rate of the planted species. For plantation of small plants digging of pits is very important for preparing of soil environment near the roots of the plants. Size of the pit will be optimum enough to supply required nutrients to the roots of the plants. The usual method is to dig pit of required size three to four months before planting of the species, which is generally done at the break of the monsoon. The pits of 45 cm x45 cm x45 cm size in case of hardier spices like Eucalyptus, Shisham, Acacia etc., but larger pit size is preferred for fruit yielding trees like mango, Jamun etc. 1 mx 1 mx 1 m pits may be used for plantation of other trees. The soils of the plant side will be mixed with 1/3 farmyard manure before refilling about a week prior to plantating. List of plants identified for roadside plantations and green belt are presented in **Table 1.8**.

Table 1.8

List of Plants identified for Road side Plantations for Green Belt

Botanical Name	Importance
Acacia auriculiformis	Tall ever green drought resistant avenue tree
Ailanthus excels	Tall branched semi ever green tree
Albizialebck	Branched ever green leguminous tree
Alstoniascholaris	Beautiful medicinal tree
Azadirachtaindica	Neem oil and neem products
Bauhinia racemosa	Ornamental tree
Cassia fistula	Ornamental and bark is a source of tannin
Cassia siamea	Ornamental avenue tree
Cocosnucifera	Coconut palm
Balbergiasissoo	Avenue and timber tree
Dendrocalamusstrictus	Bamboo products
Casuarinaseqisetifolia	Pulp and construction material
Delonixregia	Ornamental avenue tree
Eucalyptus sp	Grown in high density along the boundary
Ficusbenghalensis	Shade and a source of food for birds
Ficusracemosa	Edible fruits
Ficusreligiosa	Shade and a source of food for birds
Gmelinaarborea	Timber
Grewiliarobusta	Avenue tree
Holopteliaintegrifolia	Fiber and timber
Leucaenaleucocephala	Fodder and pulp wood
Mangiferaindica	Edible fruit
Micheliachampaca	Scented flowers
Mimosopselengi	Shade and edible fruit
Muntingiacalabura	Shade and edible fruit
Pongamiapinnata	Source of bio-diesel

Polyalthiapendula	Majestic tree drooping branches
Polyalthialongifolia	Avenue tree
Samaniasaman	Shade, timber and fruits are a good live stock feed
Sapindusemarginatus	Soap nut tree
Spathodeacompanulata	Ornamental avenue tree
Terminaliaarjuna	Common avenue tree
Terminaliacatappa	Yield edible almond seed

10.0 Staff Required for Post Project Monitoring

At present the Unit has a full fledged EHS Department where the environment wing is having qualified, experience and trained personnel to man the operations and related environmental management activities. Strength of environment wing is 10. In the proposed expansion, another 5 trained and qualified personnel will be inducted in to the team.

Records shall be maintained for the analysis of raw effluents and treated effluents, ambient air quality data, stack emissions monitoring results, micro-meteorological data and noise levels. These records are not only required for the perusal of the pollution control board authorities but also to derive at the efficiencies of the pollution control equipment as the objective of the project proponents not only compliance with statutory regulations, but also a serious commitment towards clean environment.

The industry shall be regularly maintaining the records as per the Hazardous waste regulations and other Environmental regulations and is applying for the annual consents for air and water, and renewal of authorization for the storage and storage of hazardous waste.

11.0 OtherSustainable development measures adopted

M/S Aurobindo adopted many good practises towards sustainable development. Few are

- Implementing reuse of treated wastewater
- Heat value of Organic wastes (solids & liquids) is utilized in manufacturing of cement instead of incineration of wastes
- Manufacturing systems equipped with enhanced in-process solvent recovery systems by adopting primary and secondary condensers, dry vacuum pumps, etc.
- Fugitive losses reduced through closed pipeline transfer, nitrogen blanketing on bulk storage tanks
- Embraced non-CFC chilling systems, viz., VAMs, Liquid Ammonia.
- Recycling of packing drums for re-filling

12.0 Regulatory Compliance

The industry will maintain records as per the hazardous waste regulations and EPA regulations and apply for the annual consents for air and water, and renewal of authorization for the storage of hazardous waste as per the Hazardous Waste (Handling & Management) Rules, 1989. The records of hazardous waste manifest will bemaintained. The industry shall obtain the consent for Establishment (CFE) and Consent for operation (CFO) as required under the section 25/26 of the Water Act, 1974 and the under Section 21/22 of Air Act, 1981 before b trial production and commissioning from the A. P. Pollution Control Board. The CFO will be renewed each year by the industry. The industry will obtain the necessary permissions under Hazardous Waste (Management & Handling) Rules 1989, and Manufacture, Storage and Impact of Hazardous Chemicals Rules, 1989, issued by the Ministry of Environment Forests, New Delhi. The industry will submit the environmental statement every year before September 30. The management ensures that it will comply with all the directions and regulations issued by the Ministry of Environment and Forests, New Delhi, State and Central Pollution Control Boards. The Consent for Establishment, Consent for Operation will be displayed in a

conspicuous location for the information of the inspecting authorities of different departments.

13.0 Cost Estimate for Environment Management Plan

It is estimated that the capital cost for implementing the Environment Management Plan is Rs. 48.08 Crore (existing Rs. 33.08 Cr + Rs. 15.0 Cr for the proposed expansion), while recurring costs for the same is aboutRs.4.0 Cr.